Operating Manual

Model 20-600/602 Portable
Binary Gas Analyzer

Model 20-600: 120 V, 50/60 Hz
Model 20-602: 230 V, 50/60 Hz

Note: This manual covers all 20-600 configurations.

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Rev. 2

READ INSTRUCTIONS BEFORE OPERATING

GOW-MAC® INSTRUMENT CO.

277 Brodhead Road, Bethlehem, PA 18017 U.S.A. Tel: (610) 954-9000

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The warranties made by GOW-MAC® Instrument Co. with respect to the product are voided if the product is not used and serviced in accordance with the instructions in this manual.

Please protect yourself and your employees by following these operating instructions. We encourage our customers to write or call for any additional information relative to the use or repair of this instrument.

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TERMS AND CONDITIONS OF SALE

WARRANTIES MODEL 20-600 ANALYZERS SOLD BY GOW-MAC® INSTRUMENT CO. ARE WARRANTED FOR A PERIOD OF ONE YEAR AGAINST DEFECTS IN MATERIALS AND WORKMANSHIP. THE TERMS OF THIS WARRANTY ARE AS FOLLOWS:

1. The warranty period begins with the shipping date of the equipment to the original purchaser.

2. Certain parts such as batteries, fuses, glass accessories, septa, columns, etc., are expendable in normal use, and their service life is unpredictable. Such items are not covered by this warranty.

3. Filaments of thermal conductivity detectors are not covered by this warranty.

4. Hydrogen Palladium Tubes are not covered by this warranty.

5. All requests for service or repair under this warranty must be received within the warranty period by GOW-MAC® or its authorized representative. All repairs are made at GOW-MAC plants or at the office of authorized representatives.

6. All repairs, adjustments, and other services under this warranty shall be performed free of charge to the purchaser. However, warranty service and repairs shall be limited to equipment malfunctions which, in the opinion of GOW-MAC®, are due or traceable to defects in original materials or workmanship. Instrument malfunctions caused by abuse or neglect of the equipment are expressly not covered by this warranty.

7. Instrument parts which have been repaired or replaced during the warranty period are themselves warranted only for the remaining unexpired portion of the original one-year warranty.

8. Repairs, adjustments, and service performed after expiration of the one-year warranty period shall be charged to the purchaser at the then current prices for parts, labor, and transportation.

9. This warranty attaches to the equipment itself and is not limited to the original purchaser. Unexpired portions of the warranty are thus transferable to subsequent owners.

10. GOW-MAC® expressly disclaims any liability to users of its products for consequential damages of any kind arising out of or connected with the use of its products.

11. Except as stated in Sections 1 through 8 above, GOW-MAC® makes no warranty, expressed or implied (either in fact or by operation of law), statutory or otherwise; and, except as stated in Sections 1 through 8 above, GOW-MAC® shall have no liability under any warranty, expressed or implied (either in fact or by operation of law), statutory or otherwise.

12. Statements made by any person, including representatives of GOW-MAC® which are inconsistent or in conflict with the terms of this warranty shall not be binding upon GOW-MAC® unless reduced to writing and approved by an officer of the Company.

13. This warranty shall be governed by the laws of the Commonwealth of Pennsylvania.

LIABILITY Buyer assumes all responsibility for warning and protecting its employees and independent contractors with respect to all hazards to persons and property in any way connected with the Equipment and the use thereof. Seller's liability for any claim of any kind hereunder, whether or not based on contract, tort (including negligence), strict liability, warranty, or any other grounds, shall not exceed the purchase price of the Equipment or the portion of the purchase price attributable to any part or parts of the Equipment in respect to which such claim is made. Seller shall not be liable for any special, indirect, incidental, or consequential damages. Without limiting the generality of the foregoing, Seller shall have no liability with respect to the results obtained by use of the Equipment, whether in terms of product condition, operating cost, general effectiveness, success or failure, or regardless of any statement made in any written proposal submitted by Seller. It is expressly understood that any technical advice furnished by Seller with reference to the Equipment is given gratis and Seller assumes no obligation or liability for the advice given or results obtained, all such advice being given and accepted at Buyer's risk. Each party hereby agrees to indemnify and hold the other party harmless from any actions, lawsuits, demands, claims, losses, expenses, costs, including but not limited to legal fees, and damages arising from the injury, illness or death of the indemnifying party's employees in any way related to the Equipment, whether or not such injury, illness, or death is claimed to have been caused by, resulted from, or was in any way connected with the negligence of the party to be indemnified.

