

TA Instruments

109 Lukens Drive New Castle, DE 19720

Thermal Analysis & Rheology

A SUBSIDIARY OF WATERS CORPORATION



Gas Switching Accessory

Operator's Manual

PN 992305.001 Rev. B
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Notes, Cautions and Warnings

This manual uses Notes, Cautions, and Warnings to emphasize important and critical instructions.

NOTE:

A NOTE highlights important information about equipment or procedures.

◆ **CAUTION:**

A CAUTION emphasizes a procedure that may damage equipment or cause loss of data if not followed correctly.



A WARNING indicates a procedure that may be hazardous to the operator or to the environment if not followed correctly.

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Safety

Read this section and understand the Safety precautions before proceeding with installing or using the GSA.

This accessory has been designed to comply with the following standards on safety:

- IEC 1010-1/1990, A1/1992, and A2/1995
- IEC 1010-2-010/1992, A1/1996
- UL 3101-1, First Edition.

CE Compliance

In order to comply with the requirements of Council Directive 89/336/EEC (EMC Directive) and Directive 73/23/EEC (Low Voltage Directive), as amended by 93/68/EEC, the following specifications apply to the Gas Switching Accessory:

- *Safety:*
EN 61010-1/1993 and A2/1995
EN 61010-2-010/1994
- *Emissions:*
EN 55022:1995, Class B (30-1000 MHz)
Radiated
EN 55022:1995, Class B (0.15-30 MHz)
Conducted
- *Immunity:*
EN 50082-1: 1992, Electromagnetic Compatibility—Generic immunity standard Part 1. Residential, commercial, and light industry.
 - IEC 801-2: 1991. Electrostatic Discharge.
 - IEC 801-3: 1984. Radiated RF Immunity.
 - IEC 801-4: 1988. Electric Transients.

Electrical Safety

Voltages up to 120 Vac are present in this system. Always disconnect the unit from the power source before performing any maintenance.



DO NOT REMOVE THE CABINET COVERS. Dangerous voltages are present in this instrument. Repair procedures requiring internal access to this compartment must be performed only by TA Instruments or other qualified service personnel.

Operating Safety

When operating the GSA, keep in mind that the maximum pressure allowable is 138 kPa (20 psi), using the following gases: nitrogen, oxygen, air, helium, or argon. If you want to use any other gases, contact the TA Instruments HelpLine for information.



When using oxygen with the GSA, you must be able to minimize the buildup of oxygen in order to avoid a fire hazard. We recommend that you either direct the vent gas to an exhaust system or operate in an environment that has adequate ventilation to ensure sufficient dilution.

Introducing the GSA

The TA Instruments Gas Switching Accessory (GSA) allows you to manually or automatically switch purge gases during your experiments. It can be used with any of the appropriate Thermal Analysis instruments.

This manual provides the information necessary to understand, install, operate, maintain, and order parts for the TA Instruments Gas Switching Accessory (PN 992300.901).

NOTE:

Specifications in this manual are given in the International System of Units (SI), with English equivalents in parentheses.

Description

The Gas Switching Accessory is a solenoid-controlled gas manifold which enables selective switching between two purge gases. The GSA has two modes of operation, automatic and manual. In the AUTO(matic) mode the GSA is controlled with a contact closure in the thermal analyzer through an interconnecting cable. The MANUAL mode permits operator control of the gas switching by a front panel switch. See Figure 1 for an illustration of the front panel. See page 17 for operation of the front panel.

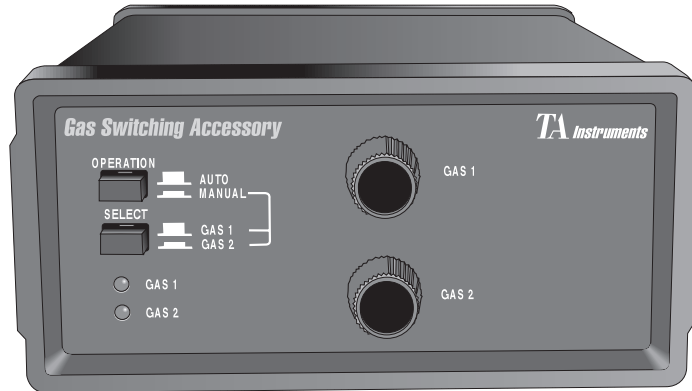


Figure 1
Gas Switching Accessory
Front Panel

The rear panel of the Gas Switching Accessory, shown in Figure 2, provides entry connections for two purge gases, an exit gas connection to the instrument, an exhaust vent connection, two electrical input connectors for automatic activation/deactivation of the solenoid manifold, power switch, and a power entry instrument AC-line connector.

