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## Operating instructions



The unit complies  
with the applicable  
EC-guidelines



Fig. 1: Front view of the control unit gas chromatograph 36670-99

## TABLE OF CONTENTS

<b>1</b>	<b>SAFETY PRECAUTIONS</b>
<b>2</b>	<b>PURPOSE AND CHARACTERISTICS</b>
<b>3</b>	<b>FUNCTIONAL AND OPERATING ELEMENTS</b>
3.1	Operating unit
3.2	Measuring probe
<b>4</b>	<b>NOTES ON OPERATION</b>
<b>5</b>	<b>HANDLING</b>
5.1	Connection of the measuring probe
5.2	Connection of a display instrument
5.3	Zero balancing the measuring bridge
5.4	Recording a chromatogram
5.5	Changing the safety fuse
<b>6</b>	<b>TECHNICAL DATA</b>
<b>7</b>	<b>ACCESSORIES</b>
7.1	Chromatograph
7.2	Display instruments
7.3	Literatur
<b>8</b>	<b>WARRANTY</b>
<b>9</b>	<b>WASTE DISPOSAL</b>

## 1 SAFETY PRECAUTIONS



### Attention!

- Carefully read these operating instructions completely before operating this instrument. This is necessary to avoid damage to it, as well as for user-safety.
- Check that your mains supply voltage corresponds to that given on the type plate fixed to the instrument.
- Install the instrument so that the on/off switch and the mains connecting plug are easily accessible. Do not cover the ventilation slits.
- Take care that no liquids or objects enter in through the ventilation slots.
- Only use the instrument in dry rooms in which there is no risk of explosion.
- Do not operate if there are visible signs of damage to the unit or the connection cord.
- Only use the instrument for the purpose for which it is intended.

## 2 PURPOSE AND CHARACTERISTICS

The control unit for gas chromatography (order no. 36670-99) serves, together with the measuring probe for gas chromatography (order no. 36670-10), for the detection of separated substances in the emergent flow of carrier gas from a gas chromatograph by means of the thermal conductivity principle. The control unit not only supplies power to the measuring probe, but also contains a measuring system with which the change in the resistance of the measuring probe can be detected.

The most important part of the measuring probe is an NTC element, which has a highest permissible temperature limit of approximately 110 °C. To avoid exposure to mechanical stress, the semiconductor and its fine lead wires are fused in a thin walled glass capillary tube, which is fitted in a glass tube with attached side tube. Power is supplied to the semiconductor through a coaxial cable with BNC plug, with which the measuring probe is connected to the control unit.

The measuring system in the control unit is based on the principle of a voltage compensated measuring amplifier. With the measuring probe connected, and after zero balancing, there is a voltage of 0 mV on the recorder output of the control unit (see 5.3). Subsequent changes in the detector resistance effect a change in the measured value, which is passed to the output of the control unit as a proportional voltage signal.

Zero balancing and measurement signals can be displayed by a measurement instrument connected to the recorder output of the control unit. Suitable instruments for this are a multimeter (e.g. analogue demonstration multimeter ADM 2, article no. 13820-00), a Yt recorder (e.g. Yt Recorder, 1 channel, order no. 11414-95), or an interface in connection with a PC (e.g. Cobra3 CHEM-UNIT, order no. 12153-00).

## 3 FUNCTIONAL AND OPERATING ELEMENTS

### 3.1 Operating unit

The unit is accommodated in an impact resistant plastic housing. A retractable carrying handle is recessed into the unit and can be folded down so that the instrument slopes down towards the back. Four rubber feet provide resistance to slipping. The unit can be stacked onto other units of the same design, because the rubber feet fit into cup-shaped recesses of the unit beneath, ensuring that the top instrument does not slide off. The sloped position can only be used for the uppermost unit of the stack.

The supplied connecting cord is used to connect the unit to the AC mains. The cord is inserted into the equipment connector at the back of the unit. The mains switch for operating the unit is situated in the immediate vicinity of the equipment connecting plug at the back of the unit.

The centre of the back plane provides a thread for the attachment of the support clamp for small case (02043-10), which is optional available (see Fig. 2). By use of that clamp, the unit can be fixed to various support rods. Thereby, the visibility will be increased in demonstration experiments.



### Attention!

To avoid damage to the inner electrical components of the unit and to prevent people from getting harmed by electric shock, use the provided support clamp 02043-10, only.

You must not use screws with lengths over 16 mm!



Fig. 2: Back plane of the small case with support clamp attached

All other functional and operating elements are located on the front panel of the unit (see Fig. 3):



Fig. 3: Operating elements

- 1 Control lamp**  
Green light-emitting diode shows when the instrument is switched on.
- 2 Coarse balancing button**  
Press button ("COARSE") for coarse balancing of the measuring bridge.
- 3 Rotary knob for fine balancing**  
Rotary knob ("FINE") for fine balancing of the measuring bridge.
- 4 BNC socket for measuring probe**  
Input ("IN") for connection of the measuring probe (order no. 36670-10) for gas chromatography to the control unit (see 5.1).
- 5 Recorder output**  
Two 4 mm safety sockets with colour coding for connection to a recorder, multimeter or interface system for displaying measured values.

