RMG GAS ANALYSIS CONTROLLER

RGC 7-C

Operating manual
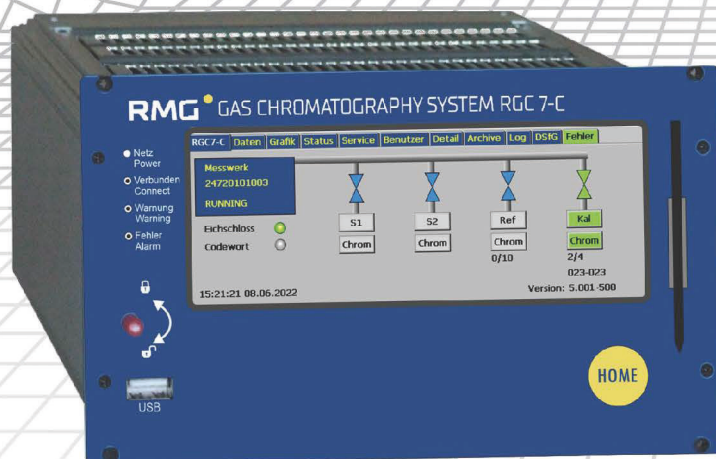
Contact details

Manufacturer information

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

Document information

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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.

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V00	September 2021	Initial creation
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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

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1 About this manual

This operating manual contains essential information on operating the Gas analysis controller RGC 7-C safely, reliably and as intended.

It forms an integral part of the RGC 7-C and must be kept close to the device in a place where it can be accessed by the personnel easily at any time.

The manual is intended for technically qualified personnel who have been trained for installation, operation, maintenance and repair.

The personnel must have carefully read and understood this manual before commencing any work. Compliance with all the specified safety information and instructions is essential for safe work.

Illustrations provided in this manual are intended to provide a general understanding and may not correspond precisely to the actual product.

1.1 Scope of the manual

This manual applies to all variants of the Gas analysis controller RGC 7-C (also referred to as 'controller' below).

The controller is used as an individual component in an overall system. The manuals of the other components used therefore apply in addition to this manual. In the event of the manuals containing contradictory instructions, please contact RMG Messtechnik GmbH and/or the manufacturers of the other components.

1.2 Abbreviations

This manual uses the following abbreviations:

RGC 7-C	**R**MG **G**as**C**hromatograph **7-C**ontroller
PED	**P**ressure **E**quipment **D**irective
DVGW	**D**eutscher **V**erein des **G**as- und **W**asserfaches (German Association for Gas and Water)
MessEV	**Mess**- und **E**ich**v**erordnung (German Weights and Measures Ordinance)
MID	**M**easurement **I**nstruments **D**irective
PTB	**P**hysikalisch **T**echnische **B**undesanstalt (German National Metrology Institute)
GUI	**G**raphical **u**ser **i**nterface
DSfG	**D**igitale **S**chnittstelle **f**ür **G**asmessgeräte (Digital Interface for Gas Measurement Equipment)
TCP/IP	**T**ransmission **C**ontrol **P**rotocol/**I**nternet **P**rotocol Family of network protocols (Internet protocol family)
IP (address)	Address based on the Internet protocol (IP) and assigned to devices in the network so that they can be addressed and accessed.
LAN	**L**ocal **A**rea **N**etwork – a local computer network.
Eth1 / Eth2	**Eth**ernet interface 1 /2 Ethernet technology enables data to be exchanged between connected devices in the local network.
SNTP	(**S**imple) standard (NTP = **N**etwork **T**ime **P**rotocol) for synchronising clocks in computer systems
RU	**R**ack **u**nit (the height of a rack is measured in rack units)

Table 1:   Abbreviations

HP	**H**orizontal **p**itch (the horizontal width of a rack is measured in horizontal pitch)
RF	Response factor
RFZ	Response factor from the last basic calibration
RT	Retention time
RTZ	Retention time from the last basic calibration

Table 1:   Abbreviations

1.3   Symbols

This manual uses the following symbols:

1., 2., etc.	Indicates steps that are to be performed in the specified sequence.
▶	Indicates a measure or an activity that is to be carried out.
▪	Indicates a general collection of information
	Indicates a reference to a specific section of this manual

Table 2:   Symbols used

1.4   Structure of the safety information

In this manual, safety information is labelled with symbols and introduced with signal words.

The safety information specifies the type and the source of the danger and describes the consequences of failing to observe the safety information.

The safety information concludes by describing the measures and actions required to avoid the hazard.

The safety information in this manual is structured as follows:

⚠ DANGER

Imminent threat

Potential consequences of failing to observe the safety information: death or extremely severe injury

    ▶ Preventive measure or action

⚠ WARNING

Dangerous situation

Potential consequences of failing to observe the safety information: severe or irreversible injury

    ▶ Preventive measure or action

> ⚠ **CAUTION**
>
> **Potentially dangerous situation**
>
> Potential consequences of failing to observe the safety information: slight or minor injury
>
> ▶   Preventive measure or action

> **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 Gas analysis controller RGC 7-C is used as a control computer and measurement recording device for the process gas chromatograph RGC 7-M. It registers, archives and transfers the measurements provided by the process gas chromatograph RGC 7-M in order to determine the energy content of natural gases and biogases, for example, or to calculate the compressibility coefficient. The controller is used for operation, it determines the analysis workflow (as control computer) and it outputs the measurements. All operating parameters are saved on the controller.

The Gas analysis controller RGC 7-C is **not** intended for use in potentially explosive atmospheres. The RGC 7-C is connected to the gas chromatograph RGC 7-M, however, which is located in a potentially explosive atmosphere.

The RGC 7-C was designed and manufactured in accordance with the latest technological developments and recognised safety standards and guidelines. Nevertheless, hazards or damage to the device or other property may occur during its use. The RGC 7-C may only be used as intended as in a perfect technical condition.

Observe the operating manual and follow the instructions and installation, start-up, operation and maintenance guidelines.

Perform cleaning and care of the device on a regular basis and observe the guidelines for 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 named above, in particular:

- Personnel who have not been given instructions engaging in activities on the device.
- Failure to follow the operating instructions issued by the owner.
- Failure to observe the operating manual.
- Using the RGC 7-C in a potentially explosive atmosphere.

NOTE
Use other than as intended
Using the device in a way other than intended renders all commercial guarantee claims void.

2.3 Liability disclaimer

All specifications and notes provided in this manual were compiled in accordance with the application standards and guidelines, the latest technological developments and many years of knowledge and experience.

RMG Messtechnik GmbH assumes no liability for loss or damage caused by:

- failure to observe this manual
- use other than as intended

- deployment of untrained personnel
- operating errors
- unauthorised modifications
- technical alterations
- use of non-permitted spare parts

The obligations arranged in the supply agreement, the general terms and conditions and the statutory regulations that applied at the time the agreement was concluded apply.

2.4   Conformity

The Gas analysis controller RGC 7-C was placed on the market in accordance with EMC Directive 2014/30/EU.

The following type examination has been performed for the device:

- Test Report: 1-1289/20-01-02, CTC advanced GmbH

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

The EU declaration of conformity is provided in the annex.

The device bears the following mark:

$$C\,E$$

For queries or for additional information, please contact RMG Messtechnik GmbH.

2.5   Type label

The type label of the Gas analysis controller RGC 7-C is located on the device's front panel.

The following figures show two example type labels for the RGC 7-C (controller) in combination with the measuring units RGC 704-M and RGC 717-M.

Processgaschromatograph **Type RGC 7-C** Control computer for RGC 704-M und measurement value recording device **RMG Messtechnik GmbH** Otto-Hahn-Str. 5 35510 Butzbach / Germany **RMG** CE ser. no. ☐ year ☐ RGC 7-M ser. no. ☐	**Processgaschromatograph** **Type RGC 7-C** Control computer for RGC 717-M und measurement value recording device **RMG Messtechnik GmbH** Otto-Hahn-Str. 5 35510 Butzbach / Germany **RMG** CE ser. no. ☐ year ☐ RGC 7-M ser. no. ☐

Fig. 1:   Type label (RGC 704-M)   Fig. 2:   Type label (RGC 717-M)

2.6 Personnel qualifications

⚠ DANGER

Danger of death arising from insufficiently qualified personnel

If unqualified personnel perform work such as mechanical and/or electrical installation, and in initial start-up, in potentially explosive atmospheres hazards arise that could cause extremely severe injury or death.

▶ All activities must only be performed by personnel who have received training and instruction for work in potentially explosive atmospheres.

▶ Keep unqualified personnel away from the hazard zones.

▶ Have any work that has been performed checked by responsible experts.

▶ Mechanical installation must also only be performed by persons with the corresponding qualifications, who have the knowledge required for the activities to be performed and the tools to be used.

NOTE

Recommend qualifications for the personnel

In general the following qualifications are recommended for all persons working with or on the Gas analysis controller RGC 7-C:

▶ Education/training relating to work in potentially explosive atmospheres.

▶ Ability to correctly assess hazards and risks in handling the RGC 7-C and all connected devices.

▶ Education/training provided by RMG Messtechnik GmbH for work with gas measuring instruments.

▶ Training/instruction in relation to all national standards and guidelines that need to be complied with for the work to be performed at the RGC 7-C.

The following personnel qualifications have been defined for the various activities in involving the RGC 7-C:

Operation:	The operating personnel use and operate the device within the scope of its intended use. The owner instructs the operating personnel regarding the tasks assigned to them and potential dangers.

Cleaning and care:	Cleaning and care of the device must only be performed by specialists with the corresponding qualifications.
Maintenance and repair:	Maintenance and repair work must only be performed by specialists who have undergone training in relation to the advanced operation and parameterisation of the device and the performance of preventive maintenance work. They are also able to perform the tasks assigned to them as the result of their specialist training and experience and knowledge of the relevant standards and provisions. These specialists are aware of the applicable legal regulations concerning accident prevention and are able to recognise and avoid potential hazards.
Installation and Electrical work:	Installation and electrical work must only be performed by a specialist electrician. A specialist electrician must have a specialist training, knowledge and experience in electrical engineering and be aware of the relevant standards and regulations (DIN VDE 0105, IEC 364, etc.). The specialist electrician is aware of the applicable legal regulations concerning accident prevention and is able to recognise and avoid potential hazards.

2.7 Responsibility of the owner

The device is used in the industrial sector. The owner of the device is therefore subject to the legal obligations relating to occupational health and safety.

In addition to the safety information provided in this manual, the safety, accident prevention and environmental regulations that apply to the device's field of application must be observed.

The following also applies in particular:

- As owner, ensure that only personnel with sufficient qualifications work on the device.
- Ensure that all employees who handle the device have read and understood this manual.
- Furthermore, you are obliged to train the personnel on a regular basis and to inform them of the risks and hazards involved in handling the device.
- Arrange for work performed by qualified personnel to be checked by responsible specialists.
- Clearly specify the responsibilities for installation, operation, troubleshooting, maintenance and cleaning.
- Make the required personal protective equipment available to the personnel.

2.8 Scope of delivery

The actual scope of delivery may differ from the explanations and depictions provided here in the case of custom designs or additional options being ordered or because of recent technical developments.

Nevertheless, the following table depicts the standard scope of delivery:

Component	Quantity
Gas analysis controller RGC 7-C	1
Operating manual	1

Table 3: Scope of delivery

For further information on the device, see section 4 'Product description'.

3 Safety information

3.1 Risk assessment and risk minimisation

The RGC 7-C was manufactured in accordance with the latest technical developments and recognised safety rules and standards, but its use does nevertheless pose some risks. Throughout the development process, these risks were identified and assessed by qualified employees. A corresponding risk analysis was compiled and used a basis for developing and implementing structural measures in order to minimise the risks.

This manual draws attention to the residual risks that cannot be prevented in safety information and instructions.

Measures for risk minimisation:

The maximum permitted temperature range is provided in section 13 "Technical data". Operation of the device is only permitted within the specified range.

3.2 General safety information

> **⚠ DANGER**
>
> **Danger – personal injury and property damage!**
>
> Failing to observe the safety information may result in danger to human life or health and environmental and property damage.
>
> ▶ Observe all the following safety information!

Bear in mind that the safety information in this manual and on the device is not able to cover all potential hazardous situations, as it is not possible to foresee how all the ways in which different circumstances may interact.

Exclusively observing the instructions provided may not be sufficient to ensure proper operation.

- Always remain attentive and think for yourself.
- Before working with the device for the first time, read this operating manual carefully, especially the safety information it contains.
- This operating manual provides warnings of unavoidable residual risks for users, third parties, devices and other property in its safety information.
- Only operate the device in a perfect technical condition, in compliance with the operating manual and in accordance with its intended use.
- In addition, observe the local legal regulations concerning accident prevention, installation and assembly.

3.3 Safety information for installation and initial start-up

<div>

⚠ DANGER

Risk of explosion arising from unauthorised installation of the RGC 7-C in potentially explosive atmospheres

The Gas analysis controller RGC 7-C is **not** approved or designed for use in potentially explosive atmospheres. Using the RGC 7-C in a potentially explosive atmosphere could, for example, cause it to become an ignition source as the result of sparking and trigger an explosion.

▶ Do not install the RGC 7-C in a place where there is a potentially explosive atmosphere.

▶ Only install the RGC 7-C in its original, complete and fault-free condition.

▶ Equalise the potential of the housing by connecting an earthing cable to the housing.

▶ When connecting auxiliary devices and sensors in potentially explosive atmospheres, ensure that corresponding explosion protection is provided for these components.

▶ For intrinsically safe components, provide galvanic isolation if they are connected to the RGC 7-C.

▶ Only allow devices and sensors to be connected to the RGC 7-C by specialist personnel in accordance with EN 60079-14, in accordance with national regulations.

▶ To clean the housing, always use a slightly damp cloth to avoid static charging as the result of friction.

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⚠ CAUTION

Danger – cutting injury

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

▶ Wear appropriate personal protective equipment when performing any work on the device.

▶ Remove any burs that are still present on fastening points.

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3.4 Safety information for normal operation

As a basic rule, the instructions of the owner of the system in which the RGC 7-C is installed must be observed.

In addition, the safety information listed below must be observed:

> **⚠ WARNING**
>
> **Risk of injury arising from incorrect operation**
>
> Incorrect operation or modifications being made to the Gas analysis controller may give rise to hazards that could cause severe injury.
>
> ▶ Read this operating manual carefully to avoid incorrect operation and only use the RGC 7-C in accordance with its intended use (see section 2.1 "Intended use").
>
> ▶ For safe operation, observe the power limits specified in the technical data (see section 13 "Technical data") and ensure that they are not exceeded.
>
> ▶ Do not use the Gas analysis controller as a step to climb on or as a handrail to steady yourself with!

3.5 Safety information for servicing, maintenance and cleaning

Service and maintenance work or repairs that are not described in this operating manual must not be carried out without prior consultation with the manufacturer.

Tampering with or modifying the Gas analysis controller in ways not described in this operating manual is not permitted.

> **⚠ DANGER**
>
> **Danger of death arising from electrical voltage**
>
> Before servicing, maintenance and cleaning work, it is essential to switch off the device and disconnect it from the mains power supply. Failing to do so may lead to extremely severe injury or death.
>
> ▶ Before any work is commenced, switch of the device's power supply and disconnect it from the mains.
>
> ▶ Only carry out work on the device as described in this manual. Ensure that the device is not live while the work is being performed.

> **⚠ WARNING**
>
> **Risk of injury arising from inappropriate servicing, maintenance and cleaning**
>
> If servicing, maintenance or cleaning work is performed incorrectly or if use of the device is resumed despite it being defective, damaged or unsafe, this may result in severe injury.
>
> ▶ Arrange for servicing, maintenance and cleaning work to be performed exclusively by specialists who have the required knowledge for the activities to be performed and the tools to be used.
>
> ▶ If a device is damaged or unsafe, it must be removed from circulation immediately and labelled accordingly to prevent it from being used accidentally.
>
> ▶ In general, it is recommended to have repairs or the exchange of a defective device performed only by RMG Service.

3.6   Special types of hazard – explosion protection

The Gas analysis controller RGC 7-C is **not** approved or designed for use in potentially explosive atmospheres. However, auxiliary devices and sensors connected to the RGC 7-C may be installed in potentially explosive atmospheres.

This symbol warns you of an explosive atmosphere; observe the information provided next to the symbol.

⚠ DANGER

Risk of explosion during installation and operation of devices and sensors in potentially explosive atmospheres

If devices and sensors connected to the RGC 7-C are installed and operated in a potentially explosive atmosphere, even very low levels of ignition energy can result in an explosion that could cause extremely severe injury and death.

▶ Observe all applicable national regulations for installing devices and sensors in potentially explosive atmospheres (e.g. IEC 60079-10, IEC 60079-14, IEC 80079-20-1).

▶ When connecting the measuring unit, and external oxygen sensor or auxiliary devices and sensors in potentially explosive atmospheres, ensure that corresponding explosion protection is provided for these components.

▶ For intrinsically safe components, provide galvanic isolation if they are connected to the RGC 7-C.

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4 Product description

The Gas analysis controller RGC 7-C is used as a control computer and measurement recording device for the process gas chromatograph RGC 7 and may only be used in conjunction with this system.

4.1 Structure of the RGC 7-C

4.1.1 Housing

The components of the RGC 7-C are located inside a housing that has a housing base and cover with venting slits, a front panel with operating elements and a device back panel with connections (cf. fig. 3).
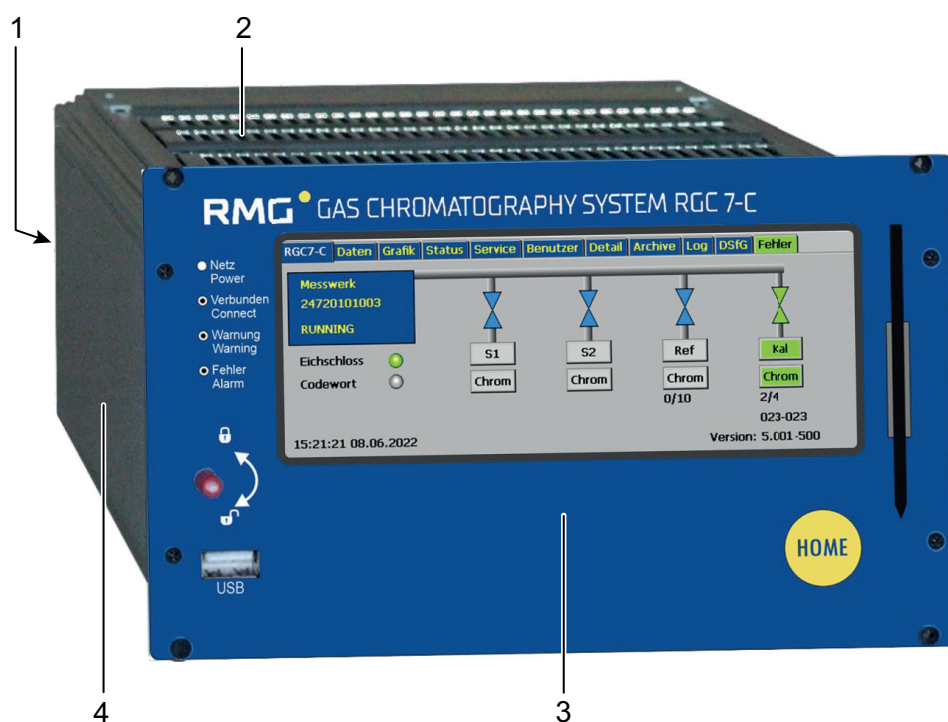
Fig. 3:   RGC 7-C – housing

No.	Designation	No.	Designation
1	Device back panel with connections	2	Housing cover with venting slits
3	Front panel	4	Housing panel

For the precise dimensions of the housing, please refer to section 13 "Technical data".

4.1.2 Front panel

The front panel contains the following operating and display elements (cf. fig. 4):
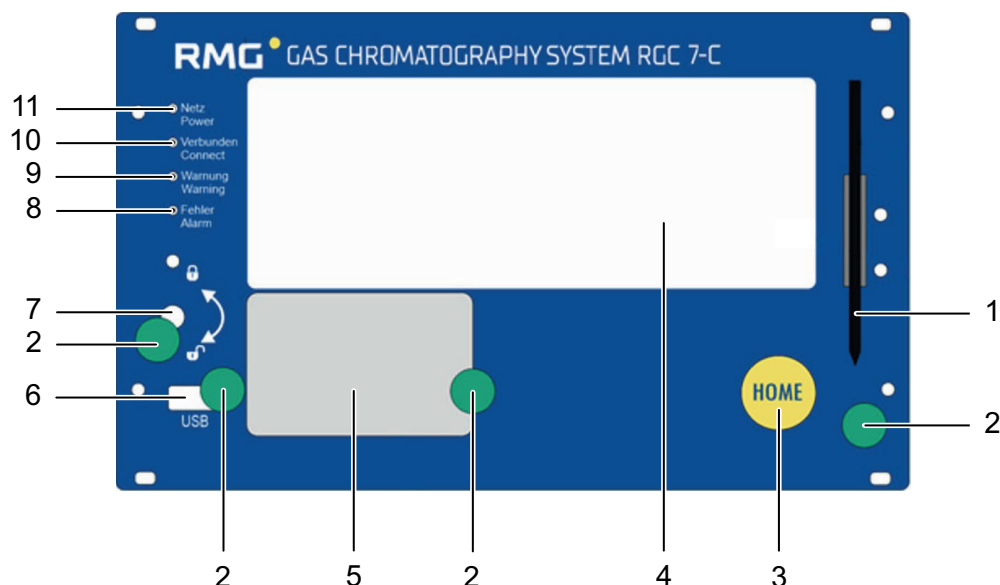
Fig. 4:   Front panel of the RGC 7-C

No.	Designation	Function
1	Stylus including holder	Operation of the touchscreen
2	Lead seal	Safeguards against the unauthorised tampering
3	**HOME** operating key	Changing between start menu and error menu
4	Touchscreen	Display and operating field of the controller
5	Type label	Device identification and labelling
6	USB port	Port of USB components (e.g. a mouse), lead-sealed in the case of officially calibration operation
7	Calibration switch as rotary switch	Sealable rotary switch (when the end stop has been reached in the clockwise direction, the calibration lock / user lock is open)
8	**Error** LED (red)	Lit up continuously: An error/malfunction has occurred Flashing: The current error has an impact on an official calibration function
9	LED **warning** (yellow)	Lit up continuously: A warning has been issued Flashing: The current error has an impact on a function that is **not** officially calibrated
10	**Connected** LED (orange)	Lit up continuously: A measuring unit (RGC 7-M) is connected and active
11	**Network** LED (green)	Lit up continuously: Power is supplied to the device Flashing: The calibration or user lock is open

4.1.3 Components in the housing

Inside the housing there is an compact industrial PC with a modular design (an 'embedded PC') that is equipped with the following components:

- Standard processor (CPU ARM1176)
- Standard memory card (4 GB)

The embedded PC controls all functions that are performed with the RGC 7-C, in conjunction with the **Windows CE 6.0** operating system.

4.1.4 Connections

The connections of the RGC 7-C are located on the device back panel (cf. fig. 7).

In total, the RGC 7-C has the following inputs and outputs as a maximum:

- 8 analogue inputs
- 4 analogue outputs
- 20 digital inputs
- 12 digital outputs

For the assignment of the individual terminal strips and additional information on the connection options, please refer to section 6.2 "Electrical installation".

4.1.5 Extending the connections

If additional inputs and outputs are needed, add-on modules with additional digital and analogue inputs and outputs can be connected to the serial port X12 or COM 2 (RS 232) of the RGC 7-C.

For the extension, it is essential to use the following modules:

- Start module fieldbus coupler MODBUS; RS-232 (Wago, item no. 750-316/300-000)
- End module bus terminal (Wago, item no. 750-600)

Between the start and the end module, the following additional modules can be chosen in various combinations and installed:

- 4-channel digital input (Wago, item no. 750-402)
- 4-channel digital output (Wago, item no. 750-504)
- 4-channel analogue input (Wago, item no. 750-455)
- 4-channel analogue output (Wago, item no. 750-555)
- 2-channel analogue output (Wago, item no. 750-554)
- Internal system supply module 24 V DC, galvanically isolated (Wago, item no. 750-602)

With the external Wago modules, the RGC 7-C can be extended with:

- Up to 16 additional analogue inputs
- Up to 16 additional analogue outputs
- Up to 16 additional digital inputs
- Up to 16 additional digital outputs

To enable use of the Wago modules, various parameters need to be set in the user interface. For a detailed description of this, please refer to sections 7.8.14 "Level 16 Ports" and 7.8.17 "Level 19 External I/O system".

4.2   Function of the RGC 7-C

The controller RGC 7-C is an important extension of the process gas chromatograph RGC 7 that analyses natural gases, biogases and similar gas mixtures and supplies the measurements required for determining the energy content and calculating the compressibility coefficient. The controller is used for operation, it determines the analysis workflow (as control computer) and it outputs the measurements. All operating parameters are saved on the controller.

In addition to its control tasks, the RGC 7-C fulfils the following functions:

- Calculation of the calorific value, standard density, heating value, density ratio, Wobbe index from the percentage shares of the individual gas components that have been identified in accordance with ISO 6976, and optional calculation of the methane number in accordance with DIN EN 16726.
- Saving the analysis results in archives (minute, hour, day, month)
- Extensive communication functions (Modbus, RMGBus, DSfG, etc.)
- Selection of operating modes for inspection purposes and to analyse gas samples
- Maintenance function: 'bake out'
- Monitoring of analogue and binary input signals

Analysis operation

The process gas chromatograph RGC 7 is available in two variants:

- **Single-stream:**   measurement gas from just one sampling point is analysed.
- **Double-stream:**   difference measurement gases from two separate sampling points are analysed. In the default setting, the sampling point, and therefore the measured gas, is alternated after each analysis.

During initial commissioning or re-commissioning after repair and/or service work, a **basic calibration** of the RGC 7 is performed. This specifies the initial values for all gas components, on the basis of the certified calibration gas with known concentrations. For each gas component, a response factor is calculated that can be used to monitor the drift of the system. This is done by using these response factors as basis data for a comparison with the response factor from the regular calibrations.

In normal operation, the process gas chromatograph RGC 7 carries out individual analysis procedures. For each column unit, the foundation for an analysis is the signal curve of the thermal conductivity detector, referred to as a chromatogram. Every peak in this chromatogram marks a gas component. The time period until the peak occurs is referred to as the retention time. It is the central criterion for identifying the individual components of a gas mixture and thus helps to identify the individual components in the chromatogram.

The area under the signal curve of each peak, which determines the corresponding substance amount, is identified. The controller RGC 7-C evaluates the determined area amounts and uses calculation polynomials to calculate the share of the individual gas components in the unit mol %. The multi-level coefficients required for this are determined in the factory calibration.

The results of an analysis are displayed in the user interface in the 'Data' menu (cf. section 7.3 "Menu Data").

As soon as one analysis process has finished, the next one is started. Depending on the variant, this may take approx. 60 seconds for the 704-M and approx. 90 seconds for the RGC 717-M.

As systematic deviations from the calibration gas setpoints may occur during analysis operation, for example as the result of environmental influences (temperature, humidity) or age-related differences in the sensitivity of the detector, calibration must be performed at regular intervals. The calibrations can be started either manually or automatically.

During a calibration, the response factors are calculated for each gas components in order to compensate for the potential systematic measurement deviations.

In accordance with the PTB approval, a calibration is made up of at least six analysis measurements, with the last four measurements used for calibration. The calibration should be carried out once a day. Calibration with peak tracking takes roughly 10 minutes, depending on the device type.

If the RGC 7 does not need to be operated under the approval conditions, the number of calibration gas analyses and the calibration interval can be specified as desired.

During the course of the operating time of the RGC 7 measuring unit, drift may also occur, for example in the case of accumulation of moisture or heavy hydrocarbons. This drift can be identified by a change in the retention times.

If the deviation is greater than the 15% specified in the PTB approval, an alarm message is sent and the column modules of the RGC 7 measuring unit will need to be baked out again.

The subsequent renewed basic calibration is not permitted in ongoing operation.

For a detailed description of operation, the individual menus of the user interface and the options for setting options, please refer to section 7 "Operation".

5 Transport and storage

5.1 Inspection following delivery

The Gas analysis controller RGC 7-C is delivered in packaging that meets the customer's specific transport requirements. First of all, the delivery should be checked for completeness. The device must be removed from its packaging for this check. The device is then installed or placed in storage.

For details on installing the device, please refer to section 6 "Installation". Information on storing the device is provided in section 5.3 "Storing RGC 7-C".

5.2 Disposing of packaging material

Dispose of device components and packaging material in an environmentally sound manner in accordance with the applicable waste management and national waste disposal regulations and standards of the region or country to which the device is delivered.

NOTE

Reusing the packaging

Where possible, retain the packaging, as it provides optimal protection if the device is ever transported again (e.g. if the place of installation is changed or if the device is sent off for repair).

5.3 Storing RGC 7-C

If it is necessary to store the Gas analysis controller RGC 7-C, observe the following:

- ▶ Avoid long storage periods.
- ▶ After storage, check the RGC 7-C for damage and correct functioning.
- ▶ After a storage period exceeding one year, have the device checked by RMG Service. Send the device to RMG or arrange an appointment with the RMG Service organisation.
- ▶ Maintain the storage conditions listed below:
  - – Packaged in clean, dry rooms
  - – Temperature range -40 °C to 70 °C
  - – Agitation (vibrations) must not occur during the storage period.
  - – The device must not be stored under tension.

5.4 Transporting RGC 7-C

For transport, it is essential for the device to be given secure packaging that can absorb minor impacts and agitation.

- ▶ Nevertheless, inform the transport company that impacts and vibrations of any type must be avoided during transport.
- ▶ Ensure that the device is not exposed to any extreme fluctuations in temperature.

6 Installation

For installation, observe the safety information provided in section 3.3!

6.1 Mechanical installation

> **⚠ WARNING**
>
> **Danger arising from incorrect mechanical installation**
>
> If the RGC 7-C is not installed or mounted correctly, this may result in hazards to persons and property.
>
> ▶ Only specialists are permitted to perform the installation work.
> ▶ Only install the RGC 7-C in accordance with the stipulations of this manual.
> ▶ For the installation, obtain permission from the system owner.

6.1.1 Place of installation and ambient conditions

The Gas analysis controller RGC 7-C is intended for installation in a non-explosive atmosphere (safe area). It is connected via an Ethernet cable to the process gas chromatograph RGC 7, which is installed in an explosive atmosphere.

The following diagram illustrates the separation of the places of installation in a gas station into explosive zone and non-explosive zone.
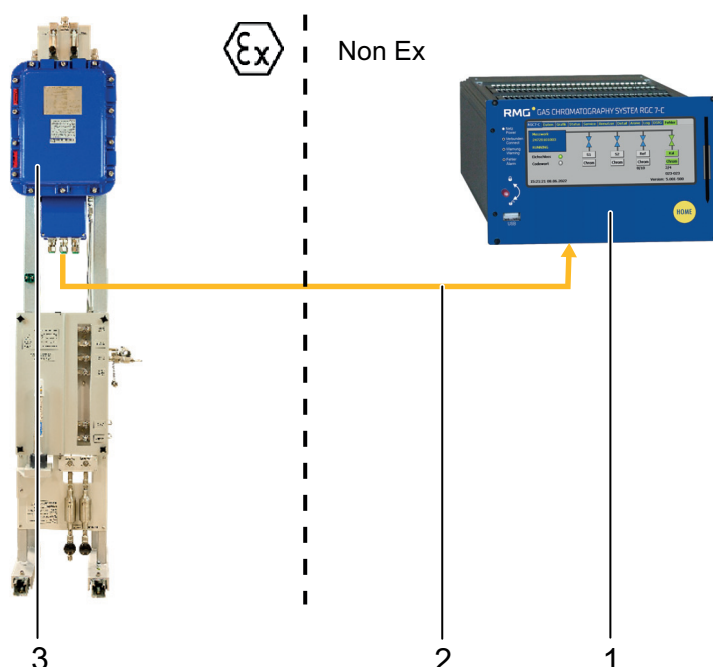
Fig. 5: Separation of the places of installation in a gas station

No.	Designation	No.	Designation
1	Gas analysis computer RGC 7-C	2	Ethernet connection
3	Process gas chromatograph RGC 7		

The following ambient conditions must be maintained at the place of installation:

Condition	Value
Humidity	0–95% relative humidity, non-condensing
Exposure to direct sunlight	Should be avoided where possible.
Ambient temperature	-20 to 55 °C
Temperature fluctuations	Large and rapid fluctuations in temperature should be avoided where possible.