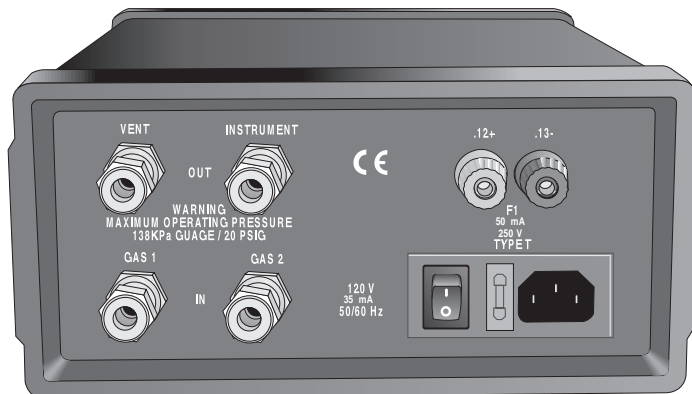


Figure 2
Gas Switching Accessory
Rear Panel

Specifications

The specifications for the Gas Switching Accessory are found in the table below.

Table 1
GSA Technical
Specifications

Dimensions	Depth: 25.4 cm (10") Width: 21.6 cm (8.5") Height: 11.4 cm (4.5")
Power Requirements	120 Vac \pm 10 %, 50/60 Hz
Weight	2.9 kg (6.4 lb)
Energy Consumption	4.2 watts
Control	Front panel switch selection. Rear panel remote, J2, J3.
Fuse Type	35 mA, Type T, 250 V
Flow Rate	Up to 1 L/min
Automatic Gas Control	Input jacks located on rear panel of GSA
Maximum	138 kPa (20 psi)
Pressure Relief Valves	Both input lines have a 175 kPa (25 psi) pressure relief valve.
Operating Temperature	15 to 30°C

Principles of Operation

Two solenoid valves and two metering valves are the main elements of the Gas Switching Accessory. A printed circuit board is used to control the solenoid valves.

Two purge gases, designated as GAS 1 and GAS 2, are admitted to the gas switching accessory through two separate inlet ports.

- One gas flows from the INSTRUMENT port to the instrument.
- The second, “unused” gas flows out the VENT port to an exhaust system.

Gas switchover is accomplished by electrically activating the solenoid valves.

The next two sections provide general information on the two modes of operation: automatic and manual. For details on operating the GSA turn to page 20.

Auto Mode

If you want to program gas selection into an experimental method automatically, through the use of the instrument control software, you will first need to place the GSA in automatic mode. To do this, push the OPERATION pushbutton switch on the GSA front panel until it is in the AUTO mode. When the accessory is in the AUTO mode, activation of the solenoid valves is accomplished by means of contact closure (completion of the circuit) in the thermal analyzer.

When the gas solenoid valves are *deactivated*:

- GAS 1 flows to the INSTRUMENT port
- GAS 2 flows to the VENT port.

Conversely, when the solenoid valves are *activated*:

- GAS 2 flows to the INSTRUMENT port
- GAS 1 flows to the VENT port.

GAS 1 may also be directed to the INSTRUMENT port by disconnecting the contact closure cable.

After the GSA is in automatic mode, you can turn purge gas 1 and 2 on or off using the Instrument Control software. See the software's online documentation for information on how to include gas control in an experimental method, if desired.

Manual Mode

If you want to manually choose a particular purge gas flow to the instrument, you can switch to MANUAL mode by following these steps:

1. Push the OPERATION pushbutton switch so that it is in the MANUAL position. This will override the automatic operation.
2. Use the SELECT pushbutton switch to choose either GAS 1 or GAS 2 to flow to the INSTRUMENT port. The SELECT pushbutton switch only functions when the OPERATION pushbutton switch is in the MANUAL mode.