### 3.2 Measuring probe

The functional and operating elements of the measuring probe are shown in Fig. 4:

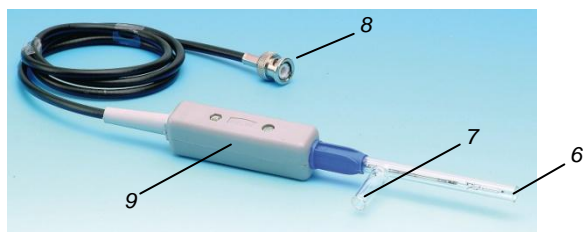


Fig. 4: Measuring probe 36670-10

#### 6 Gas inlet tube

Connection of the measuring probe to the gas outlet of a gas chromatograph is made via this glass gas inlet tube. It has an outer diameter of 8 mm and the measuring probe is held inside of it.

#### 7 Gas outlet tube

The gas which flows into the measuring probe exits it via this glass gas outlet tube, which also has an outside diameter of 8 mm.

#### 8 BNC plug

The measuring probe is connected to the control unit via this BNC plug (see 3.1).

#### 9 Handle

A handle is fixed to the sensor for handling and holding the measuring probe.

## 4 NOTES ON OPERATION

This high-quality instrument fulfils all of the technical requirements that are compiled in current EC guidelines. The characteristics of this product qualify it for the CE mark. This instrument is only to be put into operation under specialist supervision in a controlled electromagnetic environment in research, educational and training facilities (schools, universities, institutes and laboratories). This means that in such an environment, no mobile phones etc. are to be used in the immediate vicinity. The individual connecting leads are each not to be longer than 3 m. The instrument can be so influenced by electrostatic charges and other electromagnetic phenomena (HF, bursts, indirect lightning discharges) that it no longer works within the given specifications.

Carry out the following measures to reduce or eliminate the effect of such disturbance:

Avoid carpets, ensure potential equalization, use screening. Do not operate high frequency emitters (e.g. radio equipment or mobile phones) in the immediate vicinity.

After a blackout failure, carry out a "reset" with the on/off switch.

## 5 HANDLING

### 5.1 Connection of the measuring probe

With the control unit still switched off, insert the BNC plug 8 of the measuring probe into the BNC socket 4 of the control unit and lock it in position by turning it.



**Attention!**

The temperature of the carrier gas flowing into the measuring probe must not exceed 100 °C to avoid damage to the sensor by overheating.

### 5.2 Connection of a display instrument

Various display instruments for recording chromatograms can be connected via the two 4 mm sockets of recorder output 5. Connect the selected instrument to the control unit by using two 4 mm connecting cables. When doing this, ensure correct polarity, as otherwise the signals will be falsely oriented. The yellow socket designates the positive terminal of recorder output 5 and the white one the earth connection.

The following display instruments can be connected to recorder output 5 for the presentation of measurement results:

- An analogue or digital multimeter (setting: voltage measurement): The peaks of the chromatogram are indicated by the swing of the pointer or a change in the displayed digital value.
- A Yt recorder: The signals for the chromatogram are recorded over time by the vertical deflection of a pen which writes on a horizontally moving sheet of paper. When one considers that, under some circumstances, the time interval between individual signals is very short, then a continuously self-recording Yt recorder is always to be preferred. A further advantage over a multimeter is the fact that the chromatogram printed by the recorder can be directly archived after the measurement, and so be easily compared with other chromatograms.
- An interface system combined with a PC: The plotting of the chromatogram with such a system is analogous to that with a Yt recorder. The difference is only that the signals are not printed on paper, but are stored in digital form and displayed on a PC screen. The advantage is that the measurements are stored on a data carrier. They can be called up again at any time and, when appropriate, be easily subjected to further evaluation.

### 5.3 Zero balancing the measuring bridge

The sensor of the measuring probe for a gas chromatograph is part of a circuit which works on the principle of a voltage compensated measurement amplifier (see 2). As the resistance of the sensor varies greatly according to the ambient conditions (temperature and flow rate of the carrier gas, ...), the zero balance must generally be reset prior to the start of each new measurement.

When the instrument is switched on, there is a voltage of approx.  $\pm 13$  V at the recorder output. Carry out zero balancing in two steps. As first step, press the coarse balancing button 2 on the control unit. This effects an automatic electronic coarse balancing which reduces the signal on the recorder output to a few millivolts, as can be seen on a connected display instrument. As second step, compensate this signal to reduce it to 0 mV by turning the fine balancing potentiometer 3 in the one or other direction until around 0 mV is actually displayed. Signals subsequently received during the measurement will then be given out as difference to this compensation at the recorder output.