Table 4:   Ambient conditions for the RGC 7-C

6.1.2   Unit dimensions and weight

The Gas analysis controller RGC 7-C is intended for installation in a rack inside a switch cabinet (non-explosive zone). It has the following unit dimensions:

- 213 x 128.4 x 310 mm (42 HP / 3 RU) (W x H x D)

The weight of the device is approx. 2.5 kg.

6.1.3   Installation

The RGC 7-C is supplied with four screws for installation in a rack.
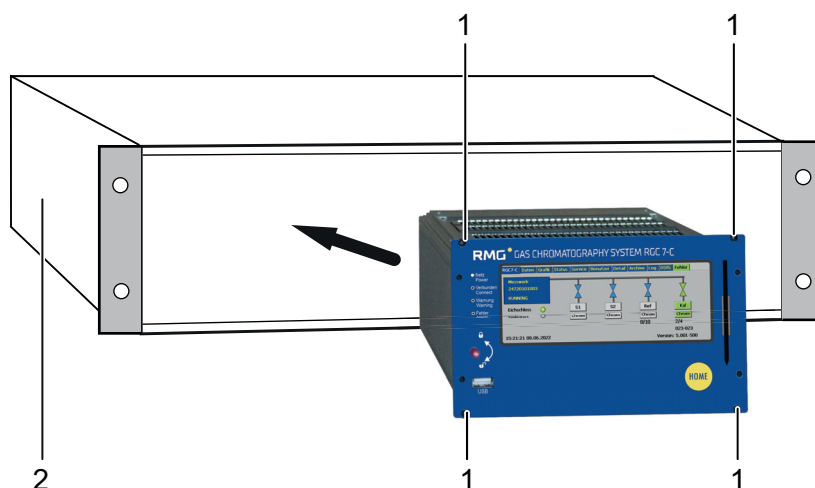
Fig. 6:   Position of the screws on the front panel of the RGC 7-C

No.	Designation	No.	Designation
1	Screws, type M2.5x10	2	Rack

Procedure for installation:

1.   Insert the RGC 7-C into the rack with the front panel facing forwards.
2.   Place the RGC 7-C in the required position and slightly tighten the four screws (fig. 6, no. 1) with a cross-head screwdriver.

6.2 Electrical installation

Before commencing work, ensure that all information and warnings from the above sections, in particular those from the section 3 'Safety information' are observed and complied with. Ensure that the device is de-energised (power supply and signals) before any changes are made to the wiring. During work, it is essential to comply with the specifications given in the sections below.

⚠ **DANGER**

Danger of death arising from electrical voltage

Work that is not carried out correctly or on a de-energised device may result in extremely severe injury or death.

- ▶ Only have the electrical installation carried out by a specialist electrician who can ensure that the installation is performed safely and correctly.
- ▶ Before any work is performed on the electrical installation, de-energise the device.
- ▶ Work on the device may only be performed after corresponding instruction with regard to the device has been provided.
- ▶ Ensure that the power data of the power supply connection corresponds to the specifications on the device's type label.
- ▶ Only use cables that match the available cable glands of the RGC 7-M.
- ▶ Equalise the potential of the housing by connecting an earthing cable to the housing.
- ▶ During installation, observe any national, regional and regulatory standards that may apply at the location of the device for electrical installation and explosion protection (e.g. EN, DIN, VDE).

The RGC 7-C has various electrical and signal connections, located on the device's back panel (cf. fig. 7).
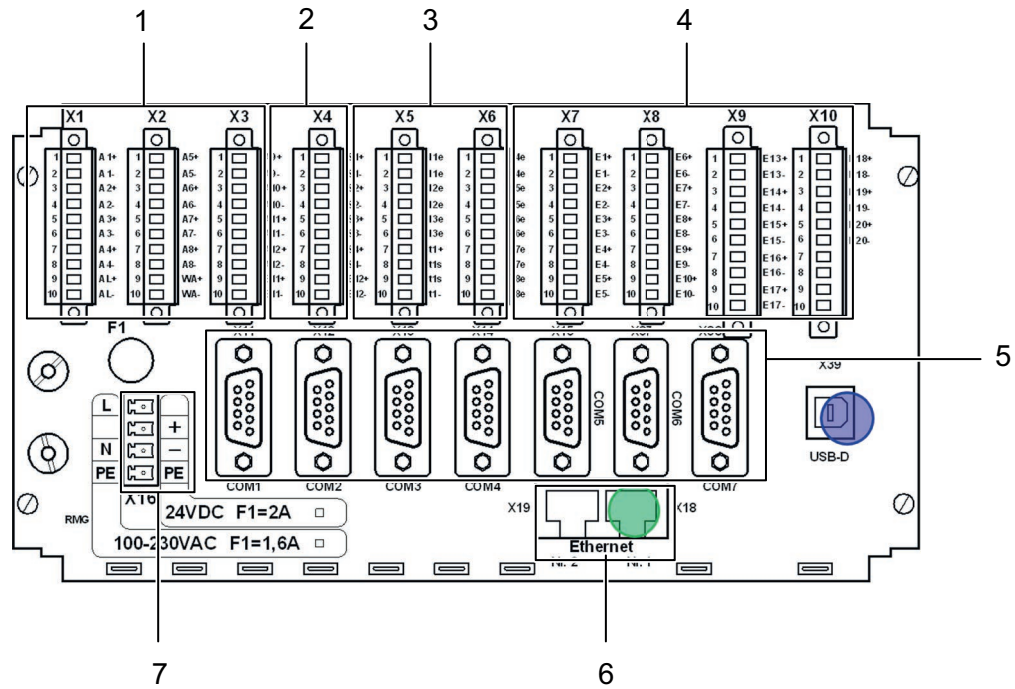
Fig. 7: Connections on the device's back panel

No.	Designation	Function
1	Terminal strip X1 to X3	■ Digital outputs, alarm and warning contacts, passive inputs
2	Terminal strip X4	■ Analogue outputs, passive inputs
3	Terminal strip X5 and X6	■ Analogue inputs, temperature inputs
4	Terminal strip X7 to X10	■ Digital inputs
5	Serial ports X11 to X15, X37 and X38 / COM 1 to COM 7	■ RS 232/RS 485 ports for various Modbus communications
6	Network ports X18 and X19 (Ethernet)	■ Connection with the measuring unit RGC 7-M ■ Connection to a PC or a local network
7	Terminal strip X16	■ Power supply connection

6.2.1 Terminal assignments of the terminal strips

The terminal connections of the individual core of terminal strips X1 to X10 are listed below:

Terminal strip X1

Core no.	Des. short	Designation long	Function	Comment
1	A1+	Digital output 1+	The digital outputs 1 to 4 can be used for the limit exceedance 'specialities' or to signal parameterised error numbers in the 'Detail' menu, levels 20.03 to 20.14 'Custom status bits 1 to 12'.	
2	A1-	Digital output 1-		
3	A2+	Digital output 2+		
4	A2-	Digital output 2-		
5	A3+	Digital output 3+		
6	A3-	Digital output 3-		
7	A4+	Digital output 4+		
8	A4-	Digital output 4-		
9	AL+	Alarm contact +	RGC 7-C: Alarm +	Contact open in event of alarm
10	AL-	Alarm contact -	RGC 7-C: Alarm -	

Table 5:   Assignment of terminal strip X1

Terminal strip X2

Core no.	Des. short	Designation long	Function	Comment
1	A5+	Digital output 5+	The digital outputs 5 to 6 can be used for the limit exceedance 'specialities' or to signal parameterised error numbers in the 'Detail' menu, levels 20.03 to 20.14 'Custom status bits 1 to 12'.	
2	A5-	Digital output 5-		
3	A6+	Digital output 6+		
4	A6-	Digital output 6-		
5	A7+	Digital output 7+	Calibration in progress	
6	A7-	Digital output 7-	Calibration in progress	
7	A8+	Digital output 8+	Collective message for digital outputs 9–12	
8	A8-	Digital output 8-	Collective message for digital outputs 9–12	
9	WA+	Warning contact +	RGC 7: Warning	Contact open in event of a warning
10	WA-	Warning contact -	RGC 7: Warning	

Table 6:   Assignment of terminal strip X2

Terminal strip X3

Core no.	Des. short	Designation long	Function
1	A9+	Digital output 9+	The digital outputs 9 to 12 can be used for the limit exceedance 'specialities' or to signal parameterised error numbers in the 'Detail' menu, levels 20.03 to 20.14 'Custom status bits 1 to 12'.*
2	A9-	Digital output 9-	
3	A10+	Digital output 10+	
4	A10-	Digital output 10-	
5	A11+	Digital output 11+	
6	A11-	Digital output 11-	
7	A12+	Digital output 12+	
8	A12-	Digital output 12-	Limit exceedance analogue value 4*
9	E11+	Input 11+	NB: passive input, $U_{max} = 30$ V
10	E11-	Input 11-	NB: passive input, $U_{max} = 30$ V

Table 7: Assignment of terminal strip X3

* Analogue values under the heading 'specialities' can be monitored. If limits are exceeded, this leads to a warning message or to a signal contact being set.

Terminal strip X4

Core no.	Des. short	Designation long	Function
1	S1+	Current output 1+	The current outputs 1 to 4 can be used to output measured values. To enable this, they must be parameterised accordingly in the Detail menu, level 15.09–12 (cf. description in section 7.8.13 "Level 15 Inputs and outputs").
2	S1-	Current output 1-	
3	S2+	Current output 2+	
4	S2-	Current output 2-	
5	S3+	Current output 3+	
6	S3-	Current output 3-	
7	S4+	Current output 4+	
8	S4-	Current output 4-	
9	E12+	Input 12+	NB: passive input, $U_{max} = 30$ V
10	E12-	Input 12-	NB: passive input, $U_{max} = 30$ V

Table 8: Assignment of terminal strip X4

Terminal strip X5

Core no.	Des. short	Designation long	Function
1	I1e	Current input 1*	The current inputs 1 to 8 can be used to record analogue measurement signals. To enable this, they must be parameterised accordingly in the Detail menu, level 15.01–08 (cf. description in section 7.8.13 "Level 15 Inputs and outputs").
2	I1e	Current input 1*	
3	I2e	Current input 2*	
4	I2e	Current input 2*	
5	I3e	Current input 3*	
6	I3e	Current input 3*	
7	t1+	Temperature input 1	Power supply ++ Room temperature
8	t1s	Temperature input 1	Sense + Room temperature
9	t1s	Temperature input 1	Sense - Room temperature
10	t1-	Temperature input 1	Power supply - - Room temperature

Table 9:   Assignment of terminal strip X5

*   The polarity of the current input is determined by the operating mode (active/passive).

Terminal strip X6

Core no.	Des. short	Designation long	Function
1	I4e	Current input 4*	Active - / passive +
2	I4e	Current input 4*	Active - / passive +
3	I5e	Current input 5*	
4	I5e	Current input 5*	
5	I6e	Current input 6*	Active - / passive +
6	I6e	Current input 6*	Active - / passive +
7	I7e	Current input 7*/ Temperature input 2	Active - / passive + Power supply ++
8	I7e	Current input 7*/ Temperature input 2	Active - / passive + Sense +
9	I8e	Current input 8*/ Temperature input 2	Active - / passive + Sense -
10	I8e	Current input 8*/ Temperature input 2	Active - / passive + Power supply - -

Table 10: Assignment of terminal strip X6

*   The polarity of the current input is determined by the operating mode (active/passive).

Terminal strip X7

Core no.	Des. short	Designation long	Function
1	E1+	Digital input 1+	The digital inputs 1 and 2 can be used to output errors or warnings. To enable this, they must be parameterised accordingly in the Detail menu, level 15.18 (cf. description in section 7.8.13 "Level 15 Inputs and outputs").
2	E1-	Digital input 1-	
3	E2+	Digital input 2+	
4	E2-	Digital input 2-	
5	E3+	Digital input 3+	P_{min} calibration gas
6	E3-	Digital input 3-	P_{min} calibration gas
7	E4+	Digital input 4+	P_{min} test gas
8	E4-	Digital input 4-	P_{min} test gas
9	E5+	Digital input 5+	T_{min} calibration gas
10	E5-	Digital input 5-	T_{min} calibration gas

Table 11: Assignment of terminal strip X7

Terminal strip X8

Core no.	Des. short	Designation long	Function
1	E6+	Digital input 6+	T_{min} test gas
2	E6-	Digital input 6-	T_{min} test gas
3	E7+	Digital input 7+	The digital inputs 7 to 10 can be used to output errors or warnings. To enable this, they must be parameterised accordingly in the Detail menu, level 15.18 (cf. description in section 7.8.13 "Level 15 Inputs and outputs").
4	E7-	Digital input 7-	
5	E8+	Digital input 8+	
6	E8-	Digital input 8-	
7	E9+	Digital input 9+	
8	E9-	Digital input 9-	
9	E10+	Digital input 10+	
10	E10-	Digital input 10-	

Table 12: Assignment of terminal strip X8

Terminal strip X9

Core no.	Des. short	Designation long	Function
1	E13+	Digital input 13+	The digital inputs 13 to 16 can be used to output errors or warnings. To enable this, they must be parameterised accordingly in the Detail menu, level 15.18 (cf. description in section 7.8.13 "Level 15 Inputs and outputs").
2	E13-	Digital input 13-	
3	E14+	Digital input 14+	
4	E14-	Digital input 14-	
5	E15+	Digital input 15+	
6	E15-	Digital input 15-	
7	E16+	Digital input 16+	
8	E16-	Digital input 16-	
9	E17+	Digital input 17+	Alarm input
10	E17-	Digital input 17-	Alarm input

Table 13: Assignment of terminal strip X9

Terminal strip X10

Core no.	Des. short	Designation long	Function
1	E18+	Digital input 18+	The digital inputs 18 and 19 can be used to output errors or warnings. To enable this, they must be parameterised accordingly in the Detail menu, level 15.18 (cf. description in section 7.8.13 "Level 15 Inputs and outputs").
2	E18-	Digital input 18-	
3	E19+	Digital input 19+	
4	E19-	Digital input 19-	
5	E20+	Digital input 20+	Warning input
6	E20-	Digital input 20-	Warning input
7		Not assigned	Not assigned
8		Not assigned	Not assigned
9		Not assigned	Not assigned
10		Not assigned	Not assigned

Table 14: Assignment of terminal strip X10

6.2.2 Terminal assignment, ports

Network ports

No.	Des. short	Designation long	Function
X18	Eth 1	Ethernet port 1	For connection with the measuring unit RGC 7-M
X19	Eth 2	Ethernet port 2	To connect a PC or local network, RJ45 socket for LAN/Ethernet (DHCP client or fixed IP address) Protocols: - Ethernet TCP/IP - Modbus TCP - http - DSfG-B - NTP

Table 15: Ethernet ports

Serial ports

No.	Des. short	Design	Function/protocols
X11	COM 1	RS 232 / **RS 485***	Modbus RTU / Modbus ASCII
X12	COM 2	RS 232	To connect an add-on module WAGO-IO (cf. section 4.1.5)
X13	COM 3	RS 232 / **RS 485***	DSfG / Modbus RTU / Modbus ASCII / RMG bus
X14	COM 4	RS 232 / **RS 485***	DSfG / RMG bus
X15	COM 5	RS 232	Modbus RTU / Modbus ASCII
X37	COM 6	RS 232 / **RS 485***	Modbus RTU / Modbus ASCII / RMG bus
X38	COM 7	RS 232 / **RS 485***	Modbus RTU / Modbus ASCII

Table 16: Serial ports

*   Configurable on the device with jumpers – information printed in bold represents the factory settings.

6.2.3 Power supply and fuse protection

The RGC 7-C must be supplied with 24 V (DC) power. The terminal strip X16 is intended to be used for this.

To provide protection from excess current, the device has a fuse (F1) that is triggered at double the rated current (F1=2At).

The voltage available at the place of use must be checked for correctness and usability. The following criteria must be observed:

- Voltage range: 24 V DC (±10%)
- The safety device with the above-mentioned properties must be functional.

Terminal connection, terminal strip X16

Core no.	Des. short	Designation long
1		Not assigned
2	+	+ 24 V
3	-	0 V
4	PE	Equipotential bonding

Table 17: Assignment of terminal strip X 16 – power supply

6.2.4 Connecting an RGC 7-M to the controller

The measuring unit RGC 7-M is connected to the RGC 7-C by means of an Ethernet cable.

▶ Use an Ethernet cable that has an RJ45 connector in accordance with the T568B standard on one side. Recommended cable type: **Herkulat, 600 A S/FTP 4 x 2 AWG23**

▶ Connect the RJ45 connector to the Ethernet port 1 (X18) on the back of the controller RGC 7-C.

▶ Connect the cores of the cable to the terminals in the socket of the RGC 7 measuring unit as shown in the following table (cf. also fig. 8).

Terminal number of socket, core colour	Signal	Assignment RJ 45 (in acc. with T568B standard) Core no., core colour
5, white/orange	TxD+	1, white/orange
6, orange	TxD-	2, orange
7, white/green	RxD+	3, white/green
8, green	RxD-	6, green

Table 18: Terminal assignment for Ethernet cable in the socket of the RGC 7-M

NOTE

Distance between measuring unit and controller greater than 80 metres

If the distance between the place where the measuring unit is installed and the controller is too large, or if cables longer that 80 metres are used, data transmission may be slower and susceptibility to errors may increase.

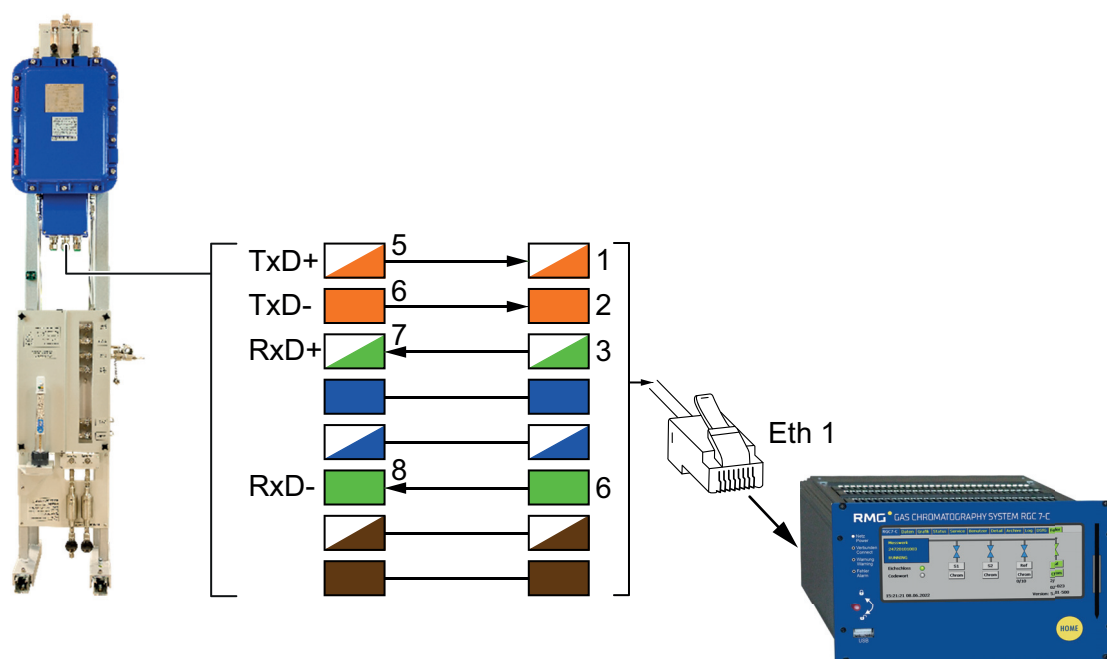▶ To ensure good data transmission, connect a VDSL modem.

Fig. 8:   Terminal assignment for Ethernet cable in the socket of the RGC 7-M

7   Operation

When the gas analysis computer RGC 7-C is connected to a process gas chromatograph RGC 7, the following operating options are available:

- Read the analysis results
- Start a manual calibration
- Switch the analysis from measurement gas to test gas (reference gas)
- Display and change operating parameters
- View archives and logbooks
- Display chromatograms
- Display error messages
- Display device status of the RGC 7
- Bake-out

NOTE

Enter code word open calibration/user lock

With the exception of the display functions, almost all other operating options require a code word to be entered (see section 7.8.24 "Level 26 User") / the calibration/user lock to be opened.

The RGC 7-C is operated by means of the touchscreen. This enables simple operation via a graphic user interface and straightforward menus.

You can press the **HOME** operating key on the front panel from any point in the menus to return to the start screen and then switch between start screen and error screen as desired.

NOTE

Damage to the touchscreen

Handling the touchscreen incorrectly could cause it to become damaged.

- ▶ Operate the touchscreen with your fingers or use the plastic stylus included in delivery.
- ▶ **Never** use a hard or sharp-edged object such as a screwdriver or pencil, as this could scratch or fracture the touchscreen film.

If a PC is connected at the network port Eth2 (X19) in the back of the device (cf. section 6.2.2), the following operating modes are also possible:

- Operating software RMGView^{GC}
- Any choice of Internet browser for viewing and saving the official-calibration and non-official-calibration archive.

7.1 User interface menus

When the Gas analysis controller RGC 7-C is connected to the power supply (cf. section 6.2.3), the touchscreen begins operation and the start screen of the graphic user interface, menu **RGC 7-C**, is displayed.

At the top of the start screen, there is a menu bar where the user interface's individual menus are arranged next to each other like tabs (cf. fig. 9).

Selecting a particular tab (with your finger or a stylus) opens the corresponding menu in the user interface. The menu bar remains visible in every menu screen.

The name of the selected menu is shown in white text, and the names of the remaining menu are shown in yellow. This makes it easy to see at a glance which menu is open.
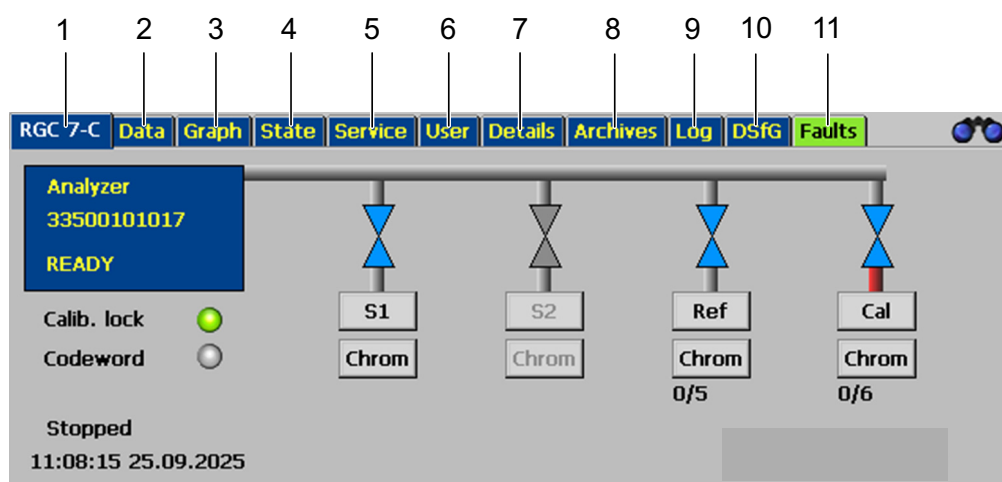
Fig. 9:   Start screen

No.	Designation	No.	Designation
1	Menu **RGC 7-C**	2	Menu **Data**
3	Menu **Graph**	4	Menu **State**
5	Menu **Service**	6	Menu **User**
7	Menu **Details**	8	Menu **Archives**
9	Menu **Log**	10	Menu **DSfG**
11	Menu **Faults**		

The display, setting and operating options in the individual menus are described in detail in the following sections.

7.2   Menu RGC 7-C

The menu RGC 7-C displays an overview of the current status of the measuring unit RGC 7-M.

Fig. 10:   Menu RGC 7-C

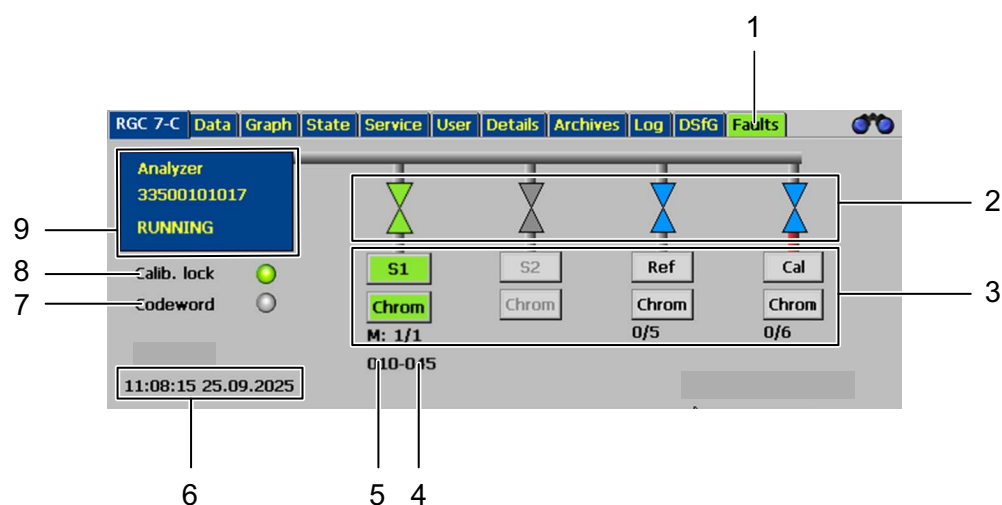| No.	Designation	Function
1	Status display **Faults**	■ Uses colour to indicate whether an error has occurred: - Green: no error has occurred. - Red: an error has occurred.
2	Status display **Gas stream connections**	■ Uses colour to indicate whether the gas flows (S1 and S2) are connected, along with reference gas (Ref) can calibration gas (Cal): - Green: the gas stream is active and connected. - Blue: the gas stream is active but not connected. - Green: the gas stream is active and connected. - Red: a pressure error has occurred.
3	Status display **Analysis**	■ Uses colour to indicate the status of the last analysis of the corresponding gas stream (S1, S2, Ref, Cal): - Green: the analysis was free from errors. - Red: The analysis was impaired. - Light grey with **black** text: no analysis has been performed. ■ Only applicable to gas stream S2: - Light grey with **grey** text: the analysis is not available for the present device design or is deactivated.
4	Display **Sample time**	■ Indicates the sample time of the analysis in seconds.
5	Display **Total time**	■ Indicates the total time of the analysis in seconds.

No.	Designation	Function
6	Display **Date and time**	■ Indicates the date and time of the device.
7	Status display **Code word**	■ Indicates the status of the code word entry: - Green = entered - Grey = not entered
8	Status display calibration/user lock	■ Indicates the status of the calibration/ user lock: - Green = open - Grey = closed
9	Button **measuring unit**	■ Changes to the menu **Status – measuring unit** ■ Displays the operational readiness of the measuring unit: - READY: Measuring unit is ready. - NOT READY: Measuring unit is not ready. - INITIALISING: Measuring unit is starting up. - FLUSHING: Measuring unit is being flushed. - RUNNING: Measuring unit is running.

7.3   Menu Data

The menu **Data** displays the results of the last analysis of the RGC 7 measuring unit.
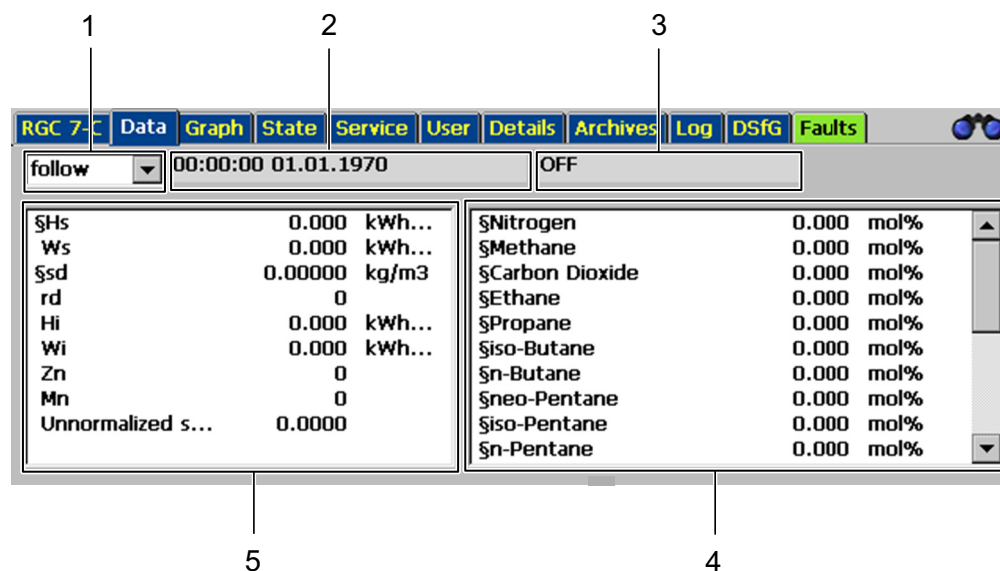

Fig. 11:   Menu Data

No.	Designation	Function
1	Selection **Analysis result**	■ Opens the selection menu to determine which analysis results should be displayed: - Following: Result of the last analysis, regardless of gas stream or gas type. - Stream 1: Measurement gas from gas stream 1. - Stream 2: Measurement gas from gas stream 2. - Ref. gas: Last reference gas analysis - Cal. gas: Last calibration gas analysis
2	Display **Timestamp**	■ Displays the timestamp indicating when the displayed measurement values were measured.
3	Display **Stream allocation**	■ Displays the gas stream in which the displayed measurement values were measured.
4	Display **Measurement values, gas components**	■ Displays the measured percentages of the individual gas components in mol %. The (selectable) § character in front of the list values indicates their official calibration status.
5	Display **Calculated values**	■ Displays values calculated on the basis of the gas composition, such as calorific value, Wobbe index, standard density and methane number, if calculation is activated for them. The § character in front of the list values indicates their official calibration status. In addition, 20 custom values (e.g. peak area) can be displayed in a separate list – cf. section 7.7 "Menu User" and section 7.8.24 "Level 26 User".

7.4   Menu Graph

The **Graph** menu can display a **trend graph** showing how a selected value changes over time or a **chromatogram** of the last analysis.

Selections in the **Graph** tab in the menu bar open a selection field with the following options:

- Chroms
- Trends

Depending on the selection, the corresponding menu opens.