A typical mode of operation for the Gas Switching Accessory during actual experiments uses an inert gas such as nitrogen to be GAS 1, and a reactive gas such as oxygen to be GAS 2. Typical end-use applications include oxidative stability studies and TGA decomposition analyses.

Installing the GSA

The Gas Switching Accessory can be used with various thermal analysis instruments, such as the DSC and TGA. This section describes unpacking, selecting a location, and installing the GSA.

Unpacking the GSA

The accessory was inspected mechanically and electrically before shipment. After unpacking, inspect the accessory for mechanical damage. If it is damaged in transit, or fails to operate properly upon receipt, notify the carrier and TA Instruments immediately. Also check that you received all items on the shipping list. If any item is missing, notify TA Instruments immediately.

Choosing a Location

Because of the sensitivity of many experiments, it is important to choose a location for the instrument using the following guidelines:

- In* . . . a temperature-controlled area.
- . . . a clean environment.
- . . . an area with ample working space around the accessory. (Refer to the technical specifications on page 11 for the dimensions.)

- Near* . . . a power outlet (120 Vac, 50 or 60 Hz, 10 amps). A step up/down line transformer may be required if the unit is operated from a higher or lower line voltage.
- . . . your TA Instruments thermal analysis controller and instrument.
- . . . purge gas supply for use during experiments.

◆ **CAUTION:**

|| Your air source must be clean, dry, and oil-free to ensure proper operation.

Connecting the GSA

To connect the Gas Switching Accessory to either the Module Interface, a 2900 series instrument, or a 2000 series instrument, follow the directions below. See Figure 3 on page 18 for an example of the installation of the GSA to a DSC instrument. See Figure 4 on page 19 for the installation of the GSA to a TGA instrument.

1. Plug the power cord (PN 890035.901 for CE instruments) into the connection on the GSA rear panel. Then plug the cord into your primary power source outlet. (Your power source should be 120 Vac only—if your main voltage is higher or lower, a transformer will be required.)
2. Connect the appropriate cable between the GAS connector on the instrument and jacks J2 (+) and J3 (-) on the Gas Switching Accessory. (Use cable PN 990906.901 for 2900/2000 series instruments,

PN 890014.901 for CE instruments, or PN 992119.901 for MIM-based instruments.)

NOTE:

The cable connectors may differ slightly in appearance, depending on the instrument involved.



The GSA can be used with the following gases: nitrogen, oxygen, air, helium, or argon. If you want to use any other gases, contact the TA Instruments HelpLine for information.

3. Connect the lines from the purge gas sources to the appropriate inlet ports on the rear panel of the GSA. To facilitate the hookup of rubber tubing to the four threaded, brass gas fittings on the rear of the Gas Switching Accessory, install the four tapered, 1/4-inch brass tube hose connectors (PN 992302.001).

◆ **CAUTION:**

Install the brass hose connectors until they are finger tight and then tighten them with a wrench until significant resistance is felt. Do not overtighten!

NOTE:

Inert gases (such as nitrogen) are typically connected to the GAS 1 inlet, and reactive gases (such as oxygen) are connected to the GAS 2 inlet.

4. Connect the INSTRUMENT outlet line from the rear panel of the GSA to a flowmeter. Connect the outlet end of the flowmeter to the desired TA instrument.
5. Connect the VENT line on the rear panel of the GSA to a hood or some other appropriate exhaust system.