PROPRIETARY INFORMATION Buyer agrees to maintain all proprietary information disclosed by Seller, including such proprietary information obtainable upon examination of the Equipment, in confidence and to refrain from any disclosure thereof to any third party (including any affiliate of Buyer), for any purpose, without the prior written consent of Seller. Buyer agrees to use said proprietary information solely for purposes of maintaining and operating the Equipment, and to refrain from any use thereof to design, construct, have constructed and/or operate any duplication or modification of the Equipment, or from any other use thereof, without the prior written consent of Seller.

IMPORTANT INFORMATION

These instructions are written for personnel operating the GOW-MAC® Model 20-600 Analyzer. Read and understand the safety precautions in this manual to become familiar with the safe practices for operating this equipment.

Dangers, Warnings, Cautions, and Notes
Dangers, Warnings, Cautions, and Notes appear throughout this manual. A sample of each statement appears below. Within each sample, a definition of the statement type and its purpose is given.

DANGERS alert you to an immediate hazard that causes serious injury or death and requires special precautions to be taken.

WARNINGS alert you to a potential hazard that causes serious injury or death *under certain conditions.*

CAUTIONS alert you to a non-immediate or potential hazard or an unsafe practice that presents a minor threat of personal injury or damage to equipment, data, or processes.


NOTE

NOTES emphasize or remind you of an important piece of information.

Contents

This manual covers all 20-600 configurations.

1. Introduction

The GOW-MAC Model 20-600 portable gas analyzers operate on the principle of thermal conductivity (the amount of heat transported through a gas is one of its properties). Thermal conductivity differences are detected by filaments in a thermal conductivity detector (TCD). In a TCD, the filaments are connected in a Wheatstone bridge where two parts of the bridge are exposed to reference gas and another two parts are exposed to sample gas. A current is passed through the bridge to heat the filaments. The thermal conductivities of the sample and reference gases must be different to create a detector output voltage (signal). Output voltages are proportional to thermal conductivity differences for reference and sample gas pairs.

The Model 20-600 is a binary gas analyzer designed to measure two-part gas mixtures. Mixes with three or more gas components are only possible to measure if the concentrations of all but two components remain constant. Ask GOW-MAC for assistance if there is a question about your application.

The TCD in the Model 20-600 is a single pass detector meaning the reference gas is sealed in the cell. Of the four filaments in the detector, one pair is surrounded by sealed reference gas, and sample gas flows over the other pair. An internal pump draws the sample as well as zero and calibration gases through the analyzer.

2. Specifications

GENERAL SPECIFICATIONS

Operating Range	Calibration for 2 ranges: Range 1 = 00.0 - 99.9% Range 2 = 0.00 - 9.99%
Detector	Thermal Conductivity using 4 filaments (WX, W2, or Ni)
Sealed Reference Gas	Application dependent
Det. Temp. Regulation	None
Power Required	60 W
Battery	Lead/Acid Gel, 12 V
Battery Life	500 recharge cycles
Sample Flow Rate	0.8 scfh (375 ccpm) at 0 psig
Pressure Required	0 psig minimum
Sensitivity	Can be calibrated for as low as 0.5% CO_2 in air (application dependent)
Accuracy	3% of full scale
Response Time	< 10 seconds
Warm up Time	1 minute
Instrument Operating Temperature Range	40 °F - 100 °F (4 °C - 38 °C)
Drift	< 10% of full scale/hour in low range
Readout Meters	standard: 4½" analog - graduated 0 - 100, evenly divided (special meters available upon request) optional: 3½ digit digital LED
Pump	Diaphragm type
Dimensions:	11.50" L x 5.50" W x 6.50" H (29.21 x 13.97 x 16.51 cm)
Weight:	Net: 14 lbs. (6.35 kg) Shipping: 17 lbs. (7.71 kg)

* Specifications will vary depending upon system configuration and are subject to change without notice.