7.4.1   Menu Graph – Chroms

The menu **Graph – Chroms** shows the chromatograms (signal curves) of the last analysis.
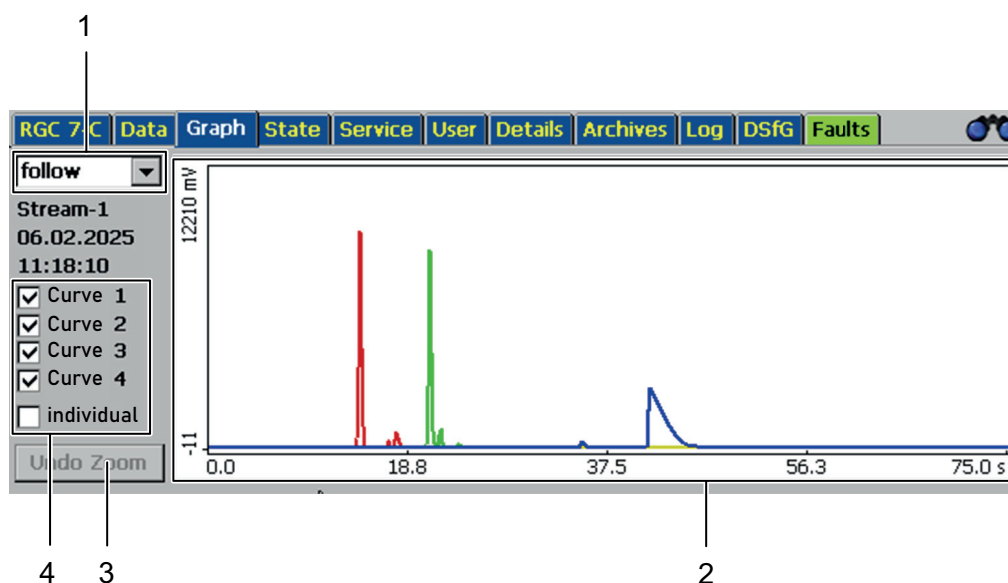
Fig. 12:   Menu Graph – Chroms

No.	Designation	Function
1	Selection **Chromatogram**	■ Opens the selection menu to determine which chromatograms should be displayed: - Following: Chromatogram of the last analysis, regardless of gas stream or gas type. - Stream 1: Chromatogram from gas stream 1. - Stream 2: Chromatogram from gas stream 2. - Ref. gas: Chromatogram of the last reference gas analysis - Cal. gas: Chromatogram of the last calibration gas analysis - Discarded: SKIP analysis that was used for flushing and whose results cannot be assigned to a particular gas stream.
2	Display field **Chromatogram**	■ Displays the selected chromatograms. ■ Has a zoom function (for description, see below).
3	Button **Undo zoom**	■ Resets a zoom that has been applied in the chromatogram display field.
4	Selection **Curve 1–4, individual**	■ Activating the checkbox selects which curve is to be displayed.

Display field Chromatogram (no. 2)

In addition to displaying chromatograms, the chromatogram display field has a zoom function that can be used to enlarge individual graph details. Do this as follows:

▶ Place the stylus at the desired location on the display field and drag the stylus diagonally to draw a rectangle.

➡ The area inside the rectangle will be displayed larger.

▶ To end the magnification, press the **Undo zoom** button.

▶ Before changing to the selection Chromatogram (no. 1), ensure that the zoom function has ended. The selection (stream) that has been made will otherwise not be displayed correctly.

Checkbox Curve 1–4, individual (no. 4)

A three-column module is installed in the RGC 7 measuring unit. One curve is generated for first column, one curve is generated for the second column and two curves are generated for the third column. These two curves can be displayed individual or together.

▶ Make your selection by activating the corresponding checkbox (Curve 1–4, individual).

7.4.2 Menu Graph – Trend

The **Graph – Trend** menu displays a graph showing how a selected value changes over time.

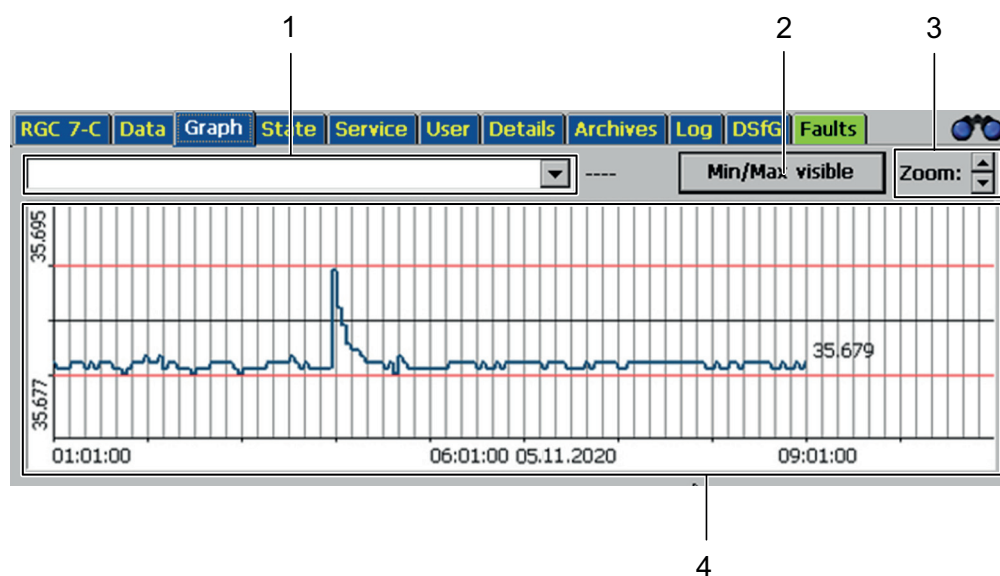

Fig. 13:   Menu Graph – Trend

No.	Designation	Function
1	Selection **measured variable**	■ Opens the selection menu with measured values or calculated values that are to be displayed in a graph.

No.	Designation	Function
2	**Min/max visible/total** button	■ Makes min/max values visible: - Visible: red lines for min and max values and display of these values on the Y-axis - Total: Display of the total value range
3	**Zoom** buttons	■ Changes the visible area of the graph curve in steps: - Up arrow: Increase scaling of Y-axis - Down arrow: Decrease scaling of Y-axis
4	Display field **Trend**	■ Displays the graph curve of the selected measured variable: - X-axis: time - Y-axis: measured variable value

Selecting measured variable (no. 1)

In the selection, the measured variable for the graph can be selected from a list.

The assignment of values and units to the listed measured variables can be adjusted as desired in the Detail menu on the basis of the values' Modbus addresses. The corresponding description is provided in section 7.8.20 "Level 22 Archives and memory", sublevel 02 Trend.

Min/Max visible/total button (no. 2)

Press this button to show the min and max values in the trend display field:

- **Visible**: One red horizontal line is shown at the min value and one at the max value, and the corresponding value is displayed at the Y-axis.
- **Total**: The trend display changes back to the display of the entire value range and the red min and max value lines are hidden again.

Zoom buttons (no. 3)

When the Trend menu is opened for the first time, the Y-axis is automatically scaled in the display field. You can use the up arrow to increase the zoom and the down arrow to decrease it.

The scaling of the X-axis (time) is fixed and **cannot** be changed with the arrow keys.

Display field Trend (no. 4)

In the **Trend** display field, the change in the selected measured variable (Y-axis) over time (X-axis) is depicted as a curve on a graph. Every time the measured variable is updated, the time axis is adjusted accordingly, i.e. the time displayed underneath the X-axis 'moves' and the curve that is displayed is shifted to the left.

An interval of 10 hours is always displayed. A total of 60 hours are recorded.

To view the measured variable values that have been moved to the left outside of the display field, you need to swipe to the right on the graph with your finger or the stylus. This means that values from a period of up to 60 hours can be brought back into the display field. The curve will no longer be updated, however, and the X-axis time will 'stand still' and the graph will stop moving.

7.5 Menu Status

The **Status** menu displays the status of the RGC 7 measuring unit and of the digital input and outputs.

Selections in the **Status** tab in the menu bar open a selection field with:

- Measuring unit
- Dig. I/O

Depending on the selection, the corresponding menu opens.

Alternatively, the menu **Status – measuring unit** can be opened by pressing the **Measuring unit** button (cf. fig. 10, no. 9) in the **RGC 7-C** menu.

7.5.1 Menu Status – measuring unit

The menu **Status – measuring unit** displays various status variables such as temperature and pressure of the column modules.
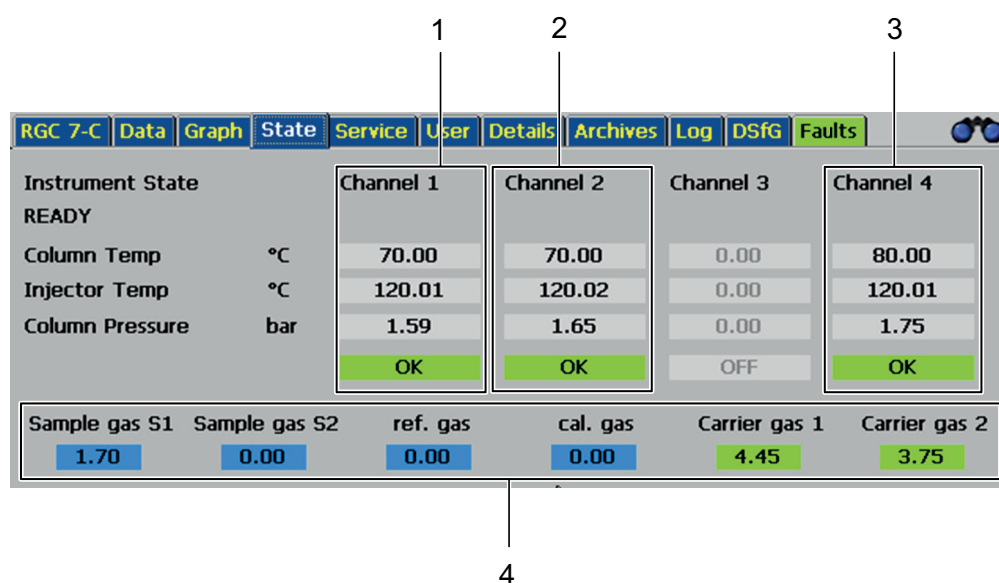
Fig. 14:   Menu Status – measuring unit

No.	Designation	Function
1	Status display **Channel 1**	■ Displays the following variables for channel 1: - Column temperature in °C, setpoint/ current value - Injector temperature in °C, setpoint/ current value - Column pressure in bar, setpoint/current value

No.	Designation	Function
2	Status display **Channel 2**	■ Displays the following variables for channel 2: - Column temperature in °C, setpoint/current value - Injector temperature in °C, setpoint/current value - Column pressure in bar, setpoint/current value
3	Status display **Channel 4**	■ Displays the following variables for channel 4: - Column temperature in °C, setpoint/current value - Injector temperature in °C, setpoint/current value - Column pressure in bar, setpoint/current value
4	Status display **Inlet pressure**	■ Displays the inlet pressure of the connected gases: - Measurement gas S1 - Measurement gas S2 - Ref. gas - Cal. gas - Carrier gas 1 - Carrier gas 2 The colour codes have the following meanings: - Green: currently measured gas stream - Blue: inactive gas stream - Grey: deactivated pressure monitoring

7.5.2 Menu Status – Digital I/O

The menu **Status – Digital I/O** (Dig. I/O) displays the status of the digital inputs and outputs.
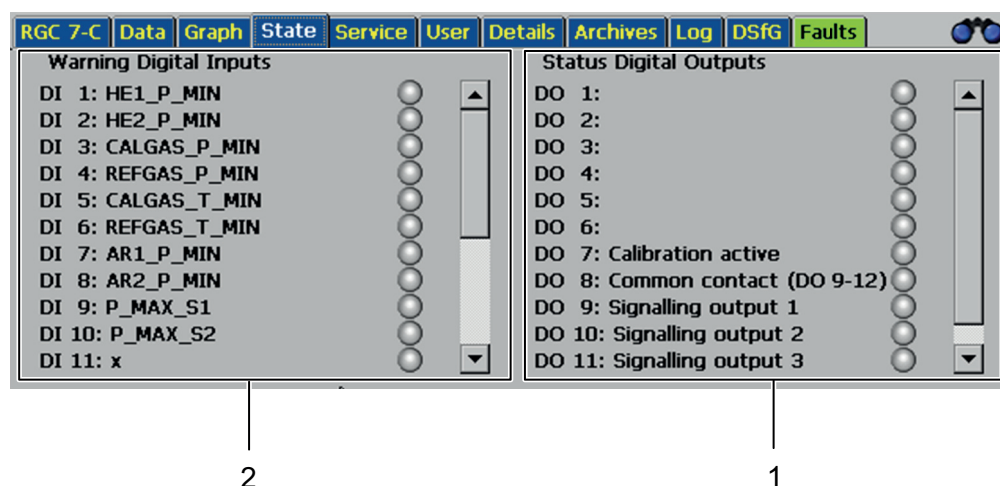
Fig. 15:   Menu Status – Dig. I/O

No.	Designation	Function
1	Display field **Status digital outputs**	■ displays the status of the individual digital outputs: - Green: a value is output (i.e. the value is a non-zero number. - Grey: no value is output, i.e. no error bit is set.
2	Display field **Warning digital inputs**	■ displays the status of the individual digital inputs: - Green: a value is output (i.e. the value is a non-zero number. - Grey: no value is output, i.e. no error bit is set.

7.6 Menu Service

In the **Service** menu, various settings can be configured and functions started, depending on your authorisations. The functions for an opened calibration switch are described below. When the calibration switch is closed, some of these functions may not be available!
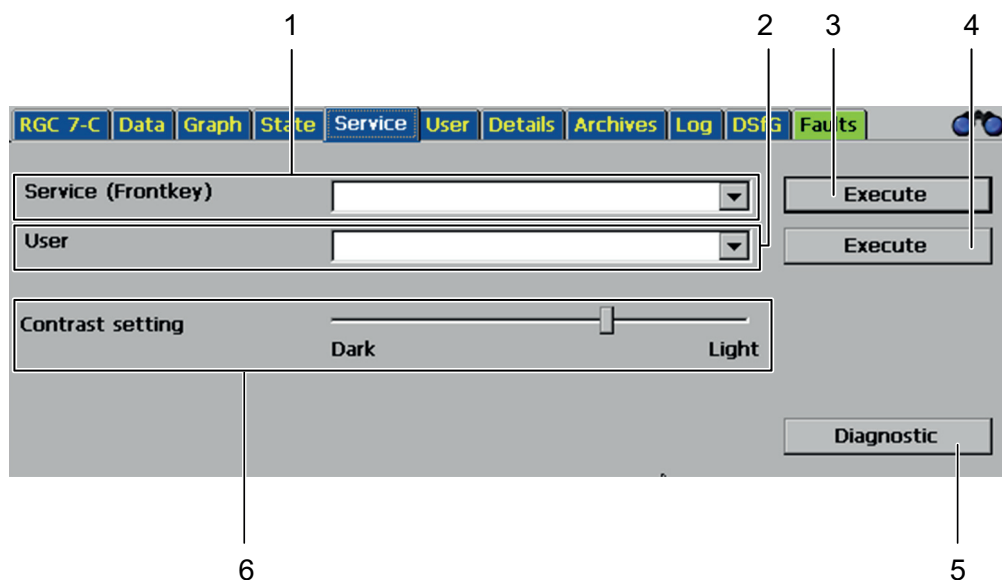
Fig. 16: Menu Service

No.	Designation	Function
1	Selection **Service (Frontkey)**	■ Opens the selection menu with the following functions: - Official calibration commissioning - Exit RGC 7-C / start Windows Explorer (exit controller program). - Restart RGC 7-C. - Restart measuring unit. - Set measuring unit time. - Calculate block CRCs (for each level in the Details menu, a checksum is calculated on the basis of the official calibration parameters). - Import multilevel (RGC7C.RML) (import column-specific parameters from the factory calibration). - Bake out measuring unit.
2	Selection **User**	■ Opens the selection menu with the following functions: - Calibrate touchscreen (the calibration must be performed in accordance with the instructions of the device's operating system and ensures that touch point are allocated to graphic elements correctly). - Download ERRORLOG.TXT from measuring unit.

No.	Designation	Function
3	**Execute** button, Service	■ Carries out the selected function of the **Service** selection.
4	**Execute** button, User	■ Carries out the selected function of the **User** selection.
5	**Diagnostic** button	■ Opens a dialogue window with status messages for the various data connections of the RGC 7-C (cf. fig. 17).
6	**Contrast setting** slider	■ Changes the image contrast of the touchscreen (dark – light).

NOTE

Incorrect settings impact the device function

Some of the above functions can only be carried out if the calibration switch is open and have a strong impact on functionality. For this reason, they are reserved for RMG Service!

If the controller program is exited, the device will no longer be in official calibration use!

However, work such as baking out may still be performed, under the supervision of the person with official calibration authorisation.

Diagnostics button (no. 5)

Pressing the **Diagnostics** button opens a new window where status messages from the various data connections of the RGC 7-C can be viewed.
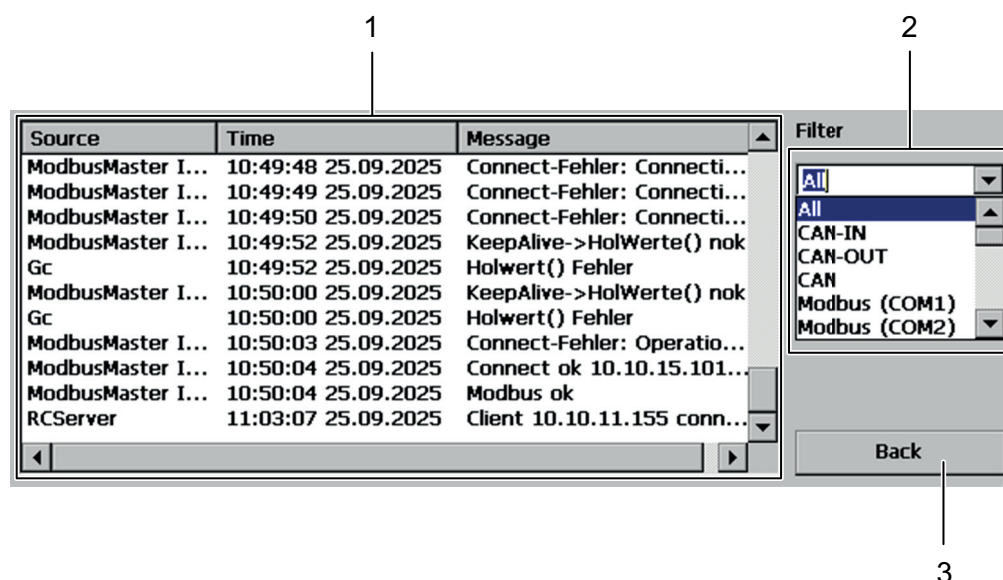
Fig. 17:   Menu Service – window Diagnosis

No.	Designation	Function
1	Display field **Status messages**	■ Lists the messages with source and time.

No.	Designation	Function
2	Selection **Filter**	■ The following filter criteria area available to reduce the display to a specific data connection: - All - CAN-IN - CAN-OUT - CAN - Modbus (COM1) - Modbus (COM2)
3	**Back** button	■ Changes back to the **Service** menu

7.7   Menu User

The **User** menu provides a user-defined display of up to 20 frequently used measured values. The list of measured values can be put together as desired in the **Detail** menu.

For a description of how to compile the list, please refer to section 7.8.24 "Level 26 User".
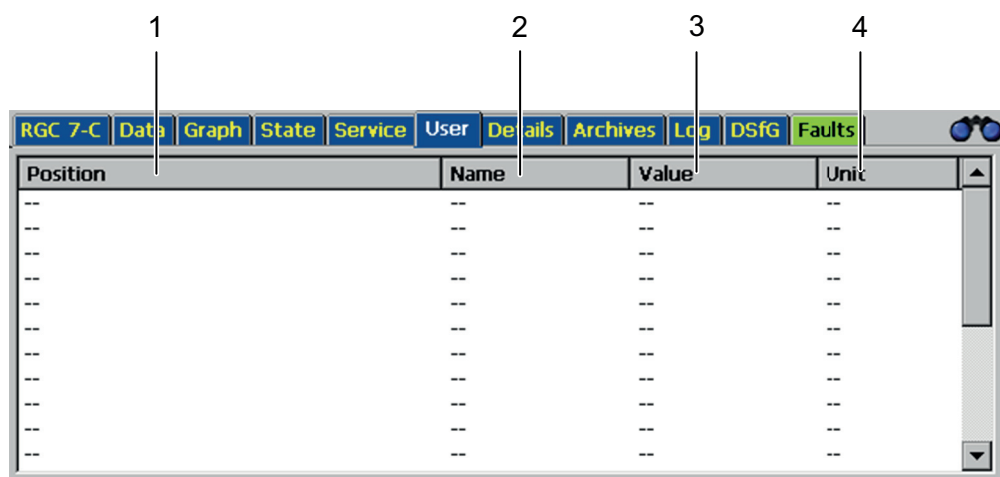
Fig. 18:   Menu User

No.	Designation	Function
1	Display field **Position**	■ Displays the menu that the selected measured value comes from.
2	Display field **Name**	■ Displays the designation of the measured value.
3	Display field **Value**	■ Displays the corresponding value.
4	Display field **Unit**	■ Displays the corresponding physical unit.

7.8   Menu Detail

The **Detail** menu contains a list of all measured values, parameters and operating modes that can be shown and changed in this menu.
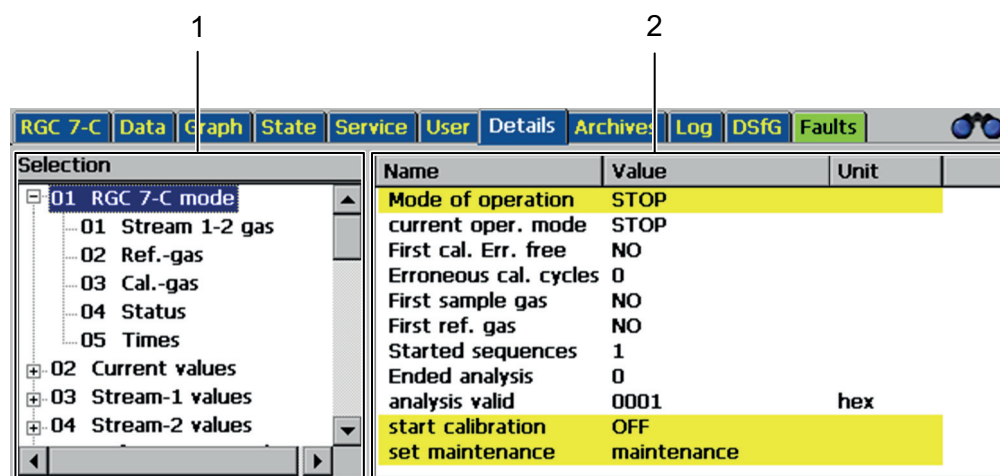
Fig. 19:   Menu Detail

No.	Designation	No.	Designation
1	**Selection** field	2	Field **Parameter change**

Field Selection (no. 1)

In the **Selection** field, there is a list of measured values, parameters and operating modes in a tree structure with two levels (main level and sublevel). To access the sublevel, press the 'plus sign' next to an element in the main level. The sublevel will then be added to the tree structure and a 'minus sign' will be displayed next to the main level element (cf. fig. 20).
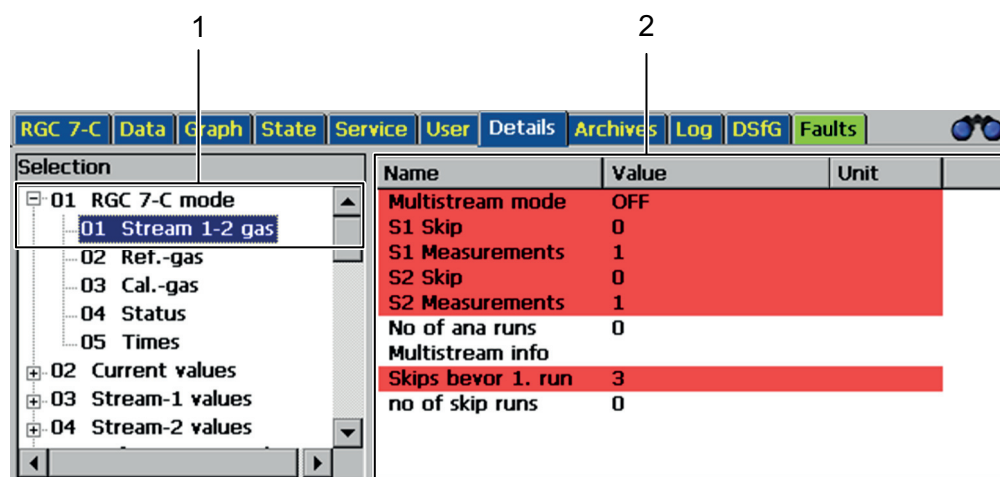
Fig. 20:   Menu Detail – display sublevel

No.	Designation	No.	Designation
1	Field **Selection**, display **sublevel**	2	Field **Parameter change**

The elements of the main level and sublevel are all numbered and have a designation/name. Selected elements/levels are marked with a blue background.

For references to specific levels and sublevels, the above sections and following sections use abbreviations as illustrated in the following example:

- **Level 13.03**, refers to level 13 'Calculation parameters' and sublevel 03 'Reference conditions'.

Field Parameter change (no. 2)

The **Parameter change** field always displays the parameters and measured values of the particular level selected in the **Selection** field and marked with a blue background (cf. fig. 19).

The parameters in the Parameter change field are marked with background of different colours:

- Parameters with a red background are protected by the calibration lock and can only be changed when the calibration lock is open.
- Parameters with a yellow background are protected by the user code word and can only be changed after the user code word has been entered.
- Parameters with a blue background are not protected and can be changed by the user as desired.
- Parameters with a white background serve to provide information and cannot be changed.

When you select a displayed parameter (with your finger or a stylus), a new window opens either for information purposes or for editing the selecting parameter (cf. fig. 21).
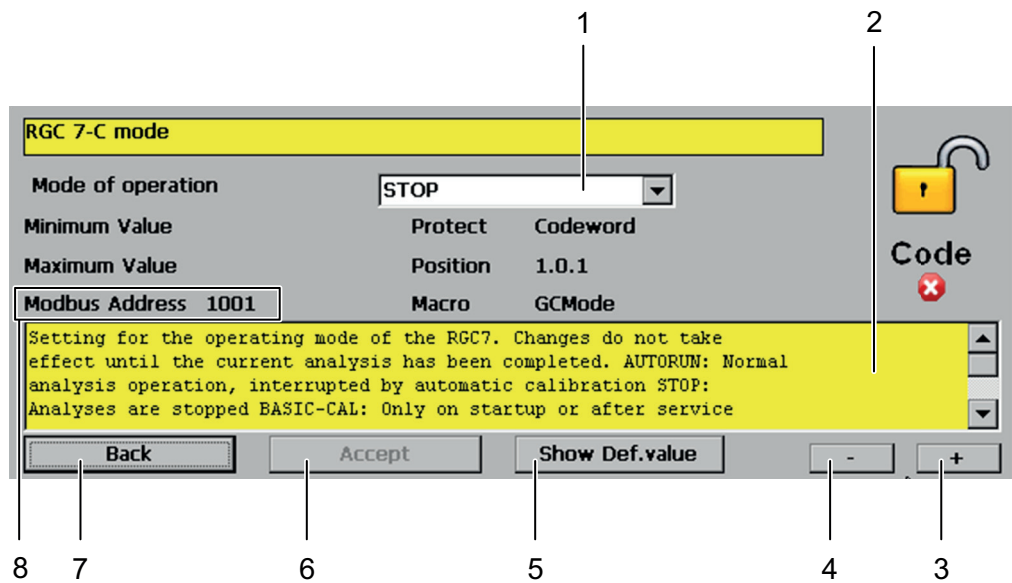
Fig. 21:   Parameter change window

No.	Designation	No.	Designation
1	**Selection** or **entry field**	2	Field for description/notes
3	**+** button	4	**-** button
5	**Show Def. value** button	6	**Accept** button

No.	Designation	No.	Designation
7	**Back** button	8	**Modbus address** display for the selected variable

Depending on the type of parameter, this window will contain either a **selection** for changing the mode or an **input field** for entering numerical values or text (no. 1).

When the input field is selected, a keyboard opens automatically so that entries can be made.

When the calibration switch is closed, the selection of the entry field for parameters with calibration switch protection are shown with a grey background and no changes can be made.

In the text field (no. 2) a brief description of the parameter or additional information is displayed.

The '**-**' and '**+**' buttons change the display in this window to the previous or the next parameter in the current level.

Pressing the **Show def. value** button (no. 5) enters the default value into the selection or the input field (no. 1) where it can be confirmed by pressing the **Apply** button (no. 6).

Pressing the **Back** button (no. 7) closes the current window and the **Detail** menu is displayed once again.

The following sections list the setting and editing options and status displays for each individual level in detail.
For assigning individual parameters, the Modbus address of the specific variable is often needed. This can always be found in the **parameter change window** (cf. fig. 21, no. 8), which opens when the corresponding variable is clicked or in a separate Modbus parameter list.

7.8.1 Level 01 RGC 7-C mode

Main level

Setting or changing the operating mode of the RGC 7-C is not possible while certain processes are being carried out, e.g. stabilisation at the start of a measurement. If a change is nevertheless made during the process, the value will automatically jump back to its original setting. The operating mode can only be changed after the process has been completed.

▶ Setting the operating mode of the RGC 7-C.
- AUTORUN
- STOP
- BASIC CALIB.
- NORMAL CALIB.
- REF GAS
■ Additional display of the following information
- Cur. operating mode
- First cal. error-free
- Faulty cal. cycles
- First analysis complete
- First ref. gas analysis

– Sequences started

– Analyses completed

Sublevel 01 Stream 1-2 gas

▶ Setting multi-stream mode.

– Off

– On

When multi-stream mode is activated, the desired number of skip cycles and measurements for stream 1 and stream 2 can be entered. They are then worked through one after the other.

▶ Entry of the number of skip cycles and measurements for stream 1 and stream 2 when multi-stream mode is switched on.

■ Display of the sequential number of the current measurement and the number of skip cycles.

Sublevel 02 Ref. gas

▶ Entry of the maximum number of reference gas analyses.

■ Display of the sequential number of the reference gas measurement.

Sublevel 03 Cal. gas

▶ Entry specifying at which calibration gas analysis the calibration is to be started. (Averaging from).

▶ Entry of the number of calibration cycles.

■ Display of the sequential number of the calibration gas measurement and the calibration cycles used.

NOTE

Automatic peak tracking measurements

During the calibration measurements, peak tracking measurements are also performed. This means that the actual calibration time will include the time needed for the peak tracking measurements.

Sublevel 04 Status

■ Display of status messages relating to the RGC 7-C mode / selected operating mode.

Sublevel 05 Times

■ Display of time and date information relating to analysis and injection time.

Example application at main level: changing operating mode

To change the operating mode, the code word must first be entered.

For a description of how to enter the code word, please refer to section 7.8.24 "Level 26 User".

Once the code word has been entered, you will remain in the **Detail** menu, and should proceed as follows:

1. In the **Selection** field, select the level **RGC 7-C mode**.
   ➡ The blue background indicates that the corresponding level is selected.
2. In the right-hand field **Parameter change**, select the parameter **operating mode**.
   ➡ The corresponding window for parameter change opens.
3. Select the desired operating mode in the list in the selection field.
4. Press the **Apply** button to activate the selection.
5. Exit the parameter change window by pressing the **Back** button.