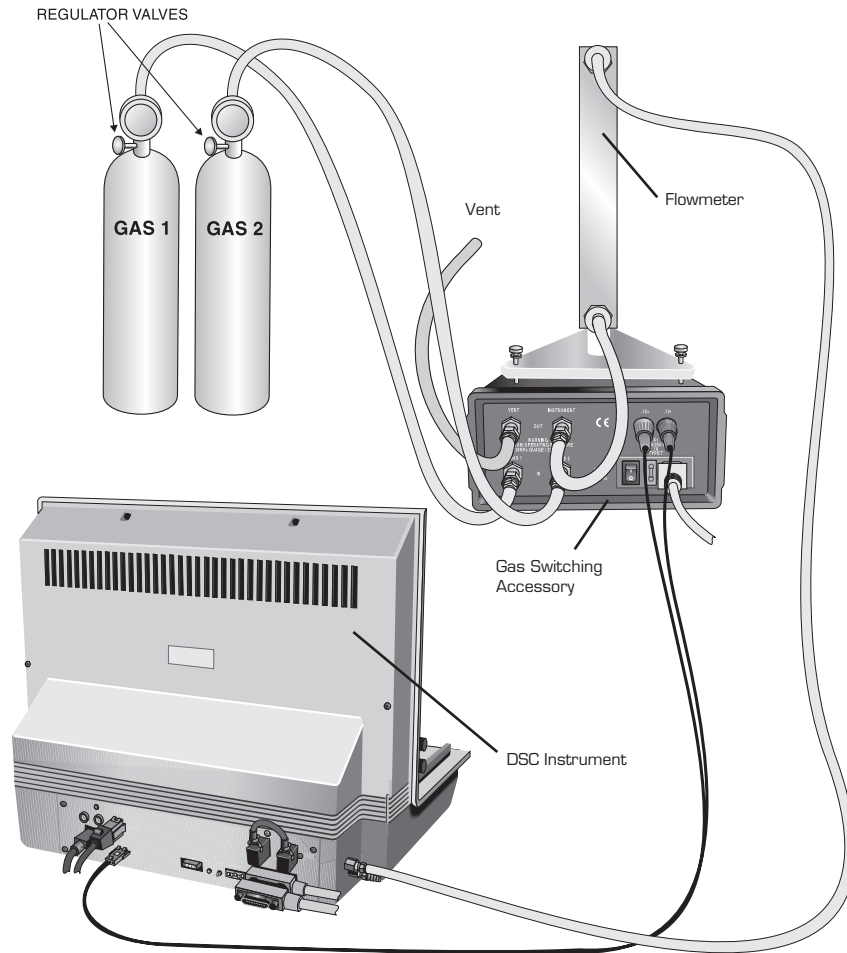
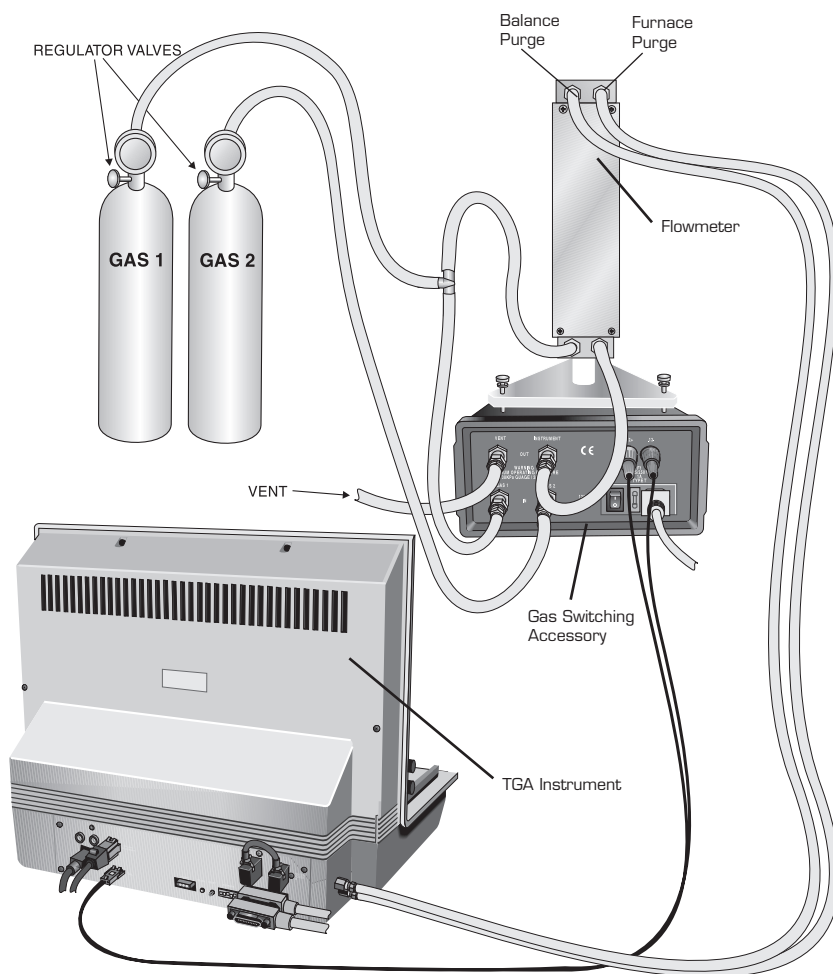