3. Controls

MODE switch

The power source is selected with the slide-type MODE switch located on the 20-600 analyzer side. The electric power source can be set from either an internal 12 VDC battery or from AC line current: 115 VAC, 60 Hz for model 20-600 and 230 VAC, 50 Hz for the model 20-602.

When running the analyzer on AC line current, do not exceed 24 hours of continuous operation. If the instrument must be operated longer than 24 continuous hours, it should be cycled on 10 hours of battery operation and 24 hours of line current operation. This will prevent overcharging the lead/ acid gel battery.

Rotary switch

Located on the top panel can be set to one of four positions:

OFF. Instrument power is off. When the rotary switch is in the OFF position, the analog meter movement is shunted for its protection during transit.

BAT TEST. Switch to BAT TEST to check the battery charge. The LED (light emitting diode) illuminates when the rotary switch is in the BAT TEST position and when the battery has charge enough for instrument operation.

CAL 1. The CAL 1 position is the more sensitive of two ranges that can be calibrated. When a digital meter is used, the readout is in the hundredths place. The trim potentiometer located at the CAL 1 position adjusts the span during calibration procedure of the CAL 1 range.

CAL 2. The CAL 2 position is the less sensitive of two ranges that can be calibrated. When a digital meter is used, the readout is in the tenths place. The trim potentiometer located at the CAL 2 position adjusts the span during calibration procedure of the CAL 2 range.

ZERO Potentiometer

The ZERO potentiometer adjusts zero during the calibration procedure of either the CAL 1 or CAL 2 ranges.

Readout Meter

The readout meter is powered by the DC millivolt signal output of the detector. The 20-600 analyzers are supplied with a digital meter. It can be used for direct reading of a sample concentration. When the rotary switch is in the BAT TEST position, the digital meter reads out the battery charge in volts.

Sample In fitting

Sample is introduced to the instrument through the 1/8 Sample is pulled through the instrument by a diaphragm pump.

Sample Out fitting

Sample vents from the instrument through the 1/8 inch compression fitting on the side panel. Sample flow can be measured by connecting the Sample Out fitting to a flow meter, for example a rotameter. For a flow check, the instrument must be powered and the rotary switch set to CAL 1 or CAL 2 which energizes the pump. The sample flow should be 0.8 scfh (375 ccpm).

4. Operation

A. Check the battery charge and re-charging

Instruments with digital display meters

For instrument models with digital LCD display meter, check the battery charge by putting the MODE switch in the BATTERY position and the ROTARY switch in the BAT TEST position. The battery charge is displayed in volts on the digital meter. The battery needs recharging when the display reads approximately 11 or less.

Recharging the battery

The internal battery powers the instrument for approximately 12 hours. To re-charge, plug the service cord into a 115 VAC, 60 Hz receptacle (230 VAC, 50 Hz for 20-602 models). Switch the ROTARY switch to OFF and the MODE switch to the LINE CHARGE position. A period of 24 hours is required to fully re-charge the battery. **DO NOT CHARGE THE BATTERY LONGER THAN 24 HOURS**. Full charge is indicated on all models when the light at the BAT TEST position is illuminated. On models with digital meters, full charge is also indicated by a meter reading over 12.

B. Zero set

1. Put the MODE switch in desired position, BATTERY or LINE / CHARGE.
2. Check the battery charge as described in Section 4, A. If battery charge is low, operate on AC line voltage or recharge.
3. Adjust the ROTARY switch to the desired range, CAL 1 or CAL 2. The pump is now operating. Apply the appropriate zero gas to the instrument.