7.8.2 Level 02 Current values

Main level

- Display of the following values from the last analysis of the RGC 7-M:
  - Calorific value (Hs)
  - Wobbe index (Ws)
  - Standard density (rho,n)
  - Density ratio (Dv, standard density divided by the standard density of air)
  - Heating value (Hi,n)
  - Lower Wobbe index (Wi,n, calculated from the heating value)
  - Real gas factor in normal state (Zn)
  - Methane number (calculated in acc. with DIN EN 16726:2019)
  - Non-standard sum of components (before standardisation to 100%)
  - Columns component status 1
  - Columns component status 2

Sublevel 01 Percentages

- Display of the molar percentages of the gas composition of the last measurement (concentrations after standardisation in [mol %]).

Sublevel 02 Areas

- Display of the peak areas below the chromatogram for each gas component.

Sublevel 03 Times

- Display of the peak start times (ST = start time integration before the peak) for each gas component.
- Display of the peak end times (ET = end time integration after the peak) for each gas component.
- Display of the retention times (RT = highest point of the peak) for each gas component.

7.8.3   Level 03 Stream 1 values

Main level

- Display of the values (calorific value, Wobbe index, etc.) from the last analysis of stream 1.

Sublevels 01 to 03

- See section 7.8.2 "Level 02 Current values".

7.8.4   Level 04 Stream 2 values

Main level

- Display of the values (calorific value, Wobbe index, etc.) from the last analysis of stream 2.

Sublevels 01 to 03

- See section 7.8.2 "Level 02 Current values".

7.8.5   Level 07 Reference gas values

Main level

- Display of the values (calorific value, Wobbe index, etc.) from the last analysis reference gas analysis.

Sublevels 01 to 03

- See section 7.8.2 "Level 02 Current values".

7.8.6   Level 08 Calibration gas values

Main level

- Display of the values (calorific value, Wobbe index, etc.) from the last analysis calibration gas analysis.

Sublevels 01 to 03

- See section 7.8.2 "Level 02 Current values".

7.8.7   Level 09 Calibration results

Main level

- Display of the calibration status and the time of the last basic calibration.

Sublevels 01 to 10:

Abbreviation	Designation	Explanation
RF	Response factor for the last calibration	The response factor is a device-specific correction value that specifies how sensitively the detector of the gas chromatograph reacts to a certain gas component. It is determined during calibration by calculating the ratio of the measured signal (peak) to the known concentration of the components in the calibration gas. The response factor is used to level out systematic differences in the detector response and to standardise the measurement results. This ensures that the concentrations of the individual gas components in the sample gas can be calculated correctly.
RFZ	Response factor from the last basic calibration	Response factor determined during the basic calibration (for definition of response factor, see above).
RT	Retention time from the last calibration	The retention time is the time period that a gas component needs to reach the detector after being injected into the carrier system of the gas chromatograph. It is specified in seconds and minutes and is characteristic for each substance under constant analysis conditions. The retention time is used to identify the individual gas components, as each substance dwells in the separation column for a different amount of time because of its specific physical and chemical properties (e.g. molecule size, polarity).
RTZ	Retention time from the last basic calibration	Retention time determined during the basic calibration (for definition of retention time, see above).
Original RT	Original retention time	Retention time determined during the factory calibration. This is entered by RMG.

Table 19: Definitions for response factor and retention time

Display of the calibration results in the sublevels listed below:

- 01 RFZ (response factors from the last basic calibration)
- 02 RF (response factors from the last automatic or manual calibration)
- 03 Delta RF (difference between RFZ and RF)
- 04 Original RT (original retention time; entered in the RMG testing laboratory)
- 05 RTZ (retention times from the last basic calibration)
- 06 RT (retention times from the last automatic or manual calibration)
- 07 Delta RT to RTZ (difference between RTZ and RT)
- 08 Delta RT to orig. RT (difference between RT and original RT)

- 09 Area totals (display of: area totals for the last basic calibration, total of all peak areas from the last automatic or manual calibration and percentage deviation of the area totals from basic calibration and automatic (or manual) calibration.)
- 10 Deviations (deviation of the values standard density, calorific value and CO_2 percentage from the last calibration from setpoint.)

7.8.8   Level 10 Specialities

Main level

▶ No selection is possible in the parameter change window. Please navigate directly to the desired sublevel.

Sublevels 01 to 11

In the sublevels 01 to 11 listed below, the same parameters can be set, so the parameterisation options will only be explained in detail for sublevel 07 Add. monitoring 1.

- 01 Dew point pressure
- 02 Dew point temp.
- 03 COS
- 04 H2S
- 05 Mercaptan
- 06 Dew point KW
- 07 Add. monitoring 1
- 08 Add. monitoring 2
- 09 Add. monitoring 3
- 10 Add. monitoring 4
- 11 Add. monitoring 5

Example application: Parameterising additional monitoring

In the sublevels **07 Add. monitoring 1 to 11 St. monitoring 5**, up to 5 current inputs (internal or external) with different limits can be monitored and warnings or contact outputs can be generated.

To parameterise additional monitoring, a code word must first be entered.

For a description of how to enter the code word, please refer to section 7.8.24 "Level 26 User".

Once the code word has been entered, you will remain in the **Detail** menu, and should proceed as follows:
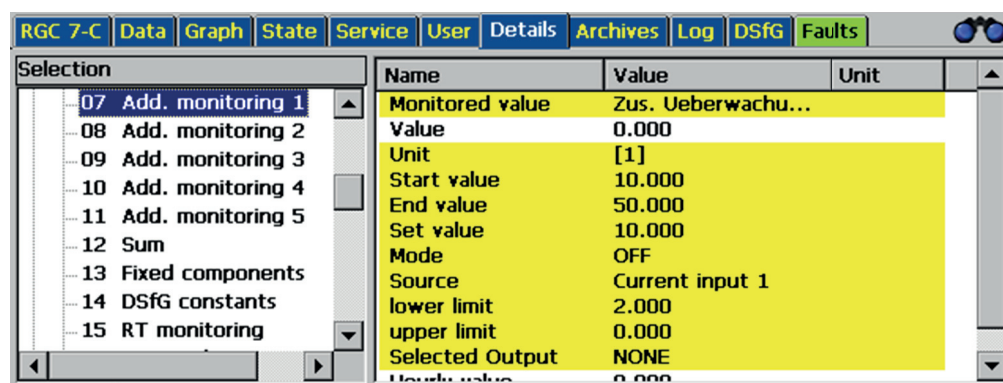
Fig. 22:   Menu Detail – level 10.07 Add. monitoring 1

1. In the **Selection** field, select the level **10 Specialities**.

2. Then select the sublevel of **add. monitoring (1 to 5)** that you would like to parameterise.

    ➡ The blue background indicates that the corresponding sublevel is selected.

3. In the right-hand field **Parameter change**, select the desired parameter:

    ▪ The **measured value** displays the current calculated value for monitoring. The monitoring is based on the

        – measured current of the current input selected in the **Source** parameter,

        – and the values from the parameters **start value** and **end value**.

    ▪ The **unit** parameter can be used to enter a unit that will be assigned to the converted measured value.

    ▪ The **default value** is loaded as an alternative measured value if the calculated measured value is greater than the **upper limit** value.

    ▪ In the **operating mode** parameter, you can select whether the source is a 0 to 20 mA signal or a 4 to 20 mA signal.

    ▪ In the **contact selection** parameter, you can select whether a warning message is generated when the **upper limit** is exceeded or whether one of the contact outputs 9 to 12 is set.

Sublevel 12 Total sulphur

▪ Display total sulphur: total amounts of all sulphur compounds (H2S, COS and mercaptan)

▶ Enter upper warning limit: upper warning limit for total sulphur percentage for triggering a warning message.

▶ Specify warning mode: switch total sulphur warning mode on/off (NO/generate warning)

Sublevel 13 Fixed components

▶ Specify components default: the four components helium, hydrogen, oxygen and argon can be defined as fixed values. This mode can be switched off and on with OFF/ON. The other measures components are then standardised to 100% minus the fixed components. This mode is not permitted in official calibration operation.

▶ Enter helium default: fixed defined percentage of helium.

▶ Enter hydrogen default: fixed defined percentage of hydrogen.

▶ Enter oxygen default: fixed defined percentage of oxygen.

▶ Enter argon default: fixed defined percentage of argon.

▶ Enter methanol default: fixed defined percentage of methanol.

▶ Enter hydrogen sulphide default: fixed defined percentage of hydrogen sulphide.

Sublevel 14 DSfG constants

■ Only for RGC 717: Display carbon monoxide S1: value of the carbon monoxide percentage in stream 1 required for the standard DSfG query.

■ Only for RGC 717: Display carbon monoxide S2: value of the carbon monoxide percentage in stream 2 required for the standard DSfG query.

■ Display ethene S1: value of the ethene percentage in stream 1 required for the standard DSfG query. This value is always 0.

■ Display ethene S2: value of the ethene percentage in stream 2 required for the standard DSfG query. This value is always 0.

■ Display propene S1: value of the propene percentage in stream 1 required for the standard DSfG query. This value is always 0.

■ Display propene S2: value of the propene percentage in stream 2 required for the standard DSfG query. This value is always 0.

Sublevel 15 RT monitoring

▶ Activation of the monitoring: activation of the warning message (ON/OFF) if the RT/RTZ factor for nitrogen drops below the set value. The RT is calculated by averaging the RTs across the set time window minus the RT averaging of the previous time window of the same length.

▶ Entry start-up bypass: number of days after the basic calibration until the warning message can be set for the first time.

▶ Entry summation time: number of days over which the retention time is averaged.

▶ Entry nitrogen deviation limit: warning limit for the deviation of the retention time of nitrogen, for example to issue a warning regarding saturation of the molecular sieve column.

■ Display of current deviation: current value of the drift calculation.

Sublevel 16 Gas qualities manager

▶ Activate gas qualities manager: switch interface for the gas qualities manager on/off.

▶ Enter following parameters:
  – GBH ID stream 1/stream 2: ID of gas quality source
  – GBH preset stream 1/stream 2: starting value for CRC12
  – GBH prio stream 1/stream 2: priority of gas quality source
  – GBH type stream 1/stream 2: type of gas quality source

■ Display following parameters:
  – GBH CRC12 stream 1/stream 2: CRC12 of gas quality source
  – GBH status stream 1/stream 2: Status
  – folder no. stream 1/stream 2: analysis counter GBH status stream 1/stream 2 for gas qualities manager.

7.8.9   Level 11 Components parameters

Main level

- No selection is possible in the parameter change window. Please navigate directly to the desired sublevel.

Sublevels 01 to 21

In the following sublevels, a separate set of multilevel coefficients (MLC and MLC H2) is to be entered for the calculation polynomial of the molar percentage of each individual gas component, for the measuring unit variants RGC 704-M and RGC 717-M. These coefficients are determined before delivery and do not change in the course of operation.

- 01 Nitrogen
- 02 Methane
- 03 Carbon dioxide
- Ethane
- 05 Propane
- 06 iso-Butane
- 07 n-Butane
- 08 neo-Pentane
- 09 iso-Pentane
- 10 n-Pentane
- 11 C6+
- 12 n-Hexane
- 13 n-Heptane
- 14 n-Octane
- 15 n-Nonane
- 16 Oxygen
- 17 Helium
- 18 Hydrogen
- 19 Argon
- 20 Carbon monoxide
- 21 Hydrogen sulphide

7.8.10   Level 12 Calibration parameters

Main level

- ▶ Parameterisation of general parameters for automatic calibration, such as day/ length/frequency, interval, hour.
- Display of timestamp of last and next calibration.
- ▶ Specify whether the response factor of hydrogen should be used for the calibration for helium (selection = RF of hydrogen) or not (selection = RF of helium) if no helium is present in the calibration gas.
- ▶ Specify whether the response factor of n-butane should be used for the calibration for neo-pentane (selection = RF of n-butane) or not (selection = RF of neo-pentane) if no neo-pentane is present in the calibration gas.

Sublevel 01 Default values

▶ Entry of the setpoints for the percentage of each gas component in the calibration. The values are to be taken from the certificate of the internal calibration gas.

Sublevel 02 Limit cal.

▶ Specifies the maximum permitted deviation [%] between measured value and setpoint for calibrations for the following values:
  – Calorific value (HS deviation)
  – Standard density (rho, n deviation)
  – CO_2 percentage (CO_2 deviation)
  – Response factors (response factor dev.)
  – Total of all peak areas (total areas dev.)

7.8.11 Level 13 Calculation parameters

Main level

▶ Selection of calculation in acc. with:
  – ISO 6976:2016
  – GPA 2172
▶ Selection of which method is to be used to calculate the concentrations from the areas:
  – Method 1 (natural gas for RGC 704-M)
  – Method 2 (hydrogen for RGC 717-M)

Sublevel 01 ISO-6976

■ No selection is possible in the parameter change window.

Sublevel 02 GPA-2172-09

▶ Specification of the calculation modes for the following values:
  – HS calculation (calorific value)
  – Density calculation (standard density)
  – Wobbe calculation (Wobbe index)
  – Z calculation (real gas factor)
  – Hexane mode (C6 input variable)
  – NeoP. mode (C5 input variable)

Sublevel 03 Reference conditions

▶ Specification of the standard and combustion temperature and the standard pressure.

Sublevel 04 Limits analysis, calibration

▶ Entry of the maximum permitted deviation [%] of the retention time.

▶ Entry of the maximum permitted deviation [%] of non-standardised total.

Sublevel 05 Limits analysis

▶ Entry of a default value that is output as a substitute value in the event of an alarm for the following values:
  - Calorific (Hs)
  - Wobbe index (Ws)
  - Methane number (Mz)
  - Standard density (rho, n)
  - Density ratio (DV)

▶ Entry of an upper and a lower limit for the above-mentioned values; an alarm is then triggered when the limit is breached.

Sublevel 06 Permitted min. values analysis

▶ Entry of a lower limit in accordance with approval for each individual gas component.
  ➡ An alarm or a warning is triggered when values drop below this limit. In official calibration operation, this is the lower measurement range limit in accordance with the PTB approval.

Sublevel 07 Permitted max. values analysis

▶ Entry of an upper limit in accordance with approval for each individual gas component.
  ➡ An alarm or a warning is triggered when values rise above this limit. In official calibration operation, this is the upper measurement range limit in accordance with the PTB approval.

Sublevel 08 Default values analysis

▶ Selection of the error behaviour in the event of gas component limit breach. The following are available:
  - Error
  - Warning

▶ Selection of the mode for the default values for the gas components. The following are available:
  - ALL: In the event of a limit breach, all default values are set.
  - IGNORE: The default values are ignored.
  - INDIVIDUAL: In the event of a limit breach, only the corresponding value is set.

▶ Entry of a default value for each gas component that is output as a substitute value in the event of a limit breach.

Sublevel 09 Alarm limits analysis, calibration

▶ Entry of a lower limit (min) and an upper limit (max) for each gas component.

➡ An alarm is then triggered when these limits are breached.

Sublevel 10 Warning limits analysis, calibration

▶ Entry of a lower limit (min) and an upper limit (max) for each gas component.

➡ A warning is then triggered when these limits are breached.

Sublevel 11 Units

▶ Selection of the units for:
   – Standard density [kg/m³]
   – Calorific value [kWh/m³], [MJ/m³], [kc/m³], [BTU/f³]

▶ Specification of the decimal place for the following values:
   – Hs, i and Ws, i
   – rho, n
   – Mz
   – Components
   – Cal.gas.def. (Calibration gas default values)
   – Dv
   – Zn

Sublevel 12 Test entry

▶ Entry of values for gas component percentages to carry out a calculation test.

Sublevel 13 Test results

▪ Display of the results of the calculation test.

Sublevel 14 Selection

▶ Specification of whether the methane number is calculated in accordance with the ISO procedure.

7.8.12 Level 14 Measuring unit

Main level

▪ Display of following system information relating to the measuring unit (RGC 7-M):
   – Measuring unit no.
   – Measuring unit manufacture date
   – Column cassette no.
   – Measuring unit type
   – PGC component status 1
   – PGC component status 2

▶ Entry of the IP address of the measuring unit.

Sublevel 01 Parameter

▶ Specification of the column operating mode:
  – Column equipment: 1-2-4
■ Display of the column enabling 1 to 4. With the setting **ON**, pressure, temperature and status messages are updated for the specific column module.
▶ Specification of the chromatogram mode:
  – NONE
  – FETCH In this mode, the chromatograms are loaded by the measuring unit from the RGC 7-C by means of 'file protocol'.
■ Display chrome file port: communication port IP for the file protocol.
▶ Possibility for valve default:
  – AUTOMATIC
  – STREAM_1
  – STREAM_2
  – REF_GAS
  – CAL_GAS

NOTE

Valve default in regular operation

In regular operation, **AUTOMATIC** must be selected for the valve default! Any other selection switches off automatic valve change and should only be used in test operation.

▶ Specification of the maximum analysis time, constituting the absolute duration of an analysis including flushing and injection. If no end of the measurement is detected within this time, an error is output.
▶ Specification of the maximum pause time. After half of the input time has elapsed since the last completed analysis, the sequence is restarted. If the complete time has elapsed, the controller will initiate a restart of the measuring unit.
▶ Specification whether the RGC 7-C should perform a calibration after every measuring unit restart.
▶ Specification of the waiting time after which analyses can be carried out again following a measuring unit restart.

Sublevel 02 Status

■ Display of the following measuring unit status:
  – Connection status: display whether there is a connection to the measuring unit.
  – Instrument status: status of the measuring unit RGC 7-M (e.g. INITIALISING, ERROR, NOT READY)
  – Instrument cycle: duration of the last complete analysis cycle
  – Column status of column modules 1 to 4 (e.g. OK, MAINTENANCE, OFF)
  – Column 1 to 4: composite status of the column module
  – Current analysis time: running time of the current analysis cycle
  – Housing temperature: temperature inside the measuring unit housing
  – Ambient pressure (air pressure)
  – Sequence status: status of the running sequence (e.g. IDLE, RUNNING,

ABORTED, ERROR, PAUSED)

- – Analysis status: status of the running analysis (e.g. INIT, STABILISATION, READY, ANALYSIS, ERROR)
- – Active valve: valve switched in the measuring unit

Sublevel 03 Column 1 to Sublevel 06 Column 4

In these sublevels, the following settings can be made / the following parameters are displayed for the individual column (column 1 used as example):

- ▶ Entry of column temperature default (setpoint)
- ■ Display of column temperature (current measured value)
- ■ Display of injector temperature (current measured value)
- ■ Display of column pressure (current measured value)

Sublevel 07 Peaks

- ■ Display 'Column 1 total' to 'Column 4 total': number of peaks found in the chromatogram of the last measurement for the individual column module.

Sublevel 08 Analysis gas pressure

- ■ Display of pressure of measurement gas: Pressure of the gas that is currently being measured (measurement gas, calibration gas or reference gas)
- ■ Display pressure ref. gas: Measurement gas pressure sensor 1
- ■ Display pressure stream 2: Measurement gas pressure sensor 2
- ■ Display pressure stream 1: Measurement gas pressure sensor 3
- ■ Display pressure cal. gas: Measurement gas pressure sensor 4
- ▶ Entry of starting value: Lower adjustment limit for current input used for the pressure of the measured gas (normally the pressure at a current input of 4 mA).
- ▶ Entry of end value: Upper adjustment limit for current input used for the pressure of the measured gas (normally the pressure at a current input of 20 mA).
- ▶ Entry of setpoint: Setpoint set in factory for the pressure of the gas that is currently being measured.
- ▶ Entry of max. deviation: maximum permitted deviation for the pressure of the gas that is currently being measured. If the limit is breached, an alarm is triggered and no further analysis is started.
- ▶ Selection of operating mode: operating mode of the current input that is used for the pressure of the gas that is currently being measured.
- ▶ OFF
- ▶ Digital
- ▶ Selection of source: selection of the current input for the pressure of the gas that is currently being measured. Also check the setting for the corresponding current input.
- ▶ Digital
- ▶ Entry of damping: setting for the damping for the measurement gas pressure monitoring

Sublevel 09 Carrier gas I

- ■ Display of pressure: input pressure carrier gas 1
- ▶ Entry of starting value: lower adjustment limit for current input used for the pressure of carrier gas I (normally the pressure at a current input of 4 mA).
- ▶ Entry of end value: upper adjustment limit for current input used for the pressure of carrier gas I (normally the pressure at a current input of 20 mA).
- ▶ Entry of setpoint: setpoint set in factory for the pressure of carrier gas I.
- ▶ Entry of max. deviation: maximum permitted deviation for the pressure of carrier gas I. If the limit is breached, an alarm is triggered and no further analysis is started.
- ▶ Selection of operating mode: operating mode of the current input that is used for the pressure of carrier gas I.
  - – OFF
  - – Digital
- ▶ Selection of source: selection of the current input for the pressure of carrier gas I. Also check the setting for the corresponding current input.
  - – Digital

Sublevel 10 Carrier gas II

The displays and setting options for carrier gas II are identical to those described above for sublevel 09.

Sublevel 11 Bake-out

- ▶ Specification of bake-out duration: duration of the bake-out process, including baking out, cooling down and equilibration.
- ■ Display of remaining bake-out duration: remaining time until the end of the bake-out process.
- ■ Display of temperature, columns 1 to 4: column temperature for the individual column for the bake-out.
- ■ Display of pressure, columns 1 to 4: column pressure for the individual column for the bake-out.

The bake-out procedure and the required settings are described in detail in section 8.3.1 "Bake-out".
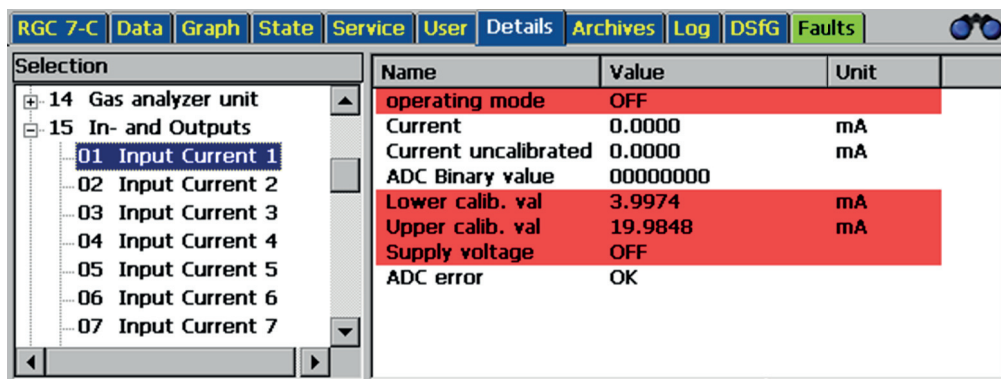
7.8.13 Level 15 Inputs and outputs

Main level

- ▶ Parameterisation of:
  - – Current input 1–8 (sublevel 01–08)
  - – Current output 1–4 (sublevel 09–12)
  - – Temperature 1–2 (sublevel 13–14)
  - – Internal measured values (sublevel 15)
  - – Digital outputs (sublevel 16)
  - – Digital inputs (sublevel 17)
  - – DE parameters (sublevel 18)

Example application: Parameterising current input

To parameterise a current input, the user lock must be opened.

Fig. 23:   Menu Detail – 15.01 Current input 1

Once this has been done, process as follows to parameterise a current input:

1. In the **Detail** menu, select the level **15 Inputs and outputs**.

2. Then select the sublevel of the **current input (1 to 8)** that you would like to parameterise.

    ➡ The blue background indicates that the corresponding sublevel is selected.

Section 6.2.1 "Terminal assignments of the terminal strips" explains which ports on the back panel of the device are assigned to which current inputs.

3. In the right-hand field **Parameter change**, select the desired parameter:

    ■ The parameter **operating mode** is used to activate the current input.

    ■ The parameter **power supply** activated the power supply for passive current sensors.

    ■ The display value **current input** indicates the current measured current in mA.

    ■ The display value **ADC error** indicates the status of the ADC converter:

        – **OK**: ADC converter within its measuring range.

        – **Error**: ADC converter outside of its measuring range

Example application: Programming current output

To program a current output, the code word must first be entered.

For a description of how to enter the code word, please refer to section 7.8.24 "Level 26 User".

Once the code word has been entered, you will remain in the **Detail** menu, and should proceed as follows:

1. In the **selection** field, select the measured value that you want to output by means of a current output, e.g. in Level 03.01 Stream 1 values/percentages.

2. In the right-hand field Parameter change, select the measured value that is to be output, e.g. methane.

    ➡ The parameter change window will open.

3. Read off the Modbus address (cf. fig. 21, no. 8) and note it down.

4. Exit the parameter change window by pressing the **Back** button.

5. In the **selection** field, select the desired current output 1–4 (level 15 Inputs and outputs, sublevel 09–12).

6. In the right-hand window Parameter change, select the parameter **operating mode**.

   ➜ The **parameter change** window will open.

7. Select the desired operating mode for the current output, e.g. 4–20 mA, in the list in the selection field.

8. Press the **Apply** button to activate the selection.

9. Exit the parameter change window by pressing the **Back** button.

10. In the field **Parameter change**, select the parameter **Selection**.

    ➜ The **parameter change** window will open.

11. In the input field, enter the Modbus address for the measured value output that you noted previously and press the **Apply** button to confirm the entry.

12. Exit the parameter change window by pressing the **Back** button.

13. Specify the following additional parameters:

    ■ Parameter **Physic. min. value** is the measured value for which the minimum current (0 or 4 mA) is to be output.

    ■ Parameter **Physic. max. value** is the measured value for which the maximum current (20 mA) is to be output.

    ■ The **limit breach** parameter should be set to warning, if the current output is not used for official calibration transfer.

7.8.14 Level 16 Ports

Main level

■ Display of the status of all COM ports (COM1 to COM7).

Sublevels 01 COM 1 – 07 COM 7

▶ Input or selection of parameters for all COM ports (COM 1 to COM 7, sublevel 01–07):

– Baud rate: baud rate for the individual serial port.

– Data bits: selection of data bits/parity/stop bits for the individual serial port.

– Protocol: selection of the protocol for the individual serial port

– Modbus address: Modbus address (1 to 247) for the individual serial port, if protocol is selected.

– Modbus text mode: Modbus text mode for the individual serial port, if protocol is selected.

– Modbus byte sequence for the individual port.

– Modbus register offset: Modbus register offset (0/1) for the individual serial port, depending on Modbus specification. The register definitions of other device manufacturers may contain this offset.

– Modbus user list: selection (OFF/ON) whether the custom Modbus configuration is used for the individual serial port.

– User list Modbus: selection whether the Modbus user list should be interpreted in accordance with Modicon or Enron.

■ Display MB telegram counter: Modbus telegram counter for the individual serial port. Counts the incoming MB telegrams.

The following protocols are available in the various serial ports:

Designation	Protocol
COM 1	■ Modbus-RTU ■ Modbus-ASCII
COM 2	■ WAGO-IO
COM 3	■ DSfG ■ Modbus-RTU ■ Modbus-ASCII ■ RMGBus
COM 4	■ DSfG ■ RMGBus
COM 5 WinCE(C2)	■ Modbus-RTU ■ Modbus-ASCII
COM 6 WinCE(C3)	■ Modbus-RTU ■ Modbus-ASCII ■ RMGBus
COM 7 WinCE(C1)	■ Modbus-RTU ■ Modbus-ASCII

Table 20: Protocols of the serial ports

Sublevel 08 RMGBus test mode

▶ Activation/deactivation of RMGBus test mode: selection (ON/OFF) whether the RMGBus test mode is used for testing of the communication channel to a connected device (e.g. volume corrector or flow computer).

➡ If it is activated (ON), entered default values are output via the RMGBus at regular time intervals that can be processed by a connected device. A message is displayed in the Errors menu to signal that test mode has been activated.

▶ Entry of default values for each gas component output in RMGBus test mode.

Example application: Parameterising COM port 2 for interface add-on module (Wago)

In level 16.02 Ports COM2, various parameters can be set for communication with the interface add-on module (cf. fig. 24).
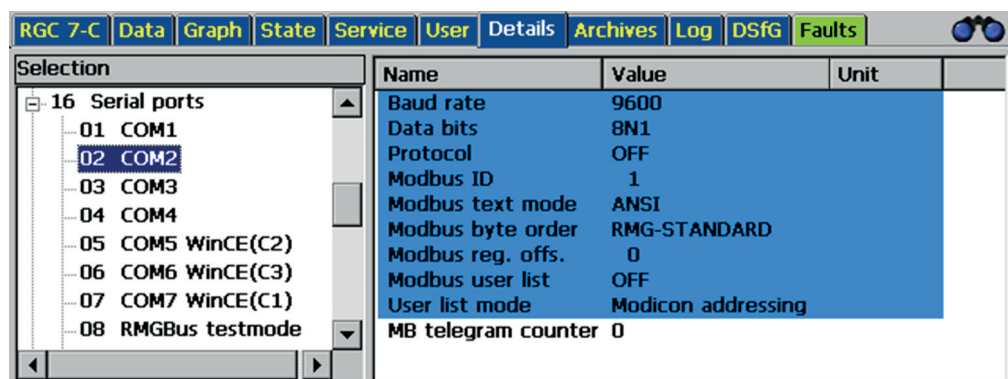
Fig. 24: Menu Detail – 16.02 COM2

For parameterisation, proceed as follows:

1. In the **Selection** field, select the **COM2** port.
   ➡ The blue background indicates that the corresponding sublevel is selected.

2. In the right-hand parameter change window, select the parameter that you want to configure.
   ➡ The **parameter change** window will open.

3. In the list in the selection field, select the required setting / enter the required value in the input field.

4. Press the **Apply** button to activate the selection or the entry.

5. Exit the parameter change window by pressing the **Back** button.

7.8.15 Level 17 Network

Main level

- Display of the status of the LAN connections:
  - LAN 1 status: status of the LAN 1 network (the displayed messages originate from the Windows CE operating system. For detailed information on the message, refer to the online operating system documentation.)
  - LAN 2 status: status of the LAN 2 network (the displayed messages originate from the Windows CE operating system. For detailed information on the message, refer to the online operating system documentation.)
- Recommended configuration LAN 1 (RMG network):
  - RGC 7-C
  - RGC 7-M
  - Service PC (ProStation, RMGViewGC)
  - Web server active
  - DHCP server active
  - Modbus TCP/IP active (for RMGView)
- Recommended configuration LAN 2 (customer network):
  - DSfG DFÜ active
  - Web server active
  - DHCP server NOT active
  - Modbus TCP/IP active
  - ...
- Display MB telegram counter: Telegram counter LAN 1 and LAN 2 (protocols: Modbus). Counts the incoming MB telegrams (Mb slave).

Sublevel 01 Addresses

▶ Specification of LAN-1 IP mode: IP settings can be allocated automatically if the network supports this function. Otherwise, set a fixed IP address:
  - AUTO_IP: obtain IP address automatically (via DHCP)
  - FIXED_IP: The set IP address is used.

NOTE

IP address for LAN 1

A fixed IP address (FIXED_IP) should always be set to LAN 1 (RMG-LAN).

If the setting AUTO_IP is selected, the RGC 7-C **must** be restarted. With the restart, you check the DHCP server and update the IP address assigned by the server.

- Display of LAN-1 IP of DHCP: current or last IP address assigned by the server for LAN-1. If no assignment has yet been made, 'not found' will be displayed.
- ▶ Entry of LAN-1 IP address this is the IP address for LAN-1. The address is made up of four numbers between 0 and 255, separated with a full stop.
  Example: 192.168.20.1
  This address is only used if the DHCP mode is set to FIXED_IP.
- ▶ Entry of LAN-1 subnet mask: the subnet mask is a bit mask that specifies in the network protocol IPv4 in the description of IP networks how many bits at the start of the depicted IP address constitute the network prefix.