Figure 3
Typical Gas Switching
Accessory Installation to
a DSC 2910 or 2920 Instrument



This configuration maintains an inert purge through the TGA balance chamber.

Figure 4
Typical Gas Switching
Accessory Installation to
a TGA 2950 or 2050 Instrument

Operating the GSA

Before operating the GSA, it is important to become familiar with the various items located on the front and rear panels of the accessory.

The GSA Front Panel

Figure 5 provides an illustration showing the front panel and its controls. (See Figure 6 for the rear panel items.) Refer to Table 2 (on the next page) for a description of each item on the front panel.

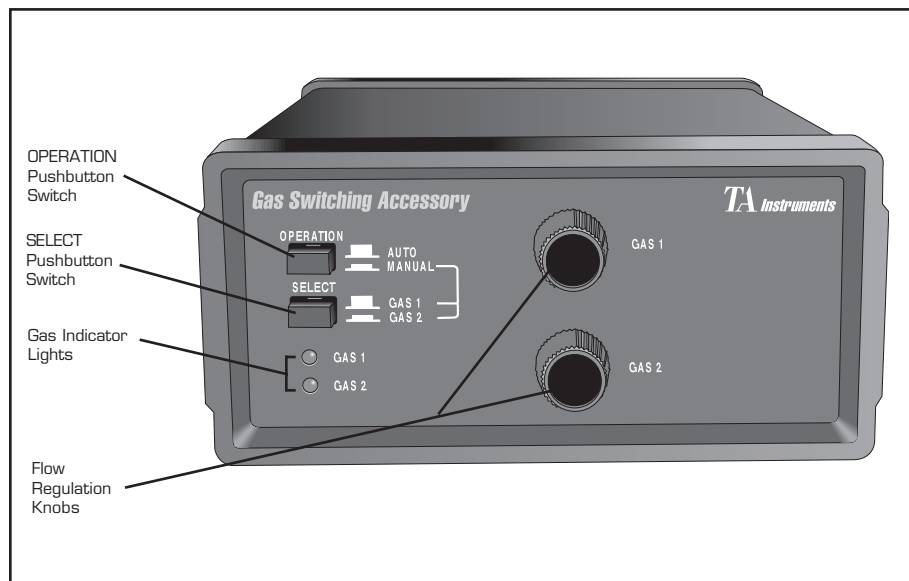


Figure 5
GSA Front Panel

Table 2
GSA Front
Panel Controls

Name	Description
SELECT pushbutton switch	<p>A two-position switch that allows you to select either GAS 1 or GAS 2.</p> <p>This switch functions only when the OPERATION pushbutton switch is in the MANUAL mode. (This switch can be used to test operation of the GSA for troubleshooting purposes.)</p>
OPERATION pushbutton switch	<p>A two-position pushbutton switch that enables you to manually control the selection of gases or place the accessory in AUTO mode.</p>
Gas Indicator Lights	<p>Two indicator lights that light selectively to indicate which purge gas is flowing to the instrument.</p>
Flow Regulation Knobs	<p>Used to regulate the flow of gases to the instrument and to the vent.</p>

NOTE: Flow regulation knobs are not to be used as “on-off” valves.

The GSA Rear Panel

Figure 6 provides an illustration showing the rear panel. (See Figure 5 for the front panel items.) Refer to Table 3 below for a description of the rear panel power switch.