### 5.4 Recording a chromatogram

To record a chromatogram, connect the gas inlet tube of the measuring probe for gas chromatography 6 to the gas outlet opening of the gas chromatograph used (e.g. a gas separation column, order no. 36670-00). If appropriate, connect a flow meter (e.g. a Soap bubble flow meter, order no. 36675-00) to the gas outlet tube of the measuring probe 7, to quantitatively determine the flow rate of the carrier gas. The connections of the measuring probe to the gas chromatograph and to the flow meter must be gas-tight to ensure that the carrier gas from the chromatograph flows quantitatively through the probe. Leaks would result in measurement errors. These connections are best made with so-called glass threaded connectors of size GL 18/8 or with tight-fitting tubing.

Connect the measuring probe to the control unit (see 5.1) and connect a suitable display instrument to recorder output 5 (see 5.2). After arranging a continuous flow of carrier gas, switch on the control unit.

The control unit is generally ready to operate when switched on. As the heat generated by the transformer it contains affects the electronics, however, it should be switched on about half an hour before the first measurement for optimal results.

The conditions (temperature, flow rate of the carrier gas, separating material, ...) under which the mixture to be examined is to be gas chromatographically separated depend on the properties of the mixture and the selected separating column. It is naturally not possible to go into details on these parameters here. As a rule, the conditions under which separations are to be carried out are described in the appropriate literature or in information provided by manufacturers of separating columns.

### 5.5 Changing the safety fuse

The fuse holder is in the upper part of the mains socket of the instrument, and so is only accessible when the connecting cord is not plugged in. Unplug the connecting cord, open the fuse holder using a screwdriver, take out the defect fuse and replace it with a new one (first check the specification of this against the data on the type plate), then fit the fuse holder back in the mains socket.

Should this fuse blow when the instrument is switched on, never replace it with a more resistant fuse! A defect is indicated and the instrument must be returned to the Phywe service department for repair.



**Attention!**

The fuse used as replacement must be of exactly the same rating as that given on the type plate of the instrument. It is not permissible to use any other type of fuse!

## 6 TECHNICAL DATA

(typical for 25 °C)

Operating temperature range 5–40 °C  
Relative humidity < 80 %

### Input\*

BNC socket for connection to the measuring probe for the gas chromatograph (order no. 36670-10)

### Output\*

Recorder output 4 mm sockets,  
 $V_{\max} = \pm 13 \text{ V}$

### Power supply

Connection voltage 110–240 V AC  
(+6 % / -10 %)  
Mains frequency 50–60 Hz  
Power consumption approx. 7 VA  
Main fuse see type plate  
(5 mm x 20 mm)

Dimensions (mm) 194 x 130 x 140 (WxHxD)  
Mass 1 kg

\* Input and output are not floating

## 7 ACCESSORIES

### 7.1 Chromatograph

- Gas separation column 36670-00

- Glass jacket 02615-00
- Kieselguhr, 50 g 31501-05
- Dinonyl phthalate, 100 ml 31276-10
- Soap bubble flow meter 36675-00
- Immersion thermostat A 100 46994-93
- Accessories set immersion thermostat A 100 46994-02
- Bath for thermostat, 6 l 08487-02
- Pressure cylinder, helium, 2 l 41776-00
- Pressure reducing valve, helium 33481-00
- Table stand for 2 l gas cylinder 41774-00

## 7.2 Display instruments

### 7.2.1 Multimeters

- Analogue demonstration multimeter ADM 1 13810-00
- Analogue demonstration multimeter ADM 2 13820-00
- Multi range meter, analogue 07028-01
- Digital multimeter 07134-00

### 7.2.2 Recorders

- Yt recorder, 1 channel 11414-95
- Yt recorder, 2 channels 11415-95

### 7.2.3 Interface systems

- Cobra3-CHEM-UNIT 12153-00
- Cobra3 power supply 12151-99
- Software Cobra3 CHEM-UNIT 14520-61

*alternatively:*

- Cobra3-BASIC-UNIT 12150-00
- Cobra3 power supply 12151-99
- Software Cobra3 universal recorder 14504-61

## 7.3 Literature

- Handbook, glass jacket system 01196-12

## 8 WARRANTY

We give a warranty of 24 months for units supplied by us inside the EU, and a warranty of 12 months outside the EU. The following is excluded from the warranty: Damage that is due to non-compliance with the operating instructions, improper use, or natural wear.

The manufacturer can only be held liable for the function and safety-relevant properties of the unit, if the maintenance, service, and modifications of the unit are performed by the manufacturer or by an institution that is expressly authorised by the manufacturer.

## 9 WASTE DISPOSAL

The packaging mainly consists of environmentally-friendly materials that should be returned to the local recycling stations.



Do not dispose of this product with normal household waste. If this unit needs to be disposed of, please return it to the address that is stated below for proper disposal.

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