Example:

IP address 11000000 10101000 00000001 10000001 192:168:001:129

AND network mask 11111111 11111111 11111111 00000000 255:255:255:000

= network part 11000000 10101000 00000001 00000000 192:168:001:000

IP address 11000000 10101000 00000001 10000001 192:168:001:129

AND NOT network mask 00000000 00000000 00000000 11111111 000:000:000:255

= device part 00000000 00000000 00000000 10000001 000:000:000:129

- ▶ Entry of LAN-1 standard gateway: If the RGC 7-C wants to send an IP package to another IP address, it will first examine the target IP address. If it finds that the target IP address is located in its own subnet, it will send directly.
  For all other target IP addresses, it will send the IP package to the standard gateway. The standard gateway computer will then hopefully know how to proceed.
- ▶ Entry of LAN-1 DNS server: address of the DNS server for LAN-1.
- Display of LAN-1 Mac address: MAC address of LAN port 1

The settings for LAN port 2 can be implemented in the same way as described for LAN-1.

Sublevel 02 DHCP server

- ▶ Specification of the DHCP server mode:
  - – OFF
  - – LAN-1
  - – LAN-2

The DHCP server enables the network configuration to be assigned to clients. The connection of the RGC 7-C with the RGC 7-M must be realised by means of fixed IP addresses. DHCP can be used for a Service PC that is occasionally available, for example.

Important note:

The DHCP server must be ready for operation before all other devices in the same network!

- ▶ Entry of the DHCP lease time: the DHCP lease time is a time value that specifies how long a client can use the assigned IP configuration.

▶ Entry of the DHCP addr. number: this is the number of addresses that are managed by the DHCP server.

▶ Entry of the DHCP start addr.: start address of the address range managed by the DHCP server. This address range must take into account the IP addresses for LAN-1 and LAN-2. Fixed and automatically assigned IP addresses must be in their own ranges.

Example:

RGC7-C 192.168.20.1 (fixed IP)

RGC7-M 192.168.20.2 (fixed IP)

DHCP 192.168.20.10 (length = 10)

…

DHCP 192.168.20.19

A laptop connected to the system is given an address between 192.168.20.10 and 192.168.20.19.

▶ Possible entry of the DHCP server DNS: this is the address of the DNS (Domain Name Server) that the DHCP server sends to the client. DNS is used for name resolution in the network. This could involve converting a computer name (host name) into an IP address, for example. The RGC 7-C does not need a DNS, so this text field can be left empty.

▶ Entry of the DHCP server domain: this is the name of the domain that the DHCP server sends to the client.

Sublevel 03 Services

▶ Selection of web server: specifies the LAN port for the web server. The following options are possible:
  – OFF: no web server available
  – LAN-1: web server only on LAN-1
  – LAN-2: web server only on LAN-2
  – BOTH: web server available on LAN-1 and LAN-2

▶ Selection DSFG EDI: specifies the LAN port for the DSFG EDI. The following options are possible:
  – OFF: No EDI available
  – LAN-1: EDI only on LAN-1
  – LAN-2: EDI only on LAN-2
  – BOTH: EDI available on LAN-1 and LAN-2

▶ Selection TCP/IP: specifies the LAN port for the Modbus TCP/IP. The following options are possible:
  – OFF: No Modbus TCP/IP available
  – LAN-1: Modbus only on LAN-1
  – LAN-2: Modbus only on LAN-2
  – BOTH: Modbus available on LAN-1 and LAN-2

▶ Entry of Modbus address: Modbus TCP/IP device address (ID). This address may only be assigned once per bus.

▶ Selection of Modbus TCP/IP text mode:
  – ANSI
  – UNICODE

Text can be transferred as ANSI or UNICODE characters. The setting depends on

the recipient.

▶ Selection of byte sequence for Modbus TCP/IP:

   – RMG standard

   – GC

▶ Modbus user list: selection (OFF/ON) whether the custom Modbus configuration is used for Modbus TCP/IP.

▶ User list Modbus: selection whether the addressing of the Modbus user list should be interpreted in accordance with Modicon or Enron.

▶ Selection of remote control port: specifies the network port that is activated for remote control. The following options are possible:

   – OFF: No remote control available

   – LAN-1: remote control only on LAN-1

   – LAN-2: remote control only on LAN-2

   – BOTH: remote control available on LAN-1 and LAN-2

▶ Entry of remote control port: port that is opened in the registry of the RGC 7-C for remote control. In official calibration operation, the port must be set to 4831.

▶ Entry of remote control password: the password for remote control must be identical to the password in RMGViewGC (preset: 12345)

▶ Specification of remote control timeout: after the timeout period for remote control has expired without a command coming from the master, the connection is ended. If '0 hours' is entered, the function is deactivated.

7.8.16 Level 18 DSfG

Main level

▶ Entry of the device ID: display and parameterisation of the device ID for remote data transfer access via DSfG-B-IP. The device ID is queried by the control centre software during the log-in procedure.
Note: the device ID must be made up of exactly 12 characters. The characters themselves may only be from the group of numbers '0–9' or letters 'A–Z' or 'a–z'.
Spaces, umlauts and special characters are not permitted. This restriction is the result of DSfG using a 7-bit code for transfer.

■ Display of the status of the remote data transfer: this displays which DSfG bus a remote data transfer via DSfG-B-IP is connected to. If no remote data transfer is active, the text 'OFFLINE' will be displayed.

Sublevel 01 Bus-1 (COM 3)

■ Display of bus subscribers (A–P) at DSfG-Bus-1.

■ Display of bus subscribers (Q–_) at DSfG-Bus-1.

▶ Specification of the instance type of the gas chromatograph (GC):

   – G instance

   – Q instance

The instance type applies jointly to all GCs at DSfG-Bus 1.
You can select instance G, the old gas quality instance, recognisable by the DSfG data element name, starting with a lower-case 'd', or instance Q, the new gas quality instance, recognisable by the data element name starting with a lower-case 'q'. The instance type may be different on all DSfG buses of

the RGC 7-C.

▶ Specification of the GC instance S1/S2: DSfG address of the GC instance on DSfG-Bus 1 for single-stream operation or stream 1/stream 2 for multi-stream operation.

▶ Specification of registration S1/S2: DSfG address of the registration instance on DSfG-Bus 1 for single-stream operation or stream 1/stream 2 for multi-stream operation.

▶ Specification of Wieser S1/S2: DSfG address of the Wieser instance on DSfG-Bus 1 for single-stream operation or stream 1/stream 2 for multi-stream operation. In the Wieser instance, daily and monthly averages are compiled and special measured values and special signals are managed.

▶ Specification of IP instance: DSfG address of the remote data transfer instance via DSfG-B-IP. If you wanted to use the DSfG-B-IP access to bus 1, a DSfG address would have to be assigned here.

▶ Entry of password: password for remote data transfer access via DSfG-B-IP at DSfG-Bus 1.

Note: The password must be made up of exactly 16 characters. The characters themselves may only be from the group of numbers '0–9' or letters 'A–Z' or 'a–z'. Spaces, umlauts and special characters are not permitted. This restriction is the result of DSfG using a 7-bit code for transfer. On the basis of the password, a decision is made as to which of the DSfG buses available at the GC the control centre will be connected to. It is therefore extremely important for the password to be different for each bus.

▶ Specification of freeze allowed: the selection ON permits triggering of a freeze attention telegram on DSfG-Bus 1.

▶ Specification of time sync. source: the selection ON permits triggering of a time synchronisation telegram on DSfG-Bus 1. If it is activated, the GC will be the timer for all other devices on DSfG-Bus 1. Time sync telegram always at 30th second at minute intervals.

▶ Entry of permitted ext. addresses: if remote data transfer access via DSfG-B-IP is activated, you can specify here which external DSfG devices at bus 1 should be visible for the control centre. The internal device are visible for the control centre if a DSfG address has been assigned at them.

Sublevel 02 Bus-2 (COM 4)

The displays and setting options for Bus-2 (COM 4) are identical to those described above for sublevel 01.

Sublevel 03 DSfG signature

▶ Specification of signature methodology:
  – None
  – RMD160+ECDSA192
  – SHA256+ECDSA192

▶ Entry of sender: sender ID for signature

▶ Specification of new key: Generate new key now?
  – Yes
  – No

■ Display of following information:
  – Time of key generation: time when key was generated

- Time of key expiration: time when key expires
- Public key Qx1 to Qx3: public key X1 to X3
- Public key Qy1 to Qy3: public key Y1 to Y3
- DFÜ signed
- DFÜ signing methodology
- Instance-selective
- EADR of sender

Example application: Activating signature

In level 18.03 DSfG signature, the generation of a signature can be activated for the data transfer.
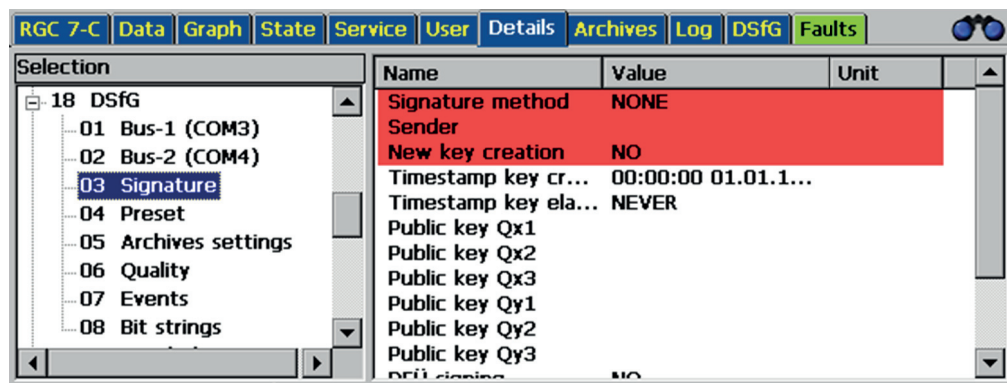
Fig. 25:   Menu Detail – 18.03 Signature

NOTE

Access to parameters of the signature

The following parameters relating to the signature are subject to official calibration protection and can only be altered when the calibration switch it open:

- Signing methodology
- Sender
- New key

To activate the signature, proceed as follows:

1. In the **Detail** menu in the **Selection** field, select level **18 DSfG**.
2. Then select the sublevel **03 Signature**.
   - ➜ The blue background indicates that the corresponding sublevel is selected.
3. In the right-hand window Parameter change, select the parameter **signing methodology**.
   - ➜ The **parameter change** window will open.
4. Select the desired signing method in the list in the selection field.
   - None
   - RMD160+ECDSA192
   - SHA256+ECDSA192
5. Press the **Apply** button to activate the selection.
6. Exit the parameter change window by pressing the **Back** button.

> **NOTE**
>
> **Recommended signature**
>
> The DVGW (German Association for Gas and Water) recommends the use of the RMD160 procedure for corresponding with the Weights and Measures Office.

---

7. In the right-hand window Parameter change, select the parameter **new key**.
    ➜ The **parameter change** window will open.
8. Select the option **Yes** in the list in the selection field.
9. Press the **Apply** button to activate the selection.
    ➜ The generation of a new key is activated.
10. Exit the parameter change window by pressing the **Back** button.

Generation of a new key is generally recommended if the
RGC 7-C has been left unattended for a prolonged period with the user lock open, e.g. during repair.

Sublevel 04 Preset

▶ Entry of CRC12 stream 1/stream 2: CRC12 start value for stream 1/stream 2. To fulfil the official calibration requirements of PTB, please program a non-zero value here. For a start value of 0, the official calibration seal will not be transferred.

Sublevel 05 Archive settings

▶ Specification of names for various archive groups (AGs).

The various archive groups save the following values:

- Archive group 1: hour averages part 1 is used for standard queries of the gas chromatograph.
  Memory depth: 2280 entries
- Archive group 2: cannot be used because of AKA2
- Archive group 3: measured values part 1 is used for standard queries of the gas chromatograph.
  Memory depth: 960 entries
- Archive group 4: Cannot be used because of AKA2
- Archive group 5: hour averages part 2 is used for standard queries of the gas chromatograph.
  Memory depth: 2280 entries
- Archive group 6: reference gas part 4 is used for standard queries of the gas chromatograph.
  Memory depth: 700 entries
- Archive group 7: daily averages compiled in Wieser instance
  Memory depth: 95 entries
- Archive group 8: analyses are used for standard queries of the gas chromatograph
  Memory depth: 960 entries
- Archive group 9: monthly averages compiled in Wieser instance
  Memory depth: 24 entries

- Archive group 10: hour averages part 3 is used for standard queries of the gas chromatograph.
  Memory depth: 2280 entries

- Archive group 11: calibration gas part 1 is used for standard queries of the gas chromatograph.
  Memory depth: 200 entries

- Archive group 12: Reference gas part 1 is used for standard queries of the gas chromatograph.
  Memory depth: 700 entries

- Archive group 13: Reference gas part 2 is used for standard queries of the gas chromatograph.
  Memory depth: 700 entries

- Archive group 14: reference gas part 31 is used for standard queries of the gas chromatograph.
  Memory depth: 700 entries

- Archive group 15: long-term archive is used for standard queries of the gas chromatograph in Q instance. Reproduced in Wieser instance because of lacking standard query in G instance
  Memory depth: 70848 entries

- Archive group 16: free

- Archive group 17: analogue values compiled in Wieser instance
  Memory depth: 2280 entries

- Archive group 18: calibration gas part 2 is used for standard queries of the gas chromatograph.
  Memory depth: 200 entries

- Archive group 19: hour averages part 4 is used for standard queries of the gas chromatograph.
  Memory depth: 2280 entries

- Archive group 20: Measured values part 2 is used for standard queries of the gas chromatograph.
  Memory depth: 960 entries

- Archive group 21: corrected measured values used for standard queries of the gas chromatograph.
  Memory depth: 960 entries

- Archive group 22: free

- Archive group 23: logbook is used for standard queries of the gas chromatograph.
  Memory depth: 2280 entries

- Archive group 24: free

- Archive group 25: free

For detailed information on the possible archive entries, please refer to the RGC 7-C parameter list, which you can download from our website www.rmg.com.

▶ Entry of min. analyses for av.: minimum number of analyse for a valid 15min average. Possible entries:
  – 0 = 1 analysis for 15min av., 1 analysis for hour av., 1 analysis for mon. av.
  – 1 = 1 analysis for 15min av., 4 analyses for hour av., …
  – 2 = 2 analyses for 15min av., 8 analyses for hour av., …
  – …

Sublevel 06 Quality

- Display of quality factors 1 to 21: the quality factors are required for the Q instance in accordance with the DSfG standard. For further information, see DSfG specification.

Sublevel 07 Events

- Display of event stream 1/stream 2: The last DSfG event for stream 1/stream 2 is displayed here.
  - Events that have arrived have a positive value.
  - Events that have gone have a negative value.
  - The event 0 means: no event has occurred since GC restart.
  - Events in the range 1 to 999 – see DSfG guidelines (manufacturer-independent, standardised).
  - Events in the range 7000 to 7999 – see online documentation of the RGC 7-C, which can be accessed via Internet browser (events without a precise equivalent in the DSfG guidelines).

To open the online documentation of the RGC 7-C in an internet browser, please observe the section 7.13 "Operation over an Internet browser".

- Display of time for event: timestamp for the DSfG event stream 1/stream 2.

Sublevel 08 Bit strings

- Display of following bit strings:
  - DSfG > delete error
  - DSfG > start calib.
  - Calib. status
  - DSfG > start ref.
  - Ref. status
  - DEI S1
  - DEI S2
  - DEI ref
  - BitsMRG
  - BitsLimits_S1
  - BitsLimits_S2

7.8.17 Level 19 External I/O system

> **NOTE**
>
> **Parameterising an external I/O system**
>
> The additional interface modules (Wago) can be parameterised without a code word and without opening the user lock.

Main level

- Display of the number of available analogue inputs and outputs and digital inputs and outputs of the additional interface modules (Wago) (cf. fig. 26).
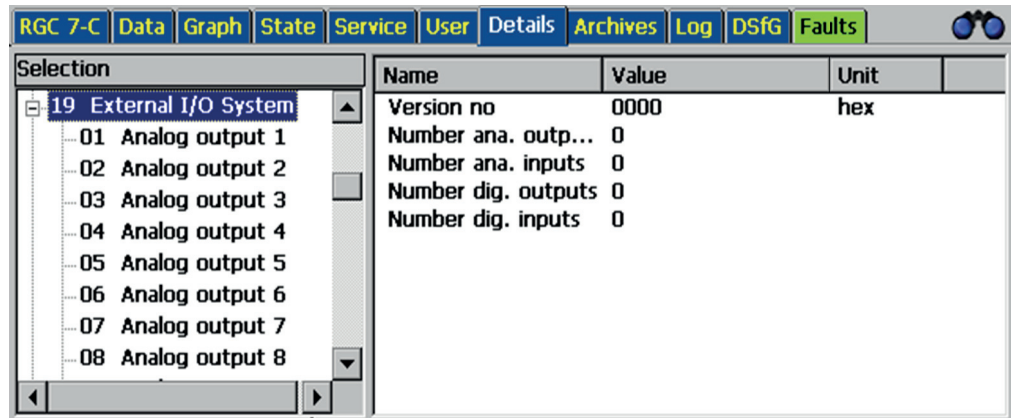
Fig. 26:   Menu Detail – 19 External I/O system

Sublevel 01–16, analogue output 1–16

In the sublevels 01 to 16, the same parameters can be set, so the parameterisation options will only be explained in detail for sublevel 01 Analogue output 1.

▶ Specification of the operating mode of the selected analogue current output:
  – OFF
  – 4–20 mA

■ Display of the status of the selected analogue current output:
  – OK
  – ERROR
  – NOT AVAILABLE

▶ Entry of selection: source (Modbus address of the selected analogue current output.

▶ Specification of limit breach: specifies what error should be generated in the event of a physical limit being breached. Possible options:
  – ALARM
  – WARNING

▶ Entry of physic. min. value: specifies the physical min limit..

▶ Entry of physic. max. value: specifies the physical max limit.

■ Display of physical value: physical value that is read out from the specified Modbus register.

■ Display of unit physic. value: unit of the physical value, if available.

■ Display of current output: physical value converted to mA.

■ Display of binary value: binary value that is transferred to the WAGO module. The value corresponds to the mA value.

Sublevel 17–32, analogue input 1–16

In the sublevels 17 to 32, the same parameters can be set, so the parameterisation options will only be explained in detail for sublevel 17 Analogue input 1.

▶ Specification of the operating mode of the selected analogue current input:
  – OFF
  – 4–20 mA

■ Display of status: status of the selected analogue current input

– OK
– ERROR
– NOT AVAILABLE

■ Display of measured value: value transferred from WAGO module to the current input.

■ Display of measured value: mA value calculated on the basis of the transferred binary value.

Sublevel 33–36, digital output 1–4

In the sublevels 33 to 36, the same parameters can be set, so the parameterisation options will only be explained in detail for sublevel 33 Digital output 1.

■ Display of value: Value transferred by RGC 7-C to the WAGO module for output via the additional digital outputs 1 to 16.
16-bit value in hexadecimal format.

▶ Input selection dig. outp. 1–16: error/warning/message number for WAGO module digital output 1–16

■ Display error dig. outp. 1–16: error/warning/message text for WAGO module digital output 1–16.

Sublevel 37–40, digital input 1–4

■ Display of measured value: Value transferred by WAGO module to the RGC 7-C, formed from the switching states of the additional digital inputs 17 to 32.
16-bit value in hexadecimal format

7.8.18 Level 20 Error and status

Main level

▶ No selection is possible in the parameter change window. Please navigate directly to the desired sublevel.

Sublevel 01 Error

▶ Acknowledge error: errors can be acknowledged here by selecting **YES**:
➡ all errors that are no longer pending are acknowledged. The selection then jumps to **NO**.

■ Bit coding of the active errors, warnings and message numbers.

Sublevel 02 Status

■ Display of device status:
– Message status: display whether a message is present (ON) or not (OFF). If there is a message that is no longer current but not yet acknowledged, ACK will be displayed.
– Warning status: display whether a warning is present (ON) or not (OFF). If there is a warning that is no longer pending but not yet acknowledged, ACK will be displayed.
– Warning contact: switching state of the warning contact.

- Alarm status: display whether an alarm is present (ON) or not (OFF). If there is an alarm that is no longer pending but not yet acknowledged, ACK will be displayed.
- Alarm contact: switching state of the alarm contact.
- S1/S2 error status: display whether an error is pending (ON) or not (OFF) that affects stream 1/stream 2. If there is an error that is no longer pending but not yet acknowledged, ACK will be displayed.
- Device status

Sublevels 03 to 18

▶ Parameterisation of 16 freely configurable 16-bit values with errors, warning and message numbers (sublevel 03–18).

Example application: Parameterising custom status bits
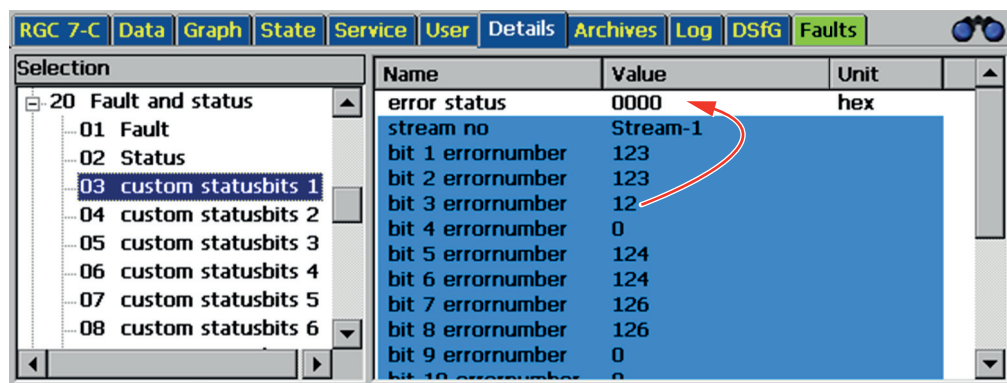
Fig. 27:   Menu Detail – 20.03 Custom status bits 1

In sublevels 03–18, 16 separate 16-bit values, each with up to 16 error numbers, can be configured in a way that allows any error/warning/message numbers, separated by streams, to set and reset individual bits.

7.8.19 Level 21 Date, time

Main level

- Display of coordinated world time: display of current world time (date and time). This time cannot be set.
- Display of local time: display of current local time (date and time). The date and time are set in the parameter 'Set local time'.
- Display of local time - world time: display of the difference between the local time and the world time in seconds.
- ▶ Entry set local time: the local time of the RGC 7-C is set here. Format time: hh.mm.ss, format date: DD.MM.YYYY.
- ▶ Selection of time zone: The required time zone can be selected from a very long list here.
- Display of last time zone change: time of last time zone change
- ▶ Specification of operating mode of time synchronisation:
  - MANUAL: The time cam be entered from the keyboard and via RMGView[GC].

- DSFG-BUS-1: The time is synchronised automatically via DSfG-Bus 1 if this function is available on the DSfG-Bus 1. In this case, the PGC cannot function as the timer for the DSfG-Bus. Manual adjustment of the time is possible for test purposes.
  - DSFG-BUS-2: same as for DSFG-BUS-1
  - NTP: The time is automatically synchronised via the specified NTP server.
  - RGC 7-C: The time is automatically synchronised via the connected RGC 7-C. (Only selectable for GC 9310.)

▶ Specification of DSfG sync address: specifies which DSfG bus subscribers accept time sync telegrams.

▶ Specification of the rules for time synchronisation:
  - ALWAYS: Synchronisation is always performed, without any rules applied.
  - STRICT: Synchronisation is always carried out if the calibration switch is open. If the calibration switch is closed, synchronisation is performed max. once per day, within the limits of ± 20 seconds.
  - EXTENDED: Like the selection STRICT, also for open code word. The first time sync. after a restart is always carried out. The first time sync. after manual adjustment is always carried out (check of function).

■ Display last time sync.: time of last time synchronisation.

▶ Entry of address NTP server: IP address of the NTP server (Network Time Protocol). This server is used to synchronise the controller clock.

▶ Entries NTP interval: interval of synchronisation via NTP. The interval is specified in hours.

▶ Display of the status of the synchronisation via NTP:
  - 0: NTP OK
  - 1: NTP error on reception
  - 2: NTP error incorrect length
  - 3: NTP error not plausible
  - 4: NTP error not synchronous
  - 5: NTP error socket
  - 6: NTP error bind
  - 7: NTP error route
  - 8: NTP error send
  - 9: NTP error
  - 10: NTP error connect
  - 11: NTP error timeout – default route incorrect
  - 12: NTP error host not found – gethost()

▶ Specification of measuring unit time sync.: here you can set (ON/OFF) whether the clock in the measuring unit should be synchronised before every calibration. If this mode is set to OFF, the measuring unit runs with its own internal clock.

■ Display of seconds since start: seconds elapsed since start of the RGC 7-C.

7.8.20 Level 22 Archives and memory

Main level

▶ Configuring general settings or selections for archives, such as specifying start of day, selecting 'write parameter log' or 'delete day archive'.

If the selected 'delete' has been set for one of the archives, it must be noted that no back-up files will be created, i.e. the data will be completely erased!

Sublevel 01 Freely selectable archives

The RGC 7-C has over 20 freely programmable archive channels. In this level, a measured value or parameter can be assigned to each channel.

▶ Assignment of a measured value or parameter to an archive channel by entering the Modbus address of the desired measured value or parameter in the Parameter change window of the corresponding archive channel.

■ Display of all archive channels with the individual assigned Modbus address of the measured value or parameter.

For detailed information as to how you can determine the required Modbus addresses for the **freely selectable archives** and the **trend**, please refer to section 7.8 "Menu Detail".

Sublevel 02 Trend

A total of 10 different measured values can be assigned for recording and depiction in the **Trend** menu.

▶ Assigning the measured value to a recording channel by entering the Modbus address of the desired measured value in the corresponding recording channel

■ Display of all recording channels with the individual assigned Modbus address of the measured value.

NOTE

Trend depiction is not retroactive

The recording of the measured values in the recording channels does not begin until the Modbus address has been assigned. It is not possible to depict the trend of any earlier measured values.

▶ You can find the trend depiction in the menu **Graph – Trend**.

For detailed information on the trend depiction, please refer to section 7.4.2 "Menu Graph – Trend".

7.8.21 Level 23 Hour values

Main level

▶ No selection is possible in the parameter change window. Please navigate directly to the desired sublevel.

Sublevels 01 Stream 1 and 02 Stream 2

- Display of the last hour averages of the components of measurement gas stream 1 or 2.

7.8.22 Level 24 Day values

Main level

▶ No selection is possible in the parameter change window. Please navigate directly to the desired sublevel.

Sublevels 01 stream 1 and 02 stream 2

- Display of the last day averages of the components of measurement gas stream 1 or 2.

7.8.23 Level 25 Month values

Main level

▶ No selection is possible in the parameter change window. Please navigate directly to the desired sublevel.

Sublevels 01 stream 1 and 02 stream 2

- Display of the last month averages of the components of measurement gas stream 1 or 2.

7.8.24 Level 26 User

Main level

▶ Selection of language
▶ Entry of code word and code word default
▶ Entry of display screensaver time
- Display of status of calibration lock, code word and DSfG code

Example application: Entering code word

Many parameters can only be changed if a code word is entered beforehand. The factory setting for the code word is **99999999**.

To enter the code word, proceed as follows:

1. In the **Detail** menu in the **Selection** field, select level **26 User**.
   ➡ The blue background indicates that the corresponding level is selected.
2. In the right-hand field **Parameter change**, select the parameter **code word**.
   ➡ The corresponding window for parameter change opens.
3. Select the input field and use the keyboard that is displayed to enter the code word.
4. Close the input by pressing the **OK** button.
5. Press the **Apply** button to activate the input.

6. Exit the parameter change window by pressing the **Back** button.

Sublevel 01 Screen

In this sublevel, a total of 20 display values can be assigned to a user-defined list for display in the **User** menu.

► Assigning a display value for the user-defined list by entering the Modbus address of the desired value in the corresponding display value position (display value 1 to 20).

Sublevel 02 Printer

If a printer is connected to the COM5 port, you can define in this level whether values should be printed, and if so which ones.

► Selection of the printer and the values to be printed.

Sublevel 03 to 06

The remaining sublevels are used to specify user-defined 16-bit and 32-bit and float numbers and texts.

7.8.25 Level 27 Service

Changes can only be made in this level with the calibration lock open!

Main level

► No selection is possible in the parameter change window. Please navigate directly to the desired sublevel.

Sublevel 01 Parameter

► Selection of user profile: The user profile can be used to show or hide parameters and display values in the various menus for the sake of clarity. The following user profiles are available:
  – User (factory setting: many values are hidden)
  – Service (some values are hidden)
  – Developer (all values are visible)
► Activation of service mode for software tests, only for RMG-Service.

Sublevel 02 Diagnostics

▪ Display of various diagnostic values, such as operating hours, CAN counter, free memory

Sublevel 03 Block CRCs

▪ Display of CRC checksums for parameters.

7.8.26 Level 28 Type label

Main level

- ■ Display of the 'electronic type label' with all relevant version information and device data.
- ▶ Selection of measuring unit type:
  - – RGC 704
  - – RGC 717
- ▶ Specification approved for:
  - – None
  - – Gas quality (GQ)
  - – UNI11885[1]: This setting is used to enable individual coordinates/parameters for SNAM[2]. The setting can be activated in both the measuring unit variant RGC 717 and RGC 704, but it is not permitted for official calibration operation in Germany.

[1]   Italian standard: specifies 'functional properties of gas chromatographs with thermal conductivity detector installed in the gas transport and distribution grid'

[2]   SNAM S.p.A.: Società Nazionale Metanodotti, an Italian operator of natural gas transmission networks.

7.9   Menu Archives

In the Archives menu, all archive entries can be viewed. One data record of the gas components and one data record of the calculated variables are displayed. You can use the selection fields to set various filters for the display, e.g. gas stream, mean average or date (cf. fig. 28).
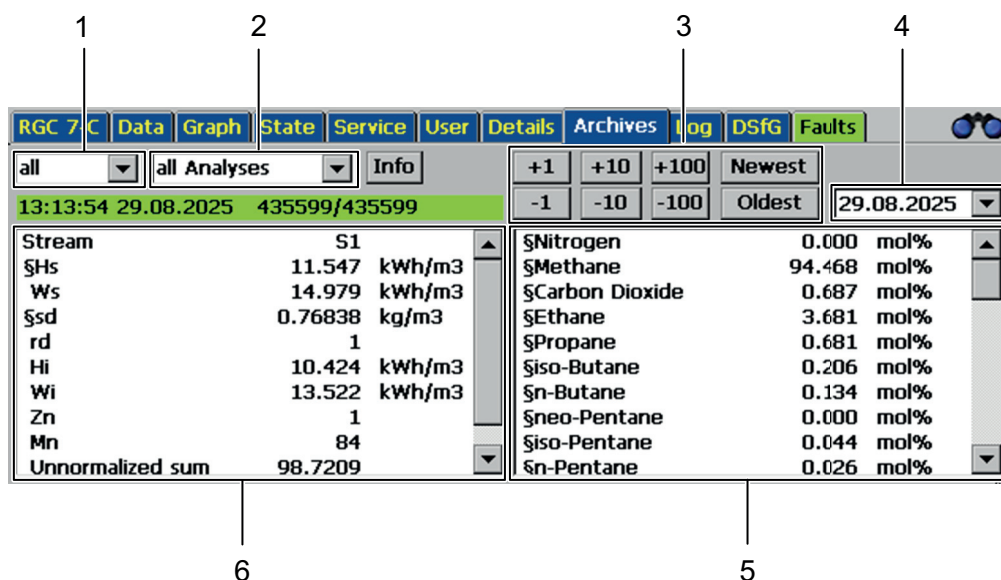
Fig. 28:   Menu Archives

No.	Designation	Function
1	Selection **gas stream**	■ Opens the selection menu for which gas stream is displayed: - All: All analyses that have been performed, i.e. including reference and calibration gas - S1: Gas stream 1 - S2: Gas stream 2 - Ref: Reference gas - Cal: Calibration gas - Skip: Analyses that are not used.
2	Selection **mean average**	■ Opens the selection menu for which averages are displayed: - Every analysis: Display of the individual analyses - Hour: Display of the hourly averages - Day: Display of the daily averages - Month: Display of the monthly averages
3	**Go to in the display** buttons	■ Pressing this button makes the display jump by the corresponding number of entries: - -100/+100: Go 100 entries back or forwards - -10/+10: Go 10 entries back or forwards - -1/+1: Go 1 entry back or forwards - Newest/oldest: Sort the data by recency, in ascending or descending order
4	Selection **Date**	■ Opens of a calendar field to select the date of the archived data
5	Display field **Archive parameters**	■ Initially shows the concentrations in mol % ■ After scrolling down with the scroll bar, the assigned archive parameters are displayed. (The selection of which parameters are displayed is made in the Detail menu in level 22.01.)
6	Display field **Measurement data from RGC 7**	■ Shows the measurement data of the RGC 7

7.10   Menu Log

In the Log menu, the logbooks for the RGC 7-M are displayed. Depending on the selection, events / error messages or parameter changes are displayed with timestamps (cf. fig. 29).