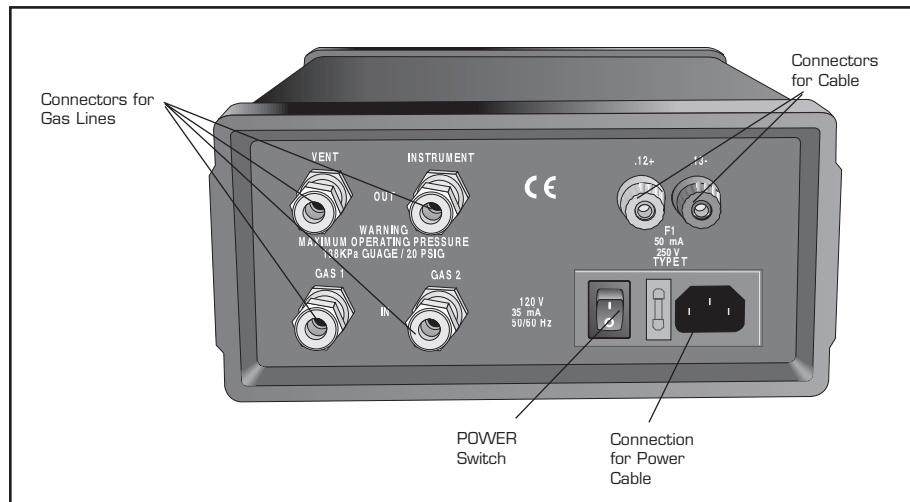


Figure 6
GSA Rear Panel

Table 3
GSA Rear
Panel Control

Name	Description
POWER switch	Controls power to the accessory. The “O” position is off.

Using the GSA

Follow these steps to start and operate the Gas Switching Accessory.

1. Adjust the regulator valves on the pressurized gas supply tanks to 14 to 35 kPa (2 to 5 psi).



Do not exceed a supply tank pressure of 138 kPa (20 psi).

2. Press POWER switch on the Gas Switching Accessory rear panel to the ON position.
3. Press the SELECT pushbutton switch to the GAS 1 position (switch shows a high profile).
4. Press the OPERATION pushbutton switch to the MANUAL mode position (switch shows a low profile). The indicator light for GAS 1 should light.



Do not exceed an inlet pressure of 138 kPa gauge (20 psi).

5. Set the GAS 1 flow rate to the instrument by adjusting the GAS 1 knob on the GSA front panel for the desired flow rate (typically 50 to 75 mL/min) as indicated on a flowmeter (not supplied). A flowmeter needle valve may also be used in combination with the GAS 1 knob to obtain the required flow rate.
6. Press the SELECT pushbutton switch to the GAS 2 position.

7. Set the GAS 2 flow rate to the instrument by adjusting the GAS 2 knob on the GSA front panel for the desired flow rate (typically 50 to 75 mL/min) as indicated on a flowmeter (not supplied). A flowmeter needle valve may also be used in combination with the GAS 2 knob to obtain the required flow rate.

NOTE:

If you want to conserve gas, you can connect a restrictor or another flowmeter to the vent outlet and adjust the flow rate accordingly using the needle valve on the flowmeter. If the vent flow is restricted too much, a pressure spike may occur when the GSA switches from GAS 1 to GAS 2. The pressure spike may appear in your data.

8. Press the OPERATION pushbutton switch to the AUTO mode position. The GSA is ready for operation.
9. Use the controller software to set up and start the experiment.

Maintaining the GSA

The TA Instruments Gas Switching Accessory only requires an occasional cleaning for maintenance of proper operation. To clean the GSA, simply wipe any dirt or dust off the accessory using a cloth that has been dampened with water and a mild detergent, if desired.

Fuse Replacement

If the fuse should need replacement, follow these instructions to remove and replace a blown fuse.

1. **Important:** Unplug the power cord before performing any further steps.
2. Slip the end of a small screwdriver under the fuse carrier tab and slide the carrier out of the GSA.
3. Remove the blown fuse from the fuse carrier. A spare fuse is located in a small compartment in the fuse carrier. You can remove the spare fuse by sliding out the compartment drawer using the end of the screwdriver.
4. Insert the new fuse in the plastic clip.
5. Obtain a new 35 mA, Type T, 250 V fuse and place it in the spare fuse compartment. Then replace the compartment and slide the fuse carrier back into the GSA.

Gas Switching Accessory