Example 1:
The TCD has a sealed helium reference. Application is to measure 15% air in helium. Set zero while sampling 100% helium. Select range CAL 2. Sample a calibration mixture of 15% air & 85% helium. Adjusting the CAL 2 trim potentiometer, set the meter to read out the actual air concentration in the calibration mix. Change back to 100% helium and check that the readout goes to 00.0. Adjust the zero readout using the ZERO potentiometer if necessary. Change back to the calibration gas to check the readout. After consecutive cycles of the correct meter readings, the instrument is ready to use.

Example 2:
The TCD has a sealed argon reference. Application is to measure 50% nitrogen in argon. Set zero while sampling 100% argon. Select range CAL 1. Sample a calibration mixture of 50% nitrogen & 50% argon. Adjusting the CAL 1 trim potentiometer, set the meter to read out the actual nitrogen concentration in the calibration mix. Change back to 100% argon and check that the readout goes to 00.0. Adjust the zero readout using the ZERO potentiometer if necessary. Change back to the calibration gas to check the readout. After consecutive cycles of the correct meter readings, the instrument is ready to use.

Adjust the ZERO potentiometer until the meter indicates 0.00 or 00.0 (digital meter). The zero readout should remain steady after 5 minutes of instrument warm-up time, if the instrument's ambient temperature remains steady, and if the zero gas temperature and pressure remain steady.

C. Calibration

Check the battery charge (if operating on battery) and check the meter zero before calibrating. The calibration procedure is described in Examples 1 and 2 in Section 4, B.

The Model 20-600 must be calibrated periodically. GOW-MAC recommends that you determine the calibration frequency necessary to meet the accuracy requirement of your application.


NOTE

The calibration gas should be a two-gas mixture. For best accuracy, the concentration of the calibration gas should be as close as possible to the expected concentration of the sample gas.

5. Maintenance
(Probe Assembly Accessory)

Remove the compression nut on the black nylon fitting that is connected to the sample probe. Pull the stainless steel tubing out of the tygon sample tubing. Remove the filter using a pair of tweezers. Replace this filter with a 1" piece of standard pipe cleaner.

6. Troubleshooting Guide

Symptom	Possible Cause
1. Pilot light will not light power switch ON.	a. Battery discharged.
	b. Regulator network defective.
2. Instrument will not zero.	a. T/C cell detectors out of balance - replace.
	b. Meter has broken taut band.

Servicing

If questions arise that this manual does not answer or service of the instrument goes beyond these instructions, please call our Repair Department at (610) 954-9000.

For all GOW-MAC instruments, our In-house Repair Service is handled only at our Bethlehem, PA U.S.A. facility. Instruments should be returned to us in their original packaging or similar, sturdy container and insured against damages. Package the product appropriately to prevent any physical damage during shipping. GOW-MAC is not responsible for product that has been physically damaged during shipment.

In order to protect our employees from exposure to various hazards, a fully completed ***Health and Safety Declaration Form*** IS REQUIRED to be returned to us for each item being sent in for repair. A form is placed into every instrument's operating manual but if yours is missing, contact us at (610) 954-9000. Our you may download a PDF version from our website @ www.gow-mac.com.

Complete the document in its entirety, sign it, and either fax [(610) 954-0599] or e-mail [repairs@gow-mac.com] it to GOW-MAC Instrument Co., Repair Dept. The instrument/device/part being returned WILL NOT be accepted into GOW-MAC's facility until we receive this completed document. Once the H & S is completed and returned **with a PO or credit card** we will issue an RMA and shipping instructions. A Return Materials Authorization (RMA) number is necessary to return an item for repair.

Products returned without a completed Health and Safety Declaration Form and/or RMA will be refused and returned at the owner's expense.

GOW-MAC Instrument Co.
Repair Department, RMA# _____
277 Brodhead Road
Bethlehem, PA 18017-8600
Tel (610) 954-9000
Fax (610) 954-0599

7. Replacement Parts List

There are many variations of the Series 20-600. Parts listed are common to most models. Please specify your instrument's complete model number and serial number when ordering replacement parts.