The events are labelled with the following code letters:

- A – Alarm
- H – Information
- W – Warning

NOTE

Parameter logging

Parameters are only logged if they are secured from unauthorised alteration with a code word or user lock.

For more information on the potential error message display, please refer to section 7.12 "Menu Errors".
A complete list of possible error messages is provided in section 11.1 "Error messages".
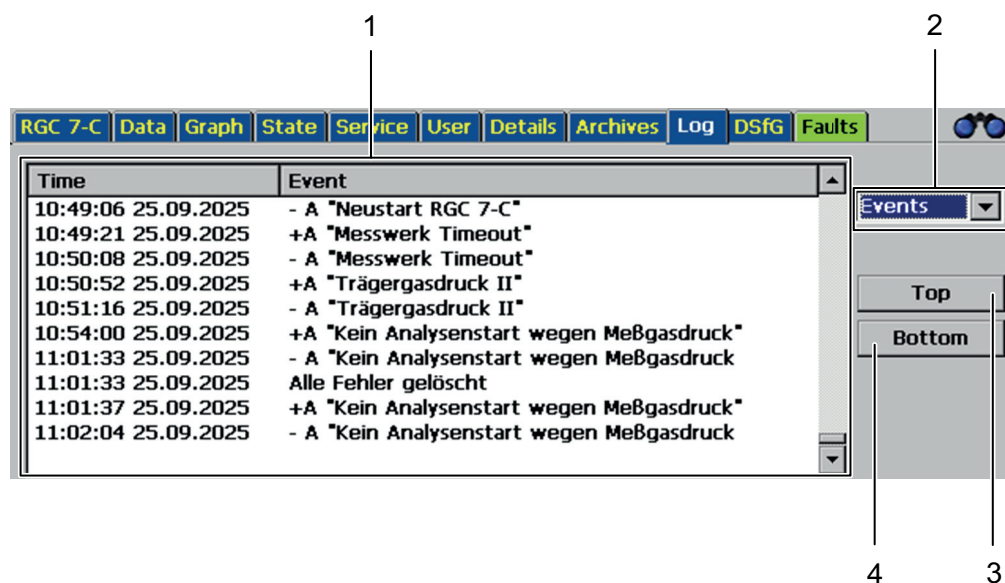
Fig. 29:   Menu Log

No.	Designation	Function
1	Display field **Events/parameters**	■ Depending on the selection in the selection field (no. 2), displays the following logs: - Events: All events, e.g. incoming and outgoing alarms with date and time - Parameters: All parameter changes with date and time, as well as the old and new value for the parameter
2	Selection **Events/parameters**	■ Opens the selection: - Events (see description above) - Parameters (see description above)
3	**Up** button	■ Jumps to start of log list
4	**Down** button	■ Jumps to end of log list

7.11   Menu DSfG

Selecting the DSfG tab in the menu bar opens a selection field with:

- Archives
- Delete

Making a selection opens the corresponding menu.

DSFG archives

In the DSfG archive menu, there are various archive groups for Stream 1 and Stream 2, which can be selected by means of the corresponding selection fields. The data of the selected archive is then displayed in the display field.
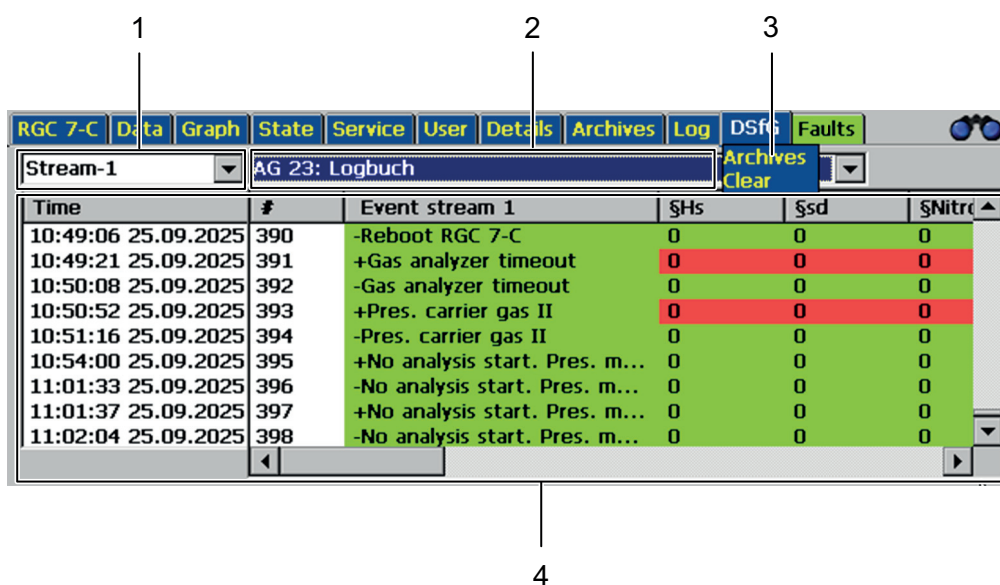
Fig. 30:   Menu DSfG – Archives

No.	Designation	Function
1	Selection **Stream**	■ Opens the selection: - Stream 1 - Stream 2
2	Selection **Archive group**	■ Opens the selection of the archive groups (cf. section 7.13.1 "Download DSfG archive") - AG 01: G485av1 - AG 03: Complete analysis 1 - AG 05: av/hr1 - AG 07: av/day1 - AG 09: av/mon1 - AG 11: Int. calibr.1 - AG 13: ExtTestGas1 - AG 15: Lantimesp.1 - AG 17: MRGanaloguev. - AG 19: Ext.MW.hr1 - AG 21: Corr.measuredValues - AG 23: Logbook

No.	Designation	Function
3	Selection field **DSfG menus**	■ Can be used to open the following menus: - Archives - Delete
4	Display field **Archive data**	■ Displays the data for the selected archive group

DSfG clear

In the DSfG clear menu, individual DSfG archives can be deleted for a particular stream, provided that the user lock has been opened.
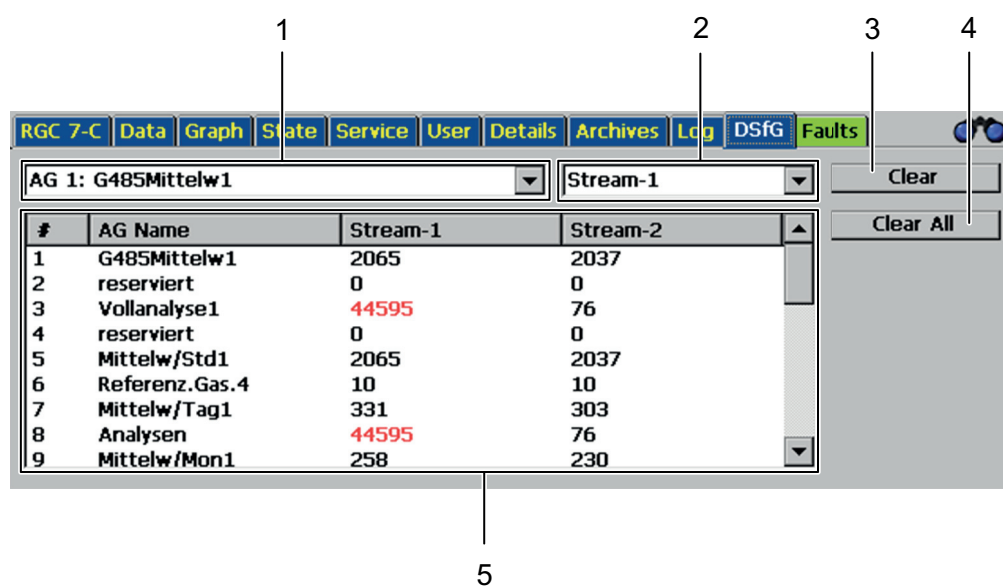
Fig. 31:   Menu DSfG – Clear

No.	Designation	Function
1	Selection **Archive group**	■ Opens the selection of the archive groups: - AG 01: G485av1 - AG 03: Complete analysis 1 - AG 05: av/hr1 - AG 06: ReferenceGas.4 - AG 07: av/day1 - AG 08: analyses - AG 09: av/mon1 - AG 10: Hours.av.3 - AG 11: Int. calibr.1 - AG 12: ReferenceGas.1 - AG 13: ExtTestGas1 - AG 14: ReferenceGas.3 - AG 15: Lantimesp.1 - AG 17: MRGanaloguev. - AG 18: CalibrationGas.2 - AG 19: Ext.MW.hr1 - AG 20: MeasuredValues.2 - AG 21: Corr.measuredValues - AG 23: log book
2	Selection **Stream**	■ Opens the selection: - Stream 1 - Stream 2
3	**Clear** button	■ Deletes the selected DSfG archive of the selected stream
4	**Clear all** button	■ Deletes all DSfG archives for both streams
5	Display field **Archive groups**	■ Displays the number of archive entries for each archive group and each stream

7.12   Menu Errors

The Errors menu displays all recent and not yet acknowledged errors. The messages are classified in the following categories:

Type of message	Colour message background	Effect of message
Alarm (A)	Red (active)	The measurement is faulty
Alarm (A)	Green (inactive)	The message is not longer active and can be deleted
Warning (W)	Yellow	The measurement is not impaired
Information (H)	Blue-violet	The message only serves to provide information and does not relate to an error

The tab of the Errors menu (cf. fig. 32, no. 2) is displayed in the colour of the most severe pending error when a different menu is currently open.
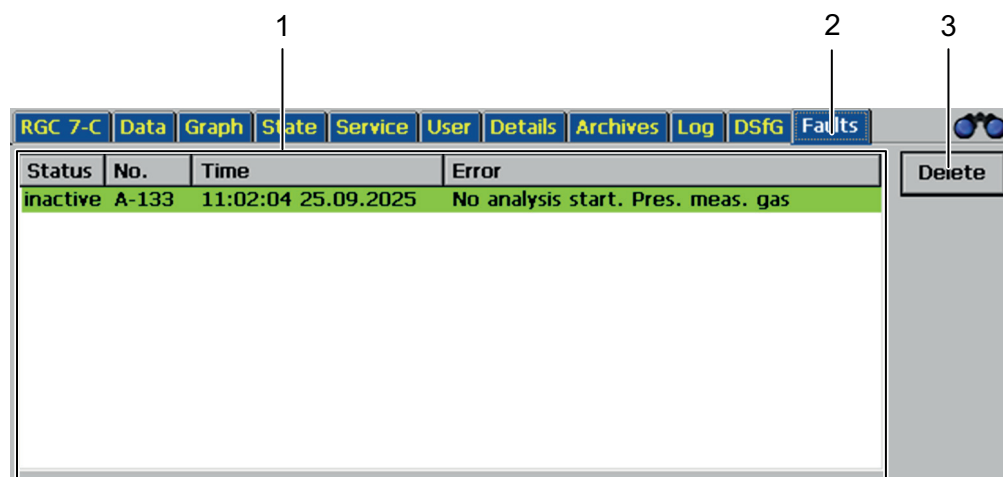
Fig. 32: Menu Errors

No.	Designation	Function
1	Display field **Messages**	■ Displays a list of all messages that have occurred
2	Tab **Errors menu**	■ Opens the list of all messages that have occurred
3	**Delete** button	■ Deletes the selected message from the displayed list, but **not** from the error log

7.13 Operation over an Internet browser

In order to operate the RGC 7-C over an Internet browser, the user must connect the RGC 7-C to a PC (cf. section 6.2.2 "Terminal assignment, ports") at the network port Eth2 (terminal X19). Nevertheless, it is only possible to view and read out the archives via this connection.

If there is a TCP/IP connection between the PC and the controller, the archive content can be displayed and read out with any Internet browser.

To back-up the data, the archive content can be saved in the file formats 'html' and 'csv'. The file format 'csv' stands for '**c**haracter-**s**eparated **v**alues', and these files can be read by MS Excel.

NOTE

Decimal separation in the 'csv' file format

If the archive data is to be output in the csv file format and read in MS Excel, the decimal separator that is selected in the csv file must match the separator selected in MS Excel.

▶ Always select the same decimal separator, i.e. either a full stop or a comma.

To access the archive data, you will need to enter a username and a password:

- Username: **gcuser**
- Password: specified individually in the Detail menu, **level 22 Archives and memory – password web archive** (cf. section 7.8.20 "Level 22 Archives and memory").

When the device's IP address is entered in the Internet browser, the start page is

opened with the language selection for the screen display. Once a language has been selected, the corresponding selection window opens:

Fig. 33: Selection window in the Internet browser

The Internet browser offers the option of viewing various parameter lists and downloading archives. You can open a particular list by clicking the corresponding link:

- **Matrix:** The matrix provides an overview of all parameters in a tree structure, as set up in the user interface's Detail menu. The parameters are sorted in accordance with the coordinates in the matrix.

- **Modbus (MB register):** This list also provides an overview of all parameters, but sorted by Modbus register.

- **Modbus coils:** This list is an overview of all Modbus coils.

- **Error list:** This list contains all possible error messages with error number, type, DSfG category, DSfG message, group flags and message text.

- **DSfG events:** This list contains an overview of possible DSfG events, sorted by DSfG message.

- **DSfG registration:** This list contains an overview of the DSfG register, sorted by DSfG data elements.

Clicking the **Archive** link opens the following selection window:
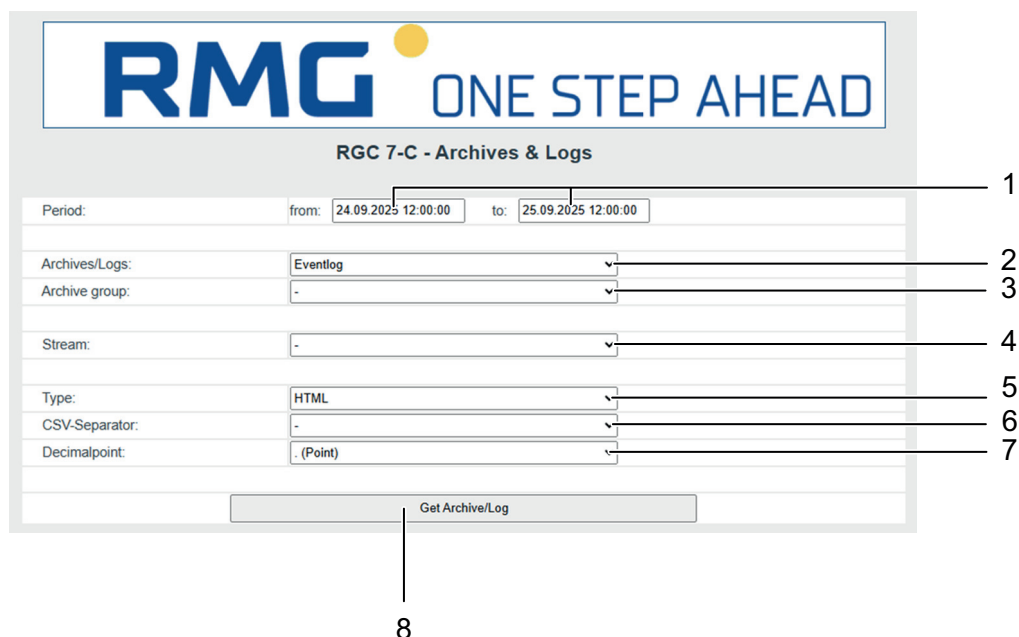
Fig. 34:   Archive selection window

No.	Designation	Function
1	**Time period** entry fields	■ Entry of the archive period to be accessed: - From DD.MM.YYYY hh:mm:ss - To DD.MM.YYYY hh:mm:ss
2	Selection **Archive/Logs**	■ Opens the selection menu where you can specify which archive or log should be downloaded – cf. description below.
3	Selection **Archive group**	■ Opens the selection menu for the archive groups if the setting 'DSfG archive' was selected in Archive/Logs (cf. no. 2) (cf. section 7.13.1 "Download DSfG archive").
4	Selection **Stream**	■ Opens the selection menu for the stream (cf. section 7.13.1 "Download DSfG archive"). The following options are available: - S1 - S2
5	Selection **Type**	■ Opens the selection menu for the file type of the downloaded archive/log file. The following options are available: - HTML - CSV display - CSV download
6	Selection **CSV separator**	■ Opens the selection menu for the CSV separator, if the setting 'CSV display/CSV download' was selected in type (cf. no. 5). The following options are available: - ; (semicolon) - , (comma) - Tab

No.	Designation	Function
7	Selection **decimal point**	■ Opens the selection menu for the deci- mal separator. The following options are available: - . (full stop) - , (comma)
8	Button **Fetch archive/log**	■ Downloads the archive in accordance with the selected settings.

To download an archive or log, proceed as follows:

▶ Specify the **time period** of the required archive/log.

▶ In **Archive/Logs**, specify the type of archive to be downloaded. The following can be selected:

– **Event log:** Error messages that are displayed in the controller.

– **Parameter log:** A log file containing parameters and their settings in the controller.

– **Individual analysis archive:** Raw data of the individual analyses, the area under the chromatogram and concentrations.

– **Hour average archive**

– **Day average archive**

– **Month average archive**

– **Calibration events archive:** All data of the calibrations with areas, concen- trations and retention times.

– **DSfG archive**: see separate description in section 7.13.1 "Download DSfG archive"

– **CP error log:** Diagnostics file directly from the measuring unit.

– **Modbus user list**

▶ Specify the type of file to be downloaded.

▶ Specify the type of CSV separator as applicable.

▶ Specify the decimal separator.

▶ Press the Fetch archive/log button to download the desired archive.

7.13.1 Download DSfG archive

If it was specified in the selection **Archive/Logs** (fig. 34, no. 2) that a **DSfG archive** should be downloaded, the **archive group** (fig. 34, no. 3) and the **stream** (fig. 34, no. 4) must also be specified.

The following archive groups can be selected:

NOTE

Addressing of the archive entries in accordance with DSfG

The individual parameters are addressed in the archive groups in accordance with DSfG specifications. For detailed information, refer to the published DVGW information 'GAS Nr. 7-3 (8. Auflage), Technische Spezifikation für DSfG-Realisierungen, Teil 3: Datenelementliste' [GAS No. 7-3 (8th edition), Technical specification for DSfG realisations, part 3: data element list].

Archive group	Designation	Description

AG 01	G485av1	Archive group 1 hour averages part 1 is used for standard queries of the gas chromatograph
		Memory depth: 2280 entries
		Instance Q: qic standard query (I) 3
		Instance G: dic standard query 3
		Filling: Interval end
		Channel assignment
		Q G value AK
		  - qaaad daacb calorific value 01
		  - qabad dabcb standard density 02
		  - qacad daccb density ratio 03
		  - qadad dadcb CO_2 04
		  - qaead daecb N_2 05
		  - qafad dafce H_2 06
		  - qagad - heating value 07
		  - qahad - Wobbe upper 08
		  - qaiad - Wobbe lower 09
		  - qajad - methane number 10
		  - qakad - real gas factor 11
		  - qei dei bit string 12

Archive group	Designation	Description

AG 03	Complete analysis 1	Archive group 3 Measured values part 1 is used for standard queries of the gas chromatograph
		Memory depth: 960 entries
		Instance Q: qje standard query (II) 5
		Instance G: dlc standard query 6c
		Filling: Measured value generated from scratch
		Channel assignment
		Q G value AK
		   - qaaag daace calorific value 01
		   - qabag dabce standard density 02
		   - qaeag dhgce N2 03
		   - qbaag dhhce methane 04
		   - qadag dhice CO2 05
		   - qbbag dhjce ethane 06
		   - qbcag dhkce propane 07
		   - qbdag dhlce i-butane 08
		   - qbeag dhmce n-butane 09
		   - qbfag dhnce neo-pentane 10
		   - qbgag dhoce i-pentane 11
		   - qbhag dhpce n-pentane 12
		   - qbiag dhqce C6-plus 13
		   - qbjag dhrce O2 14
		   - qbkag dhsce CO 15
		   - qblag dhtce ethene 16
		   - qbmag dhuce propene 17
		   - qbnag dhvce helium 18
		   - qafag dhwce H2 19
		   - qboag dcld argon 20
		   - qei dei bit string 21

Archive group	Designation	Description

AG 05	av/hr1	Archive group 5 hour averages part 2 is used for standard queries of the GC
		Memory depth: 2280 entries
		Instance Q: qjf standard query (II) 6
		Instance G: dld standard query 6d
		Filling: Interval end
		Channel assignment
		Q G value AK
		  - qaaad daacb calorific value 01
		  - qabad dabcb standard density 02
		  - qaead dhgcb N2 03
		  - qbaad dhhcb methane 04
		  - qadad dhicb CO2 05
		  - qbbad dhjcb ethane 06
		  - qbcad dhkcb propane 07
		  - qbdad dhlcb i-butane 08
		  - qbead dhmcb n-butane 09
		  - qbfad dhncb neo-pentane 10
		  - qbgad dhocb i-pentane 11
		  - qbhad dhpcb n-pentane 12
		  - qbiad dhqcb C6-plus 13
		  - qbjad dhrcb oxygen 14
		  - qbkad dhscb CO 15
		  - qblad dhtcb ethene 16
		  - qbmad dhucb propene 17
		  - qbnad dhvcb helium 18
		  - qafad dhwcb H2 19
		  - qboad dcld argon 20
		  - qei dei bit string 21

Archive group	Designation	Description

AG 07	av/day1	Archive group 7 day averages compiled in Wieser instance
		Memory depth: 95 entries
		Instance W:
		Filling: End of day
		Channel assignment
		W value AK
		   - wnaag calorific value 01
		   - wnabg standard density 02
		   - wnaeg N2 03
		   - wnagg methane 04
		   - wnadg CO2 05
		   - wnahg ethane 06
		   - wnaig propane 07
		   - wnajg i-butane 08
		   - wnakg n-butane 09
		   - wnalg neo-pentane 10
		   - wnamg i-pentane 11
		   - wnang n-pentane 12
		   - wnaog C6-plus 13
		   - wnapg O2 14
		   - wnaqg CO 15
		   - wnarg ethene 16
		   - wnasg propene 17
		   - wnatg helium 18
		   - wnafg H2 19
		   - wnatq argon 20
		   - wnayd bit string 21

Archive group	Designation	Description

AG 09	av/mon1	Archive group 9 month averages compiled in Wieser instance
		Memory depth: 24 entries
		Instance W:
		Filling: End of month
		W value AK
		  - wnaah calorific value 01
		  - wnabh standard density 02
		  - wnaeh N2 03
		  - wnagh methane 04
		  - wnadh CO2 05
		  - wnahh ethane 06
		  - wnaih propane 07
		  - wnajh i-butane 08
		  - wnakh n-butane 09
		  - wnalh neo-pentane 10
		  - wnamh i-pentane 11
		  - wnanh n-pentane 12
		  - wnaoh C6-plus 13
		  - wnaph O2 14
		  - wnaqh CO 15
		  - wnarh ethene 16
		  - wnash propene 17
		  - wnath helium 18
		  - wnafh H2 19
		  - wnatr argon 20
		  - wnayf bit string 21

Archive group	Designation	Description

AG 11	Int. calibr.1	Archive group 11 Calibration gas part 1 is used for standard queries of the GC
		Memory depth: 200 entries
		Instance Q: qla standard query (IV) 1
		Instance G: no equivalent
		Filling: Calibration result generated
		Channel assignment
		Q value AK
		  - qfaa quality factor 0 01
		  - qfab quality factor 1 02
		  - qfac quality factor 2 03
		  - qfad quality factor 3 04
		  - qfae quality factor 4 05
		  - qfaf quality factor 5 06
		  - qfag quality factor 6 07
		  - qfah quality factor 7 08
		  - qfai quality factor 8 09
		  - qfaj quality factor 9 10
		  - qfak quality factor 10 11
		  - qfal quality factor 11 12
		  - qfam quality factor 12 13
		  - qfan quality factor 13 14
		  - qfao quality factor 14 15
		  - qfap quality factor 15 16
		  - qfaq quality factor 16 17
		  - qfar quality factor 17 18
		  - qfas quality factor 18 19
		  - qfat quality factor 19 20
		  - qfau quality factor 20 21

Archive group	Designation	Description

AG 13	ExtTestGas1	Archive group 13 Reference gas part 2
		Memory depth: 700 entries
		Instance Q: qkc standard query (III) 3
		Instance G: no equivalent
		Filling: Test gas result generated
		Channel assignment
		Q value AK
		  - qaaah calorific value 01
		  - qabah standard density 02
		  - qaeah N2 03
		  - qbaah methane 04
		  - qadah CO_2 05
		  - qbbah ethane 06
		  - qbcah propane 07
		  - qbdah ibutane 08
		  - qbeah nbutane 09
		  - qbfah neopentane 10
		  - qbgah ipentane 11
		  - qbhah npentane 12
		  - qbiah C6P 13
		  - qbjah O2 14
		  - qbkah CO 15
		  - qblah ethene 16
		  - qbmah propene 17
		  - qbnah helium 18
		  - qafah H2 19
		  - qboah argon 20
		  - qei bit string 21
		  - qagah heating value 22

AG 15	Lantimesp.1	Archive group 15 long-term archive used for standard queries of the GC in Q instance
		Reproduced in Wieser instance because of lacking standard query in G instance
		Memory depth: 70848 entries
		Instance Q: qid standard query (I) 4
		Instance G: no equivalent
		Instance W: Reproduction in Wieser instance
		Filling: Quarter-hour
		Channel assignment
		Q W value AK
		  - qaaai wnaai calorific value 01
		  - qabai wnabi standard density 02
		  - qadai wnadi CO_2 03
		  - qei wnayh bit string 04

Archive group	Designation	Description

AG 17	MRGanaloguev.	Archive group 17: analogue values compiled in Wieser instance
		Memory depth: 2280 entries
		Instance W
		Filling: Interval end
		Channel assignment
		W value AK
		   - weaba current input 1 01
		   - weaca current input 2 02
		   - weada current input 3 03
		   - weaea current input 4 04
		   - weafa current input 5 05
		   - weaga current input 6 06
		   - weaha reserve 07
		   - weaia reserve 08
		   - weaha reserve 09
		   - weaka reserve 10
		   - weala reserve 11
		   - weama reserve 12
		   - weana reserve 13
		   - weaoa reserve 14
		   - weapa reserve 15
		   - weaqa reserve 16
		   - weaad bit string limits 17
		   - waaba bit string MRG 18

Archive group	Designation	Description

AG 19	Ext.MW.hr1	Archive group 19 hour averages part 4 is used for standard queries of the GC
		Memory depth: 2280 entries
		Instance Q: no equivalent
		Instance G: dlb standard query 6b
		Filling: Interval end
		Channel assignment
		G value AK
		   - dhacb heating value 01
		   - dhbcb Wobbe upper 02
		   - dhccb Wobbe lower 03
		   - dhdcb methane number 04
		   - dhecb real gas factor 05
		   - dhfcb non-standardised total 06
		   - dhgcb N2 07
		   - dhhcb methane 08
		   - dhicb CO2 09
		   - dhjcb ethane 10
		   - dhkcb propane 11
		   - dhlcb ibutane 12
		   - dhmcb nbutane 13
		   - dhncb neopentane 14
		   - dhocb ipentane 15
		   - dhpcb npentane 16
		   - dhqcb C6P 17
		   - dhrcb O2 18
		   - dhscb CO 19
		   - dhtcb ethene *
		   - dhucb propene *
		   - dhvcb helium 20
		   - dhwcb H2 21
		* Defined in standard query, not represented in archive

AG 21	Corr.measuredValues	Archive group 21 Corrected measured values used for standard query
		Memory depth: 960 entries
		Instance Q: qif standard query (I) 6
		Instance G: no equivalent
		Filling: corrected measured values generated from scratch
		Channel assignment
		Q value AK
		   - qaaaj calorific value 01
		   - qabaj standard density 02
		   - qadaj CO2 03
		   - qei bit string 04

Archive group	Designation	Description

AG 23	Logbook	Archive group 23 logbook used for standard queries of the GC
		Memory depth: 2280 entries
		Instance Q: qie standard query (I) 5
		Instance G: die standard query 5
		Filling: Alarm, warning, message coming + going
		Momentary values added to result
		Channel assignment
		Q G value AK
		    - qeq deq event number 01
		    - qaaaa daaa calorific value 02
		    - qabaa daba standard density 03
		    - qaeaa daea N2 04
		    - qbaaa dahb methane 05
		    - qadaa dada CO2 06
		    - qbbaa dahd ethane 07
		    - qbcaa dahe propane 08
		    - qbdaa dahf ibutane 09
		    - qbeaa dahg nbutane 10
		    - qbfaa dahh neopentane 11
		    - qbgaa dahi ipentane 12
		    - qbhaa dahj npentane 13
		    - qbiaa dahk C6P 14
		    - qbjaa dahl O2 15
		    - qbkaa dahm CO 16
		    - qblaa dahn ethene 17
		    - qbmaa daho propene 18
		    - qbnaa dahp helium 19
		    - qafaa dafa H2 20
		    - qboaa dcld argon 21

8 Initial start-up

8.1 General initial start-up information

Before initial start-up, ensure that all the safety information provided is observed and the installation has been carried out in accordance with the specifications of this manual.

The initial start-up is generally performed before delivery or by qualified technicians or field staff. For this reason, the initial start-up will not be discussed in detail in this manual. RMG also provides training and initial start-up services for this purpose.

> **NOTE**
>
> **Initial start-up together with the RGC 7-M**
> - ▶ Ensure that before the power supply of the RGC 7-C is switched on, all connected gas lines to the measuring unit and the measuring unit itself are purged.
> - ▶ If any air remains in the supply lines or in the measuring unit, this may destroy the column modules.
> - ▶ To flush, proceed as described in the operating manual of the RGC 7-M.

8.2 Measuring-unit-dependent settings

Depending on the measuring unit variant (RGC 704 or RGC 717), different settings must be made at the RGC 7-C.

RGC 704, official calibration natural gas operation

- ▶ In the menu **Detail**, **Level 28 Type label**, select the measuring unit type **RGC 704**.
- ▶ In the menu **Detail**, **Level 28 Type label**, select **Gas quality** in the parameter 'Approved for'.
- ▶ In the menu **Detail, Level 13 Calculation parameters**, select the calculation method **Method 1**.
    - ➡ In **Level 11 Component parameters** the first set of multi-level coefficients (MLC) is used for the RGC 704-M.
- ▶ For further settings required for official calibration operation, refer to the approval.

RGC 717 for hydrogen

> **NOTE**
>
> **Exception for RGC 717**
>
> The measuring unit RGC 717 is operated with **just one** carrier gas and uses its own type-dependent calibration process.
>
> For this reason, it is not possible to enable an RGC 704 measuring unit to be used for the analysis of hydrogen simply by changing the settings at the controller RGC 7-C. This would require further retrofitting for the measuring unit.
> - ▶ Ask RMG Messtechnik for additional information on retrofitting as required.

▶ In the menu **Detail**, **Level 28 Type label**, select the measuring unit type **RGC 717**.

▶ In the menu **Detail, Level 13 Calculation parameters**, select the calculation method **Method 2**.

▶ In the menu **Detail, Level 14.01 Measuring unit parameters**, select the setting **FETCH** for the chromatogram mode. (Calculation method 2 can only be used successfully if the chromatograms are 'fetched').

➡ In **Level 11 Component parameters** the second set of multi-level coefficients (MLC) is used for the RGC 717-M.

SNAM

The SNAM setting can be selected for both the measuring unit RGC 704 and the measuring unit RGC 717.

▶ In the menu **Detail**, **Level 28 Type label**, select the setting **UNI11885** in the parameter 'Approved for'.

➡ The required parameter fields for this setting will be enabled.

If the SNAM setting is not selected, when you select a parameter field belonging to the setting, a message will be displayed stating that the parameter is not available.

8.3 Performing initial start-up

Once you have ensured that the RGC 7-M is connected to the controller by means of the ports in the device's back panel, the following steps must be carried out for initial start-up.

For information on connecting the RGC 7-M to the RGC 7-C, please refer to section 6.2.4 "Connecting an RGC 7-M to the controller".
A detailed description of the user interface and how to use it is given in section 7 "Operation".

Procedure for initial start-up

1. Before switching on, check that the carrier gas pressure set at the external controller of the bottle rack corresponds to the required value in the menu **Status** of 4.5 bar ± 5 %. If not, readjust the pressure at the bottle rack as needed.

2. Connect the outlet line.

3. Connect the outlet line of the bypass.

4. Connect the carrier gas bottle, calibration gas bottle and measurement gas line to the ports on the measuring unit of the RGC 7-M.

5. Flush the carrier gas and calibration gas lines.

6. Install the carrier gas filter in accordance with the specifications given in the operating manual of the RGC 7 measuring unit.

7. Check that all gas lines are leaktight.

8. Connect the measuring unit to the controller by means of an Ethernet cable at port Eth1 (terminal X18) on the back of the RGC 7-C.

9. Carry out bake-out function in accordance with the description given below in section 8.3.1.

➡ Duration of bake-out procedure: approx. 12 hours.

10. In the menu **Detail, Level 01 RGC 7-C mode**, select in the parameter **operating**

mode (no. 1.0.1) the setting basic calibration (**BASIC CALIB.**).

➡ The device will carry out a basic calibration.

8.3.1 Bake-out

During initial start-up, after prolonged downtime or if impurities from undefined gas mixtures have entered the measuring unit, it is recommended to bake out the measuring unit to remove any impurities.

NOTE

Ensure that bake-out is performed correctly!

▶ To ensure that the bake-out procedure is carried out correctly, we recommend consulting with the Service of RMG before starting a bake-out.

Requirements for a bake-out:

- The operating mode of the RGC 7-C is set to **STOP** (see menu Detail, Level 01 RGC 7-C mode).
- The carrier gas pressure must be OK (see menu Status).
- The calibration switch must be opened to allow the service function **bake out** to be started.

Procedure for baking out:

1. Specify the total duration of the bake-out.

   ▶ To do this, navigate to the menu **Detail, Level 14.11 Bake-out** (cf. fig. 35/fig. 36).
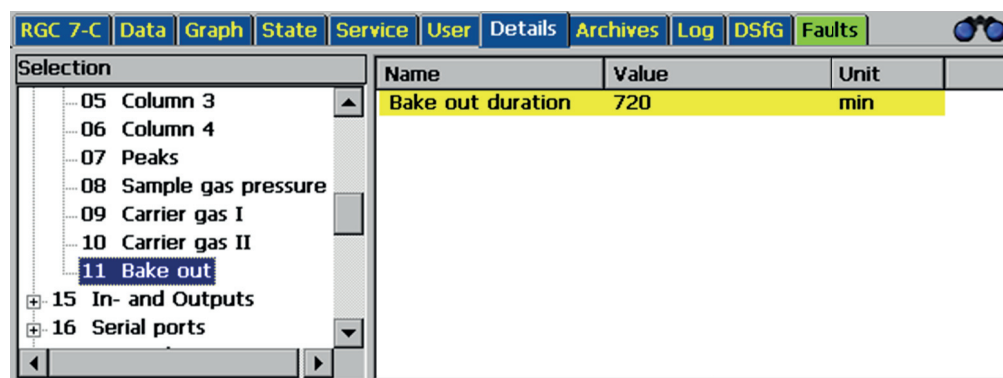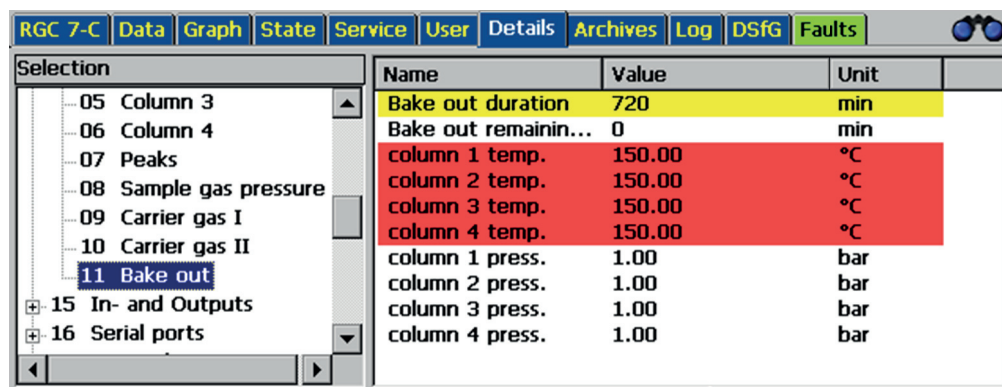
Fig. 35:   Menu Detail – Level 14.11 Bake-out (view for selected user profile 'User')

Fig. 36:   Menu Detail – Level 14.11 Bake-out (view for selected user profile 'Developer')

The user profile can be selected in the menu **Detail, Level 27.01 Service – parameters**. See also section 7.8.25 "Level 27 Service".

NOTE

Changing the parameters 'Temperature column 1 to 4'
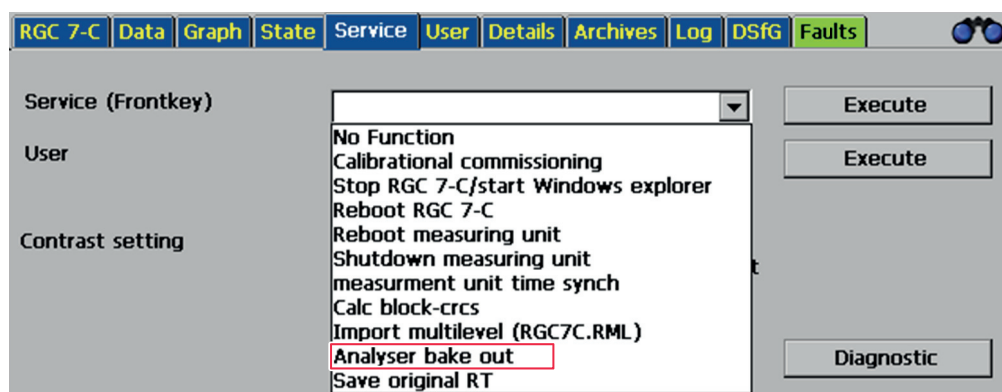
If the user profile **Developer** is selected, the changeable parameters **Temperature column 1 to 4** suggest that the bake-out temperature of the various columns could be specified in the controller. However, the entries made here are irrelevant, as the bake-out procedure and thus the bake-out temperatures are determined and controlled by the measuring unit.

▶ In the controller, it is only possible to specify the bake-out duration and start the bake-out procedure!

▶ The value for the bake-out duration can only be changed in the code word is entered (cf. section 7.8.24 "Level 26 User"). Values between 10 and 2080 minutes can be entered. In the factory setting, the value is set to 180 minutes.

2.   Start the bake-out procedure.

▶ To do this, navigate to the menu **Service** and in the selection menu **Service (front switch)** select the setting **Bake out measuring unit** (cf. fig. 37).

Fig. 37:   Menu Service – Setting Bake-out measuring unit

▶ Press the corresponding button **Run**.

➡ A new menu opens in the touchscreen (cf. fig. 38)
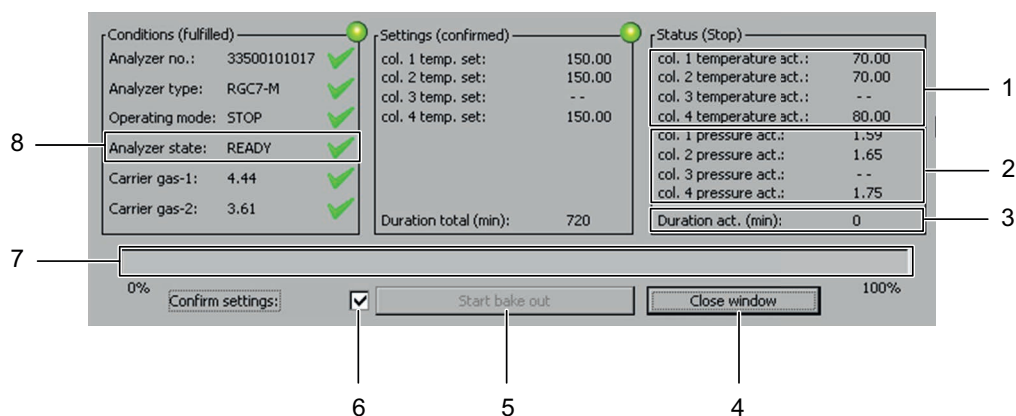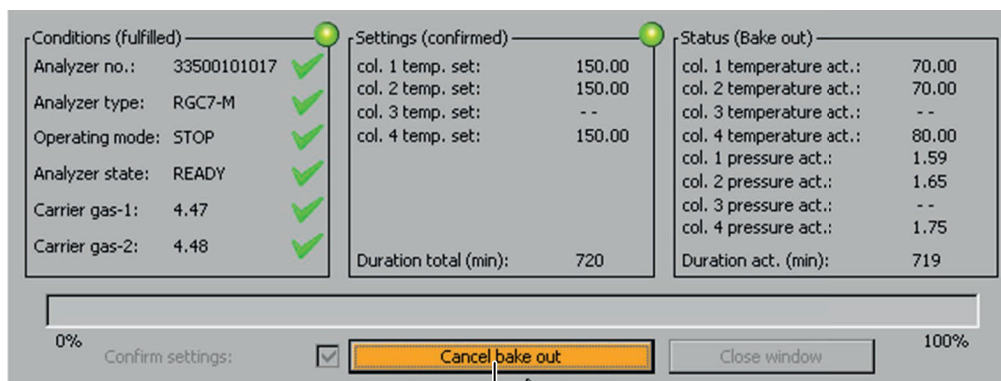
Fig. 38:   Menu Bake-out – Confirm start bake-out procedure

No.	Designation	Function
1	Display **Column X temperature actual**	▪ Shows the current temperature for each individual column.
2	Display **Column X pressure actual**	▪ Shows the current pressure for each individual column.
3	Display **Remaining duration (min)**	▪ Shows the remaining duration of the bake-out procedure.
4	Button **Exit window**	▪ Exits the current window. This is only possible once the bake-out procedure has been completed, however.
5	Button **Start bake-out procedure / confirm start bake-out procedure**	▪ Initiates the bake-out procedure.
6	Selection **Confirm settings**	▪ Activating the checkbox confirms / applies the settings.
7	Display **progress bar**	▪ Shows the percentage progress of the bake-out procedure.
8	Display **Measuring unit status**	▪ Shows the status of the measuring unit during the bake-out procedure: - Bake out - Cool down - Equilibration

▶ Press the button **Start bake-out procedure**.

➡ The text on the button changes to **Confirm start bake-out procedure**.

▶ Press the **Confirm start bake-out procedure** button.

➡ The bake-out procedure is started and it is no longer possible to leave the menu that is displayed.

➡ During bake-out, the status displays in the menu allow you to monitor the procedure.

➡ The button **Confirm start bake-out procedure** changes to **Cancel bake-out procedure** (cf. fig. 39).
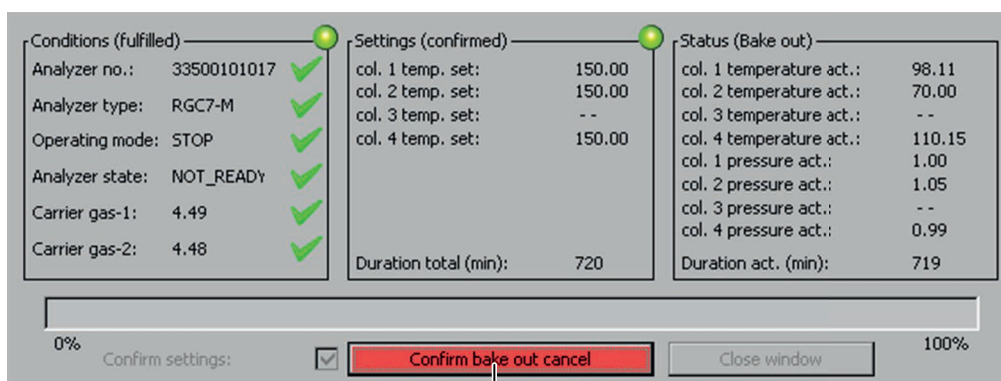
Fig. 39:   Menu Bake-out – Cancel bake-out procedure

No.	Designation	Function
1	Button Cancel bake-out procedure	■ Initiates cancellation of the bake-out procedure.

▶ To cancel the button bake-out procedure, press the button **Cancel bake-out procedure** (fig. 39, no. 1).

➡ The cancellation of the bake-out procedure is initiated, but not executed in full. The button changes to **Confirm cancel bake-out procedure** (cf. fig. 40).

Fig. 40:   Menu Bake-out – Confirm cancel bake-out procedure

No.	Designation	Function
1	Button **Confirm cancel bake-out procedure**	■ Cancels the bake-out procedure.

▶ To fully cancel the button bake-out procedure, press the button Confirm cancel bake-out procedure (fig. 40, no. 1).

➡ The bake-out procedure is fully cancelled and cool-down begins.

➡ Actions and interventions in the cool-down process are no longer possible, i.e. you now have to wait until the cool-down time (always one hour) is over (cf. fig. 41).
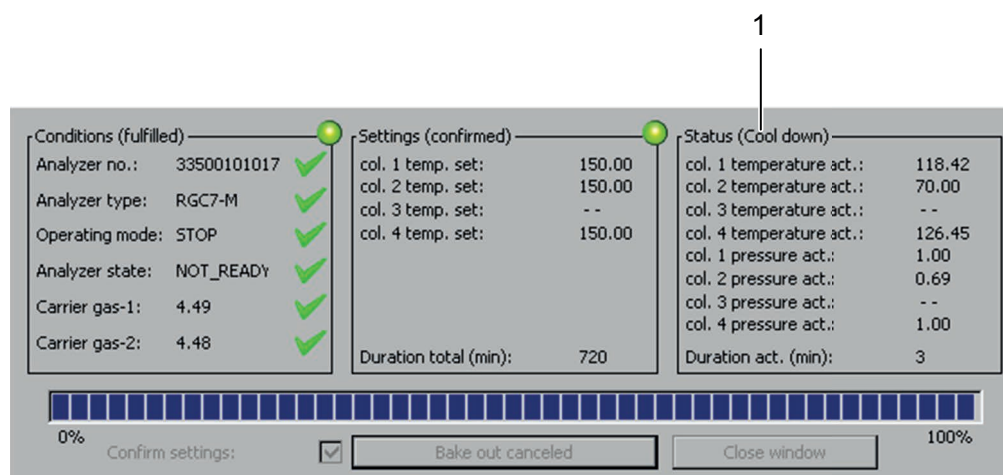
Fig. 41:   Menu Bake-out – Cool-down process

No.	Designation	Function
1	Status display	■ Shows the status of the bake-out proce-dure, in this case 'cool down'.

▶ Once cool-down is complete (cf. fig. 42, no. 1), the menu can be exited by pressing the Exit window button (fig. 42, no. 2). This is the same regardless of whether the bake-out procedure was cancelled prematurely or completed in full.
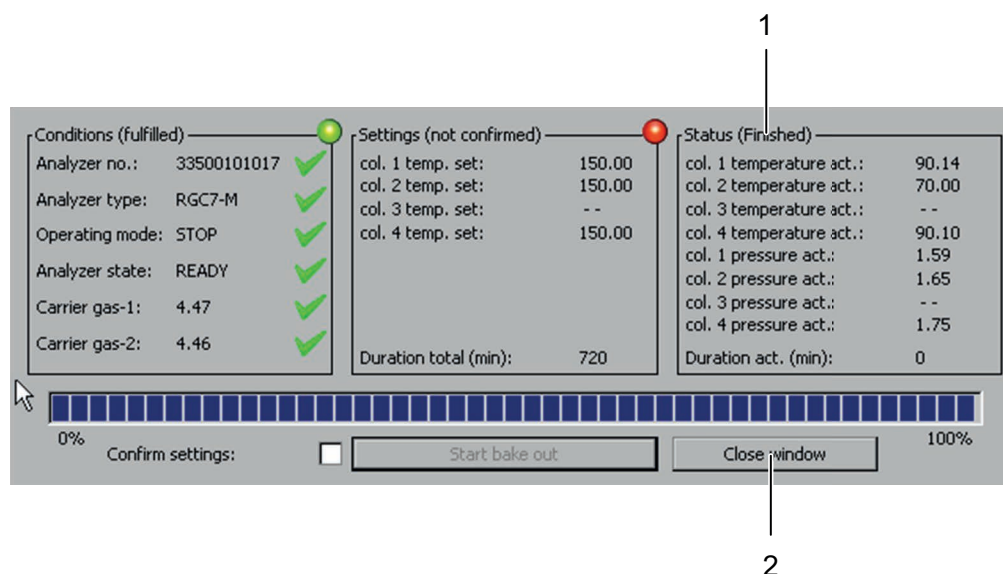
Fig. 42:   Menu Bake-out – Cool-down process complete

■ All actions of the bake-out procedure are written to the event log, but the timestamps do not correspond to a real sequence of events.

9 Operation

Once the RGC 7-C is in operation, it runs continuously.

To ensure smooth operation, observe the following instructions:

▶ Read this operating manual carefully to avoid incorrect operation and only use the RGC 7-C in accordance with its intended use (see section 2.1 "Intended use").

▶ Only operate the RGC 7-C within the power limits specified in the technical data (see section 13 "Technical data") and ensure that they are not exceeded.

▶ Protect the device from heat sources (e.g. direct sunlight).

▶ If a device is damaged or unsafe, it must be removed from circulation immediately and labelled accordingly to prevent it from being used accidentally.

▶ Ensure that the defective device is only repaired by RMG Messtechnik GmbH.

9.1 Operating modes

The RGC 7-C constitutes the controller of the process gas chromatograph RGC 7 and controls the analysis workflow in the measuring unit RGC 7-M. Accordingly, it can be used to select the operating modes explained in the following sections for the gas chromatograph.

For a detailed description of how to select the operating modes in the user interface, please refer to section 7.8.1 "Level 01 RGC 7-C mode".

When a new operating mode is selected, the analysis or calibration that is currently in progress is completed before the new operating mode is switched to.

9.1.1 Operating mode AUTORUN

The operating mode **AUTORUN** represents normal operation of the measuring unit, with analysis performed automatically. This involves cyclical sampling and analysis of the measurement gas. The analysis process is only interrupted by automatic calibration.

If the calibration is not successful, a second calibration is then performed. If this calibration is also not successful, AUTORUN mode is stopped automatically.

9.1.2 Operating mode STOP

The operating mode **STOP** can be activated to interrupt analysis mode. This means that the measurements are not displayed, evaluated, corrected or archived. Instead, only the status information of the process gas chromatograph RGC 7-M is read and output.

9.1.3 Operating mode BASIC CALIB.

The operating mode **BASIC CALIB.** is used for basic calibration during initial start-up or by RMG Service. Basic calibration must not be performed during normal analysis operation.

If a basic calibration has been initiated, the determined calibration values will be stored in the RGC 7-C along with the retention times as basic calibration factors.

Once the basic calibration is complete, AUTORUN operating mode is switched back to automatically.

9.1.4 Operating mode NORMAL CALIB.

The operating mode **NORMAL CALIB.** is used for manual calibration and can be started at any time. A manual calibration is equivalent to an automatic calibration.

During manual calibration, the valves are switched to the calibration gas inlet. The calibration cycle is then carried out. The cycle can take up to 10 minutes, depending on how many calibration runs have been set.

Once it is complete, the valves are switched back to the measurement inlet in order to automatically continue an ongoing analysis of the measurement gas in AUTORUN mode.

The time of the next automatic calibration is not affected by carrying out a manual calibration.

9.1.5 Operating mode Ref. gas

The operating mode **Ref. gas** (reference gas) is used to carry out test gas analysis / reference gas analysis. The valves are switched to the test gas / reference gas inlet and a continuous analysis measurement of the ref. gas is carried out.

The RGC 7-M remains in this mode until it is switched again or a specified maximum number of reference gas analyses have been performed. The operating mode AUTORUN is then switched back to automatically.

9.2 Saving data

For storage of the analysis results, the RGC 7-C has two types of archive:

- Measurement archive for individual analyses/hour/day/month averages
- Archive groups to DSfG standard

It should be noted that DSfG archives are not necessarily officially recognised by the Weights and Measures Office.

9.2.1 Measurement archive

The structure and the storage depth of the measurement archive are described below.

Archive no.	Archive designation	Number of entries
1	Event logbook	1,000
2	Parameter logbook	1,000
3	Archive, individual analyses	1,054,080
4	Archive, hourly averages	17,568
5	Archive, daily averages	186
6	Archive, monthly averages	120
7	Archive, calibration events	14,640

Table 21: Storage depth of the archives

Entry	Event logbook	Parameter logbook	Individual analyses	Hour averages	Day averages	Month averages	Calibration results
Date, time	X	X	X	X	X	X	X
Event (text)	X						
Parameter name (macro)		X					
Parameter – old value		X					
Parameter – new value		X					
Number of analyses per entry			X	X	X	X	
Number of valid analyses			X	X	X	X	
Stream, gas type			X	X	X	X	
Calorific value (Hs, n)			X	X	X	X	X
Wobbe index, upper (Ws, n)			X	X	X	X	X
Standard density (rho, n)			X	X	X	X	X
Density ratio (Dv)			X	X	X	X	X
Heating value (Hi, n)			X	X	X	X	X
Wobbe index, lower (Wi, n)							X
Real gas factor Zn			X	X	X	X	X
Methane number MZ			X	X	X	X	X
Non-standardised total			X	X	X	X	X
Molar percentages of the individual components (20)			X	X	X	X	X
User values (20)			X	X	X	X	
Peak areas (20)							X
Retention times (20)							X

Table 22: Entries in the individual archives

Entry	Event logbook	Parameter logbook	Individual analyses	Hour averages	Day averages	Month averages	Calibration results
Retention times of the basic calibration							X
Response factors							X
Response factors for the basic calibration							X
Time peak start (20)							X
Time peak end (20)							X
Total area							X

Table 22:   Entries in the individual archives

9.2.2   DSfG archive

The DSfG archive is split up into archive groups 1 to 23.

Archive group	Designation	Entry	Number of entries
1	Hour average 1	Hs, n; rho, n; Dv; N_2; CO_2; H_2; Hi, n; Ws, n; Wi, n; MZ; Zn; bit string	2280
3	Measured values	Hs, n; rho, n; bit string	960
5	Hour average 2	Hs, n; rho, n; bit string	2280
7	Day average	Hs, n; rho, n; bit string	95
9	Month averages	Hs, n; rho, n; bit string	24
11	Calibration gas	Calibration results: ΔHs, n; Δrho, n; ΔCO_2; RFs; cal. status	200
13	Reference gas	Hs, n; rho, n; components; bit string; Hi, n	700
15	Long-term archive	Hs, n; rho, n; CO_2; bit string	70848
17	Analogue averages	Analogue values 1 to 16; status bit string	2280
19	Extended hour averages	Hi, n; Ws, n; Wi, n; MZ; Zn; non-stand. total; components	2280
21	Reference gas	Hs, n; rho, n; CO_2; bit string	700
23	Logbook	Event; Hs, n; rho, n	2280

Table 23:   Archive groups of the DSfG standard archive

9.3   Signature

If the recorded data and measured values are to be sent via DSfG-B, the RGC 7-C offers the option of attaching a signature to this data.

The signature does not constitute any form of encryption, but does make it possible to determine whether the transferred data originate from a 'safe' source and whether the data volume has been manipulated.

The following figures and explanations illustrate the difference between 'normal data transfer' and 'data transfer with signature'.

Normal data transfer

Transmitter   Receiver

RGC 7-C
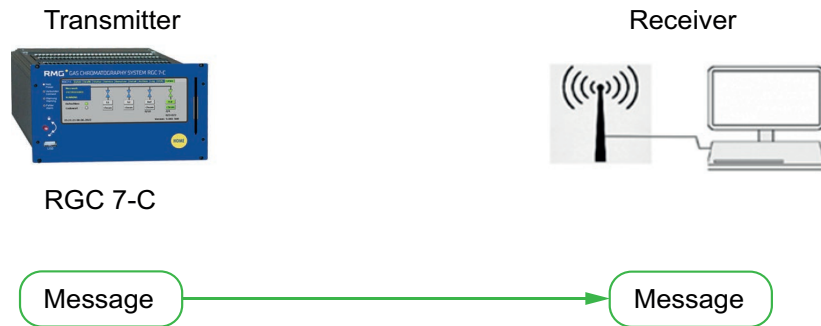
Fig. 43:   Normal data transfer

In 'normal data transfer', the data are sent to a recipient by a sender. The recipient can then process the data as desired. The sender does not need to prove they are trustworthy and potential data manipulation cannot be checked/detected.

Data transfer with signature

In 'data transfer with signature' the process is somewhat more extensive. In general, a distinction is made between three processes:

Transmitter   Receiver
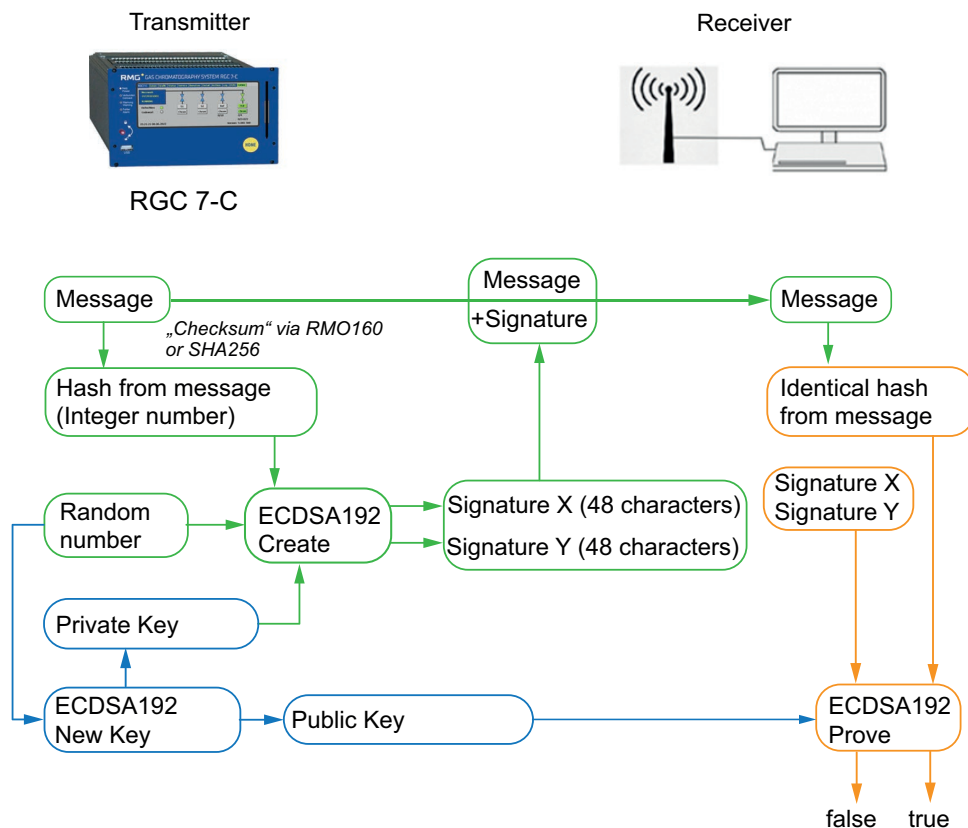
RGC 7-C

Fig. 44:   Data transfer with signature

1. A program ECDSA192 (**E**lliptic **C**urve **D**igital **S**ignature **A**lgorithm) in the RGC 7-C is supplied with a random number and then generates two keys, a 'private key' and a 'public key'. These keys are each made up of two parts, signature X and signature Y. Each signature is made up of 48 hexadecimal characters (4 x 48 = 192, which explains the name ECDSA192).

   The 'private key' is stored in the RGC 7-C internally, where it cannot be accessed.

NOTE

Readability of the private key

When the RGC 7-C is in a sealed state, i.e. when the user lock is closed, this key cannot be read or altered!

The 'public key' can be read fully in the user interface in the menu **18. DSfG – 03 Signature**, for example:

- 18.03.06 Public Key Qx1 (first 20 characters),
- 18.03.07 Public Key Qx2 (second 20 characters),
- 18.03.08 Public Key Qx3 (last 8 characters), and
- 18.03.09 Public Key Qy1 (first 20 characters),
- 18.03.10 Public Key Qy2 (second 20 characters),
- 18.03.11 Public Key Qy3 (last 8 characters)

The recipient needs this 'public key' to identify the data.

2. A hash is generated from the data of the message (with the singing method RMD160 or SHA256). This hash is incorporated into process 2 as an integer. Together with the 'private key' and a random number, the signature (made up of the parts signature X and signature Y) is calculated that is attached to the message.

3. The recipient receives the message and the signature. The recipient is able to calculate the same hash from the message. Together with the signature and the 'public key', the recipient can then verify whether the data is unchanged and whether it originates from a 'reliable source', i.e. a trustworthy sender.

The signature is activated and the signing method is selected in the user interface in the **Detail** menu. This is described in more detail in section 7.8.16 "Level 18 DSfG".

10   Maintenance and regular checks

> **⚠ DANGER**
>
> **Danger of death arising from electrical voltage**
>
> Before servicing, maintenance and cleaning work, it is essential to switch off the device and disconnect it from the mains power supply. Failing to do so may lead to extremely severe injury or death.
>
> ▶ Before any work is commenced, switch of the device's power supply and disconnect it from the mains.
>
> ▶ Only carry out work on the device as described in this manual. Ensure that the device is not live while the work is being performed.