PART No.	
10-747-***	T/C Cell (varies with model number of instrument)
120-127	Rotary switch
120-125	MODE slide switch
128-198	Meter, 3-1/2 digit digital display (LCD)
111-178	Potentiometer, 20 KΩ, 10-turn (ZERO)
020-1	Probe assembly
127-407	Power cord, detachable, 7' 6" long
141-357	Trimmer adjust tool
133-124-*	Pump assembly, micro-diaphragm (varies with model number of instrument)
141-783	Handle
141-110	Rubber feet
127-354	Knob (for rotary switch)
127-386	Knob, locking type (for Zero pot)
115-127	Red LED
119-121	Battery
121-124	Fuse (on p/n 123-189 power supply board)
123-189-***	Power supply/battery charger (varies with model number of instrument)

Health and Safety Declaration for the Return of GOW-MAC Instrument Co. Equipment

In order to protect our employees from exposure to various hazards, the following statements and/or questions **MUST** be answered by you. Fill out this document in its entirety and either fax or e-mail it to GOW-MAC Instrument Co., Attn: Repair Dept, **BEFORE** returning the product.

The instrument/part being returned **will not** be accepted into GOW-MAC's facility until we receive this completed document, along with a **PO or Credit Card**. Once approved for return by our Chemical Safety Officer, a **Return Materials Authorization (RMA) number** and shipping instructions will be issued. *All applicable regulations should be followed when returning instrumentation, and/or parts.*

Customer to Record the Following:

Model # / Part # _____

Serial #:_____

Service Technician spoken to: _____

Today's Date: _____

IF THIS FORM IS NOT APPROVED BY OUR CHEMICAL SAFETY OFFICER, THE INSTRUMENT/PART WILL NOT BE PERMITTED INTO OUR FACILITY FOR SERVICING!

A] Brief explanation of issue:_____

B] Briefly list the application(s) for which the instrument/part was used, as well as any and all chemicals, gases, and/or materials analyzed and their concentrations. (**Must be filled in**): _____

C] Is there the possibility of internal or external contamination on or in this instrument/part?

☐ Yes – see below ☐ No – proceed to D.

Please check the appropriate box.

☐ Chemicals or Substances That Are Hazardous to Health
☐ Blood, Body Fluids, (e.g. Urine, Secretions), Pathological Specimens
☐ Regulated Medical Wastes
☐ Infectious Substances or other Bio-Agents (e.g. Protein, Enzymes, Antibodies)
☐ Radioactive Isotopes used in the area. Detail type (ECD, Isotopic Labels, etc) and Activity in Micro Curies
☐ Biodegradable Material That Could Become Hazardous
☐ Other Hazards _____

If any of the above boxes are checked the following statements and/or questions must be answered.

1. Specifically describe where (on or in) the instrument/part there could be any residual contamination (for example: blood spill on the surface).____
2. Provide details of these hazards. Include names, Material Safety Data Sheets (MSDS), and concentration of contaminants, where possible. _____
3. Describe the method of decontamination used. Attach Procedure._____

D] I declare that the above information is true and complete to the best of my knowledge. I acknowledge that any inconsistencies between the condition of the instrument and the statements made on this form will delay the repair process.

Authorized signature _____ Date: _____

Name (Printed) _____ Phone number: _____

Company name: _____ Fax number: _____

Shipping address: _____

City: _____ State/Country: _____ Zip :_____

E-mail address: _____

BEFORE item can be shipped, fax completed form to: (610) 954-0599 or e-mail it to: repairs@gow-mac.com

For GOW-MAC Use Only: Signed: _____ Date ___/___/____

☐ **Passed** Safety Inspection. **OK** to proceed to Repair Dept. Chemical Safety Officer Comments: ( ) None

☐ **Failed safetyInspection. DO NOT** proceed to Repair Dept. **RMA No:** _____ ( ) On Back >>>>

GOW-MAC® INSTRUMENT CO.

REP-005
Health-Safety Declaration Doc – ONLINE
Rev.7 1/28/2022, kj