> **⚠ DANGER**
>
> **Danger of death arising from the device being damaged during maintenance and cleaning work**
>
> If the device is damaged because unsuitable tools were used or because cleaning was performed incorrectly, this may result in danger of death.
>
> ▶ Only use suitable tools to prevent damage to components.
>
> ▶ Only clean the device with a slightly damp cloth to avoid static charging of the housing.

> **⚠ DANGER**
>
> **Danger of death arising from operating a defective device**
>
> If a defective, damaged or unsafe device is used after servicing, maintenance and cleaning work, this may result in danger of death.
>
> ▶ If a device is damaged or unsafe, it must be removed from circulation immediately and labelled accordingly to prevent it from being used accidentally.
>
> ▶ Ensure that the defective device is only repaired by RMG Messtechnik GmbH.

> **NOTE**
>
> **Maintenance and repair work**
>
> In the case of normal use of the RGC 7-C, the device does not require regular maintenance.
>
> ▶ For more information, please contact RMG.
>
> ▶ Only have repairs performed by RMG, in order to avoid voiding guarantee claims as the result of incorrect repair work.

Reading values for maintenance book entry of the measuring unit RGC 7-M

In conjunction with the measuring unit RGC 7-M, the following various values are to be read off from the RGC 7-C and entered in a separate maintenance book:

- Carrier gas pressure
- Measurement gas pressure
- Column temperature (optional)
- Column pressure (optional)

To read off the values, proceed as follows:

▶ Navigate to the menu **Status** and read off the required values there.

Alternatively, the menu **Status** can be opened by pressing the **Measuring unit** button (fig. 10, no. 9) in the **RGC 7-C** menu (cf. also section 7.5 "Menu Status").

Additionally, you can also find the individual values in the Detail menu in the corresponding levels. Do this as follows:

▶ Navigate to the menu **Detail**.

▶ In the **Selection** field, select the level **14.08 Measuring unit – analysis gas pressure**.

➡ The measurement gas pressure is displayed in the **first line** in the field **Parameter change**.

▶ In the **Selection** field, select the level **14.09 Measuring unit – carrier gas**.

➡ The carrier gas is displayed in the **first line** in the field **Parameter change**.

▶ In the **Selection** field, select the level **14.03 Measuring unit – column 1**.

➡ The pressure and temperature for column 1 are displayed in the field **Parameter change**.

▶ The values for the remaining columns are provided in levels **14.04** to **14.06**.

11 Potential errors and repairs

11.1 Error messages

The error messages are categorised as follows:

- E – alarms (error): Official calibration measurement error
- W – warnings: Error relating to non-official-calibration functions
- H – information: Messages without errors

Some messages are listed as alarms and warnings. The corresponding limits can be set as desired by means of the code number for warnings and only by means of the user lock for alarms.

Error no.	Type	DSfG no.	Error text	Explanation
1	E	7001	Config file incorrect	Conflict in parameter/software assignment
2	E	7002	Load signature key	Signature key is being loaded
3	E	424	A/D converter range	Collective message A/D converter for current inputs 1 to
8	E	407	Restart RGC 7-C	Intermediate grid failure
9	E	407	Restart RGC 7-C (Bios)	Bios triggered an automatic restart
10	E	7010	Broken cable T1	Broken cable, room temperature measurement
11	E	7011	Broken cable T2	Broken cable, second temperature measurement
12	E	7012	Temp. 1 alarm limits	Error in room temperature measurement
13	E	7013	Temp. 2 alarm limits	Error in second temperature measurement
14	E	621	Current outp. 1 alarm limits	Current output 1: measured value beyond limits
15	E	622	Current outp. 2 alarm limits	Current output 2: measured value beyond limits
16	E	623	Current outp. 3 alarm limits	Current output 3: measured value beyond limits
17	E	624	Current outp. 4 alarm limits	Current output 4: measured value beyond limits
20	E	7020	ISO conditions	Input variables for ISO 6976 outside of permitted limits
21	E	7021	GPA conditions	Input var. for GPA 2172-96 outside of permitted limits
30	E	7030	Nitrogen min/max	Ana. & cal.: Nitrogen outside of user limits
31	E	7031	Methane min/max	Ana. & cal.: Methane outside of user limits
32	E	7032	Carbon dioxide min/max	Ana. & cal.: Carbon dioxide outside of user limits
33	E	7033	Ethane min/max	Ana. & cal.: Ethane outside of user limits
34	E	7034	Propane min/max	Ana. & cal.: Propane outside of user limits
35	E	7035	iso-Butane min/max	Ana. & cal.: iso-butane outside of user limits
36	E	7036	n-Butane min/max	Ana. & cal.: n-butane outside of user limits
37	E	7037	neo-Pentane min/max	Ana. & cal.: neo-pentane outside of user limits
38	E	7038	iso-Pentane min/max	Ana. & cal.: iso-pentane outside of user limits
39	E	7039	n-Pentane min/max	Ana. & cal.: n-pentane outside of user limits
40	E	7040	C6+ min/max	Ana. & cal.: C6+ outside of user limits
41	E	7041	n-Hexane min/max	Ana. & cal.: n-hexane outside of user limits

Table 24: List of error messages

Error no.	Type	DSfG no.	Error text	Explanation
42	E	7042	n-Heptane min/max	Ana. & cal.: n-heptane outside of user limits
43	E	7043	n-Octane min/max	Ana. & cal.: n-octane outside of user limits
44	E	7044	n-Nonane min/max	Ana. & cal.: n-nonane outside of user limits
45	E	7045	Oxygen min/max	Ana. & cal.: Oxygen outside of user limits
46	E	7046	Helium min/max	Ana. & cal.: Helium outside of user limits
47	E	7047	Hydrogen min/max	Ana. & cal.: Hydrogen outside of user limits
48	E	7048	Argon min/max	Ana. & cal.: Argon outside of user limits
49	E	7049	Reserve min/max	(reserve for future functions)
50	E	7050	Measuring unit timeout	Connection to measuring unit interrupted
51	E	7051	MAC LAN2 is default	MAC address for LAN2 port not set
52	E	7052	Measurement time max.	Specified maximum analysis duration exceeded
53	E	7053	Incorrect measuring unit no.	Incorrect measuring unit connected
60	E	7060	Wago AO1 alarm limits	Alarm limits for Wago analogue output 1 breached
61	E	7061	Wago AO2 alarm limits	Alarm limits for Wago analogue output 2 breached
62	E	7062	Wago AO3 alarm limits	Alarm limits for Wago analogue output 3 breached
63	E	7063	Wago AO4 alarm limits	Alarm limits for Wago analogue output 4 breached
64	E	7064	Wago AO5 alarm limits	Alarm limits for Wago analogue output 5 breached
65	E	7065	Wago AO6 alarm limits	Alarm limits for Wago analogue output 6 breached
66	E	7066	Wago AO7 alarm limits	Alarm limits for Wago analogue output 7 breached
67	E	7067	Wago AO8 alarm limits	Alarm limits for Wago analogue output 8 breached
68	E	7068	Wago AO9 alarm limits	Alarm limits for Wago analogue output 9 breached
69	E	7069	Wago AO10 alarm limits	Alarm limits for Wago analogue output 10 breached
70	E	7070	Wago AO11 alarm limits	Alarm limits for Wago analogue output 11 breached
71	E	7071	Wago AO12 alarm limits	Alarm limits for Wago analogue output 12 breached
72	E	7072	Wago AO13 alarm limits	Alarm limits for Wago analogue output 13 breached
73	E	7073	Wago AO14 alarm limits	Alarm limits for Wago analogue output 14 breached
74	E	7074	Wago AO15 alarm limits	Alarm limits for Wago analogue output 15 breached
75	E	7075	Wago AO16 alarm limits	Alarm limits for Wago analogue output 16 breached
80	E	7080	Nitrogen §min/max	Analysis: Nitrogen percentage outside of permitted limits
81	E	7081	Methane §min/max	Analysis: Methane percentage outside of permitted limits
82	E	7082	Carbon dioxide §min/max	Analysis: CO_2 percentage outside of permitted limits
83	E	7083	Ethane §min/max	Analysis: Ethane percentage outside of permitted limits
84	E	7084	Propane §min/max	Analysis: Propane percentage outside of permitted limits
85	E	7085	iso-Butane §min/max	Analysis: i-butane percentage outside of permitted limits
86	E	7086	n-Butane §min/max	Analysis: n-butane percentage outside of permitted limits
87	E	7087	neo-Pentane §min/max	Analysis: Neopentane percentage outside of permitted limits

Table 24: List of error messages

Error no.	Type	DSfG no.	Error text	Explanation
88	E	7088	iso-Pentane §min/max	Analysis: i-pentane percentage outside of permitted limits
89	E	7089	n-Pentane §min/max	Analysis: n-pentane percentage outside of permitted limits
90	E	7090	C6+ §min/max	Analysis: C6+ percentage outside of permitted limits
91	E	7091	n-Hexane §min/max	Analysis: n-hexane percentage outside of permitted limits
92	E	7092	n-Heptane §min/max	Analysis: n-heptane percentage outside of permitted limits
93	E	7093	n-Octane §min/max	Analysis: n-octane percentage outside of permitted limits
94	E	7094	n-Nonane §min/max	Analysis: n-nonane percentage outside of permitted limits
95	E	7095	Oxygen §min/max	Analysis: Oxygen percentage outside of permitted limits
96	E	7096	Helium §min/max	Analysis: Helium percentage outside of permitted limits
97	E	7097	Hydrogen §min/max	Analysis: Hydrogen percentage outside of permitted limits
98	E	7098	Argon §min/max	Analysis: Argon percentage outside of permitted limits
99	E	7099	Reserve §min/max	(reserve for future functions)
100	E	609	Cal: Retention time	Calibration: at least one retention time outside of permitted limits
101	E	610	Response factor	Calibration: at least response factor outside of permitted limits
102	E	608	Cal: non-stand. tot.	Calibration: non-standardised total outside of permitted limits
103	E	7103	Cal: Total area	Calibration: Total area outside of permitted limits
104	E	7104	Cal: Concentration	Calibration: Collective message for limit breach of components
105	E	7105	Cal: Hs,n limit	Calibration: Calorific value outside of permitted limits
106	E	7106	Cal: Rhon limit	Calibration: Standard density outside of permitted limits
107	E	7107	Cal: CO2 limit	Calibration: CO2 percentage outside of permitted limits
120	E	7120	Ana: Retention time	Analysis: at least one retention time outside of permitted limits
121	E	7121	Ana: non-stand. tot.	Analysis: non-standardised total outside of permitted limits
122	E	7122	Ana: Concentration	Analysis: Collective message for limit breach of components
123	E	7123	Ana: Hs,n min/max	Analysis: Calorific value outside of permitted limits
124	E	7124	Ana: Ws,n min/max	Analysis: Wobbe index outside of permitted limits
125	E	7125	Ana: Mz min/max	Analysis: Methane number outside of permitted limits
126	E	7126	Ana: DV min/max	Analysis: Density ratio outside of permitted limits
127	E	7127	Ana: Rho,n min/max	Analysis: Standard density outside of permitted limits
130	E	7130	Measurement gas pressure during injection	Measurement gas pressure outside of permitted limits
131	E	7131	Carrier gas pressure - I	Carrier gas pressure 1 (helium) outside of permitted limits

Table 24: List of error messages

Error no.	Type	DSfG no.	Error text	Explanation
132	E	7132	Carrier gas pressure - II	Carrier gas pressure 2 (argon) outside of permitted limits
133	E	7133	No analysis start	Analysis not started because of measurement gas pressure error
134	E	7134	Max carrier gas pressure I	Pressure of first carrier gas too high
135	E	7135	Max carrier gas pressure II	Pressure of second carrier gas too high
149	E	7149	Method not found	Method file could not be opened (only GC9390)
150	W	7150	Cal: Concentration	Calibration: Collective message for limit breach of components
151	W	7151	Ana: Concentration	Analysis: Collective message for limit breach of components
152	W	7152	Temp. 1 warning limits	Error in room temperature measurement
153	W	7153	Temp. 2 warning limits	(reserve for future functions)
154	W	7154	Current outp. 1 warning limits	Current output 1: measured value beyond limits
155	W	7155	Current outp. 2 warning limits	Current output 2: measured value beyond limits
156	W	7156	Current outp. 3 warning limits	Current output 3: measured value beyond limits
157	W	7157	Current outp. 4 warning limits	Current output 4: measured value beyond limits
158	W	7158	#DiWarnText_0	Warning message for digital input 1, text programmable
159	W	7159	#DiWarnText_1	Warning message for digital input 2, text programmable
160	W	7160	#DiWarnText_2	Warning message for digital input 3, text programmable
161	W	7161	#DiWarnText_3	Warning message for digital input 4, text programmable
162	W	7162	#DiWarnText_4	Warning message for digital input 5, text programmable
163	W	7163	#DiWarnText_5	Warning message for digital input 6, text programmable
164	W	7164	#DiWarnText_6	Warning message for digital input 7, text programmable
165	W	7165	#DiWarnText_7	Warning message for digital input 8, text programmable
166	W	7166	#DiWarnText_8	Warning message for digital input 9, text programmable
167	W	7167	#DiWarnText_9	Warning message for digital input 10, text programmable
168	W	7168	#DiWarnText_10	Warning message for digital input 11, text programmable
169	W	7169	#DiWarnText_11	Warning message for digital input 12, text programmable
170	W	7170	#DiWarnText_12	Warning message for digital input 13, text programmable
171	W	7171	#DiWarnText_13	Warning message for digital input 14, text programmable
172	W	7172	#DiWarnText_14	Warning message for digital input 15, text programmable
173	W	7173	#DiWarnText_15	Warning message for digital input 16, text programmable
174	W	7174	#DiWarnText_16	Warning message for digital input 17, text programmable
175	W	7175	#DiWarnText_17	Warning message for digital input 18, text programmable

Table 24: List of error messages

Error no.	Type	DSfG no.	Error text	Explanation
176	W	7176	#DiWarnText_18	Warning message for digital input 19, text programmable
177	W	7177	#DiWarnText_19	Warning message for digital input 20, text programmable
179	W	-	Limit H2S total	Hydrogen sulphide value (AI) above permitted limit
180	W	7180	Nitrogen §min/max	Analysis: Nitrogen percentage outside of permitted limits
181	W	7181	Methane §min/max	Analysis: Methane percentage outside of permitted limits
182	W	7182	Carbon dioxide §min/max	Analysis: CO2 percentage outside of permitted limits
183	W	7183	Ethane §min/max	Analysis: Ethane percentage outside of permitted limits
184	W	7184	Propane §min/max	Analysis: Propane percentage outside of permitted limits
185	W	7185	iso-Butane §min/max	Analysis: i-butane percentage outside of permitted limits
186	W	7186	n-Butane §min/max	Analysis: n-butane percentage outside of permitted limits
187	W	7187	neo-Pentane §min/max	Analysis: Neopentane percentage outside of permitted limits
188	W	7188	iso-Pentane §min/max	Analysis: i-pentane percentage outside of permitted limits
189	W	7189	n-Pentane §min/max	Analysis: n-pentane percentage outside of permitted limits
190	W	7190	C6+ §min/max	Analysis: C6+ percentage outside of permitted limits
191	W	7191	n-Hexane §min/max	Analysis: n-hexane percentage outside of permitted limits
192	W	7192	n-Heptane §min/max	Analysis: n-heptane percentage outside of permitted limits
193	W	7193	n-Octane §min/max	Analysis: n-octane percentage outside of permitted limits
194	W	7194	n-Nonane §min/max	Analysis: n-nonane percentage outside of permitted limits
195	W	7195	Oxygen §min/max	Analysis: Oxygen percentage outside of permitted limits
196	W	7196	Helium §min/max	Analysis: Helium percentage outside of permitted limits
197	W	7197	Hydrogen §min/max	Analysis: Hydrogen percentage outside of permitted limits
198	W	7198	Argon §min/max	Analysis: Argon percentage outside of permitted limits
199	W	7199	Reserve §min/max	(reserve for future functions)
200	W	7200	Pressure of measuring gas	Measurement gas pressure outside of permitted limits
201	W	7201	Measuring unit timeout	Measuring unit not responding
203	W	7203	Too many peaks	Chromatogram contains too many peaks
204	W	7204	Wago AO1 warning limits	Warning limits for Wago analogue output 1 breached
205	W	7205	Wago AO2 warning limits	Warning limits for Wago analogue output 2 breached
206	W	7206	Wago AO3 warning limits	Warning limits for Wago analogue output 3 breached
207	W	7207	Wago AO4 warning limits	Warning limits for Wago analogue output 4 breached

Table 24: List of error messages

Error no.	Type	DSfG no.	Error text	Explanation
208	W	7208	Wago AO5 warning limits	Warning limits for Wago analogue output 5 breached
209	W	7209	Wago AO6 warning limits	Warning limits for Wago analogue output 6 breached
210	W	7210	Wago AO7 warning limits	Warning limits for Wago analogue output 7 breached
211	W	7211	Wago AO8 warning limits	Warning limits for Wago analogue output 8 breached
212	W	7212	Wago AO9 warning limits	Warning limits for Wago analogue output 9 breached
213	W	7213	Wago AO10 warning limits	Warning limits for Wago analogue output 10 breached
214	W	7214	Wago AO11 warning limits	Warning limits for Wago analogue output 11 breached
215	W	7215	Wago AO12 warning limits	Warning limits for Wago analogue output 12 breached
216	W	7216	Wago AO13 warning limits	Warning limits for Wago analogue output 13 breached
217	W	7217	Wago AO14 warning limits	Warning limits for Wago analogue output 14 breached
218	W	7218	Wago AO15 warning limits	Warning limits for Wago analogue output 15 breached
219	W	7219	Wago AO16 warning limits	Warning limits for Wago analogue output 16 breached
220	H	7220	MN input values	Input values for methane number calculation faulty
221	H	7221	Valves fixed	Mode with fixed valves (Service only) is set
222	H	-	Test mode	PGC is running in test mode! Not official calibration mode!
223	H	7223	Cal: Default values	Total of components in calibration gas not 100%
224	H	7224	Printer not ready	Printer is not ready
225	H	7225	EVars CRC	New checksum (CRC) for official calibration parameters
227	H	7227	Test mode dig. outputs	Test mode for digital outputs is active
228	H	7228	Comparison values Ferro(CRC)	Monitoring of the calibration values for inputs and outputs
229	H	7229	Comparison values Ferro(Ver)	Monitoring of the version number for the structure of inputs and outputs
230	H	800	Calibration lock	Calibration lock open
231	H	801	Code word	Code word entered
232	H	810	Old time	Last DSfG time before change
233	H	811	New time	First DSfG time after change
234	H	802	Inspection	Calibration or reference gas is being measured
235	H	7235	Write Simufile	Simulation files are written to SD card
236	H	7236	Official calibration start-up!	An official calibration initial start-up is in progress
237	H	7237	GQM ext. test gas	Gas quality measurement, external test gas
238	H	7238	Waiting time until start	Waiting time until measurement starts
240	H	7240	Multi-level import OK	Import of multi-level coefficients successful
241	H	7241	Multi-level import not OK	Import of multi-level coefficients not successful
242	H	7242	Measuring unit initialising	Measuring unit initialising
243	H	7243	Measuring unit flushing	Measuring unit is being flushed
247	H	760	Measuring unit calibrating	Measuring unit is being calibrated
250	H	7250	Chromatogram (FTP)	Message/error on fetching chromatogram from measuring unit
251	H	7251	FlushChromatogram (FTP)	Message/error on fetching the first chromatogram after flushing

Table 24: List of error messages

Error no.	Type	DSfG no.	Error text	Explanation
252	H	7252	Write chrom	Message/error on writing the chromatogram to the SD card
253	H	7253	Write FlushChrom	Message/error on writing first chromatogram after flushing to SD card
260	H	7260	Bake-out	Bake-out in progress
261	H	7261	Cool down	Cooling down after bake-out
262	H	7262	Equilibration	Time after bake-out until measuring unit once again stable
263	H	7263	MU set meas. meth. not OK	Setting of measuring method para. in measuring unit after bake-out failed
264	H	7264	MU set meas. meth. OK	Setting of measuring method para. in measuring unit after bake-out successful
270	H	7270	Parameter log deactivated	No logging of parameter changes
271	H	-	Time old	Old time (after adjustment of time)
272	H	-	Time new	New time (after adjustment of time)
300	W	7300	Current inp. 1 warning limits	Warning limits for current input 1 breached
301	W	7301	Current inp. 2 warning limits	Warning limits for current input 2 breached
302	W	7302	Current inp. 3 warning limits	Warning limits for current input 3 breached
303	W	7303	Current inp. 4 warning limits	Warning limits for current input 4 breached
304	W	7304	Current inp. 5 warning limits	Warning limits for current input 5 breached
305	W	7305	Current inp. 6 warning limits	Warning limits for current input 6 breached
306	W	7306	Current inp. 7 warning limits	Warning limits for current input 7 breached
307	W	7307	Current inp. 8 warning limits	Warning limits for current input 8 breached
308	W	7308	Cancel bake-out -> set meas. meth.	Bake-out of the columns is cancelled and measuring method is loaded
310	W	7310	Wago AI1 warning limits	Warning limits for Wago analogue input 1 breached
311	W	7311	Wago AI2 warning limits	Warning limits for Wago analogue input 2 breached
312	W	7312	Wago AI3 warning limits	Warning limits for Wago analogue input 3 breached
313	W	7313	Wago AI4 warning limits	Warning limits for Wago analogue input 4 breached
314	W	7314	Wago AI5 warning limits	Warning limits for Wago analogue input 5 breached
315	W	7315	Wago AI6 warning limits	Warning limits for Wago analogue input 6 breached
316	W	7316	Wago AI7 warning limits	Warning limits for Wago analogue input 7 breached
317	W	7317	Wago AI8 warning limits	Warning limits for Wago analogue input 8 breached
318	W	7318	Wago AI9 warning limits	Warning limits for Wago analogue input 9 breached
319	W	7319	Wago AI10 warning limits	Warning limits for Wago analogue input 10 breached
320	W	7320	Wago AI11 warning limits	Warning limits for Wago analogue input 11 breached
321	W	7321	Wago AI12 warning limits	Warning limits for Wago analogue input 12 breached
322	W	7322	Wago AI13 warning limits	Warning limits for Wago analogue input 13 breached
323	W	7323	Wago AI14 warning limits	Warning limits for Wago analogue input 14 breached
324	W	7324	Wago AI15 warning limits	Warning limits for Wago analogue input 15 breached
325	W	7325	Wago AI16 warning limits	Warning limits for Wago analogue input 16 breached
330	W	7330	Multi-stream parameters	Error in multi-stream parameterisation
331	W	7331	Read DIL switch	Reading of DIL switch settings failed

Table 24: List of error messages

Error no.	Type	DSfG no.	Error text	Explanation
332	W	7332	Explorer running!	Windows explorer is active
333	W	7333	Save display cal.	Calibration of touchscreen not saved
334	W	7334	Software restart MW	Measuring unit restarted by analysis computer
335	W	7335	CP data	No measurement data received by measuring unit
340	W	7340	Nitrogen min/max	Ana. & cal.: Nitrogen outside of user limits
341	W	7341	Methane min/max	Ana. & cal.: Methane outside of user limits
342	W	7342	Carbon dioxide min/max	Ana. & cal.: Carbon dioxide outside of user limits
343	W	7343	Ethane min/max	Ana. & cal.: Ethane outside of user limits
344	W	7344	Propane min/max	Ana. & cal.: Propane outside of user limits
345	W	7345	iso-Butane min/max	Ana. & cal.: iso-butane outside of user limits
346	W	7346	n-Butane min/max	Ana. & cal.: n-butane outside of user limits
347	W	7347	neo-Pentane min/max	Ana. & cal.: neo-pentane outside of user limits
348	W	7348	iso-Pentane min/max	Ana. & cal.: iso-pentane outside of user limits
349	W	7349	n-Pentane min/max	Ana. & cal.: n-pentane outside of user limits
350	W	7350	C6+ min/max	Ana. & cal.: C6+ outside of user limits
351	W	7351	n-Hexane min/max	Ana. & cal.: n-hexane outside of user limits
352	W	7352	n-Heptane min/max	Ana. & cal.: n-heptane outside of user limits
353	W	7353	n-Octane min/max	Ana. & cal.: n-octane outside of user limits
354	W	7354	n-Nonane min/max	Ana. & cal.: n-nonane outside of user limits
355	W	7355	Oxygen min/max	Ana. & cal.: Oxygen outside of user limits
356	W	7356	Helium min/max	Ana. & cal.: Helium outside of user limits
357	W	7357	Hydrogen min/max	Ana. & cal.: Hydrogen outside of user limits
358	W	7358	Argon min/max	Ana. & cal.: Argon outside of user limits
359	W	7359	Reserve min/max	(reserve for future functions)
368	W	7368	Wago DI1 active	Wago digital output 1 active
369	W	7369	Wago DI2 active	Wago digital output 2 active
370	W	7370	Wago DI3 active	Wago digital output 3 active
371	W	7371	Wago DI4 active	Wago digital output 4 active
372	W	7372	Wago DI5 active	Wago digital output 5 active
373	W	7373	Wago DI6 active	Wago digital output 6 active
374	W	7374	Wago DI7 active	Wago digital output 7 active
375	W	7375	Wago DI8 active	Wago digital output 8 active
376	W	7376	Wago DI9 active	Wago digital output 9 active
377	W	7377	Wago DI10 active	Wago digital output 10 active
378	W	7378	Wago DI11 active	Wago digital output 11 active
379	W	7379	Wago DI12 active	Wago digital output 12 active
380	W	7380	Wago DI13 active	Wago digital output 13 active
381	W	7381	Wago DI14 active	Wago digital output 14 active
382	W	7382	Wago DI15 active	Wago digital output 15 active
383	W	7383	Wago DI16 active	Wago digital output 16 active
384	W	7384	Cal: Retention time warning limits	Cal.: Retention time outside of limit

Table 24: List of error messages

Error no.	Type	DSfG no.	Error text	Explanation
577	H	7577	Device restart required! (Registry)	Device needs to be restarted

Table 24: List of error messages

11.2 Repairs

For spare parts and repairs, please contact our 'Repairs & Spares' department at:

Phone: +49 6033 897–897

Email: repairs-spares@rmg.com

12   Dismantling and disposal

⚠ DANGER

Danger of death arising from electrical voltage

Before dismantling work, it is essential to switch off the device or disconnect it from the mains power supply. Failing to do so may lead to extremely severe injury or death.

▶ Before any work is commenced, switch of the device's power supply or disconnect it from the mains.

▶ Only carry out work on the device as described in this manual. Ensure that the device is not live while the work is being performed.

12.1   Dismantling

To dismantle the Gas analysis controller RGC 7-C, please proceed as follows:

1. Remove all data saved on the device by erasing all archives. To do this, navigate to menu 12. Factory settings. If you have the corresponding access rights, you can then erase the archive and reset the counters.
2. De-energise the device.
3. Loosen the device's fastening screws and carefully pull it forwards out of the rack.
4. Disconnect the connection cables.
5. Remove the device from the switch cabinet entirely.

12.2   Disposal

Dispose of device components and packaging material in an environmentally sound manner in accordance with the applicable waste management and national waste disposal regulations and standards of the region or country to which the device is delivered.

Within the EU, the following applies:
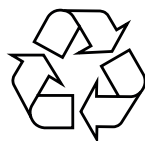
In accordance with EU Directive 2012/19/EU / the German Electrical and Electronic Equipment Act (ElektroG), devices that are no longer needed must be taken to recycling station.

The device must not be disposed of with household waste!

13   Technical data

The main component of the Gas analysis controller RGC 7-C is an **embedded PC**, i.e. PC technology with a standard processor and standard memory card. The operating system is Windows-CE 6.0, as used in palmtops and navigation devices.

Housing	
Dimensions	213 x 128.4 x 310 mm (42 HP / 3 RU) (W x H x D)
Weight	2.5 kg
Ambient temperature	-20 to 55 °C
Protection class	IP 20 (protection from solid bodies >12.5 mm, not splash-proof)

Power supply	
Power supply	24 V DC -10%/+15%
Power consumption	25 W

Front panel	
Operating keys	1 key (HOME)
Display	LCD touchscreen 640 x 240 dots 256 colours

Hardware	
Embedded PC	CPU ARM1176 533 MHz 128 MB RAM 64 MB flash

Memory	
SD card	4 GB

Operating system	
Windows CE 6.0	

Digital inputs	
Quantity	20
U_{max}	5 V (+10%)
I_{max}	13 mA
f_{max}	10 Hz
Overvoltage protection	6.8 V

Digital outputs	
Quantity	12
U_{max}	24 V
I_{max}	100 mA
P_{max}	100 mW
Overvoltage protection	33 V

Current inputs	
Quantity	8
Resolution	20 bits
I_{max}	28 mA

R_i	250 ohms
Overvoltage protection	6.8 V (inputs 1 to 4) 33 V (inputs 5 to 8)
Current outputs	
Quantity	4
Resolution	12 bits
Working resistance	700 ohms
Overvoltage protection	33 V
Data interfaces (Ethernet 2 x)	
LAN 1	Operator network, DHCP server, DHCP client or fixed IP address
LAN 2	Operator network, DHCP client or fixed IP address
For data exchange, RMG recommends choosing a fixed IP address, which then can (must) be parameterised in the connected flow correctors (e.g. ERZ2000-NG).	
USB (2x)	
Front	For mouse, ext. Hard drive or keyboard
Back	For connecting a PC
Because of the approval (i.e. for official calibration reasons), these ports are generally not available.	
Serial ports (7x)	
COM 1	RS 232 / RS 485, configurable with jumpers
COM 2	RS 232
COM 3	RS 232 / RS 485, configurable with jumpers
COM 4	RS 232 / RS 485, configurable with jumpers
COM 5	RS 232
COM 6	RS 232 / RS 485, configurable with jumpers
COM 7	RS 232 / RS 485, configurable with jumpers

Annex A – Parameter list

An in-depth parameter list is provided in our separate document '**RMG Modbus port RGC 7-C**, **parameter list**'. You can download the document from our website www.rmg.com.

Annex B – Declaration of conformity

> **NOTE**
>
> **EU declaration of conformity**
>
> The declaration of conformity presented reflects the situation on the data when the operating manual was issued. The latest version of the EU declaration of conformity is available from our website www.rmg.com.

EU-Declaration of Conformity
EU-Konformitätserklärung

$C \epsilon$

We	**RMG Messtechnik GmbH**
Wir	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.
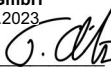
Product *Produkt*	**Gas Quality Controller RGQ-C (Baugleich RGC 7-C)**

Directive *Richtlinie*	**EMV**
EC- Directives *EG-Richtlinie*	2014/30/EU
Product marking *Produktkennzeichnung*	$C \epsilon$
Standards *Normen*	EN 61326-1:2013 IEC 61000-4-2: IEC 61000-4-3: IEC 61000-4-4: IEC 61000-4-5: IEC 61000-4-6: IEC 61000-4-8: 1993 EN 61000-4-11
EC Type-Examination *EG-Baumusterprüfung*	Prüfbericht / Test Report: 1-1289/20-01-02 **CTC advanced GmbH**
Accredited certification *Überwachungsinstanz*	---

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 02.11.2023

_____
Thorsten Dietz, Managing director

i.A. _____
Sascha Körner, Engineering Manager

RMG

ONE STEP AHEAD

Subject to change without notice!

RMG Messtechnik GmbH

Otto-Hahn-Straße 5
35510 Butzbach
Germany

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

www.rmg.com

Additional information

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