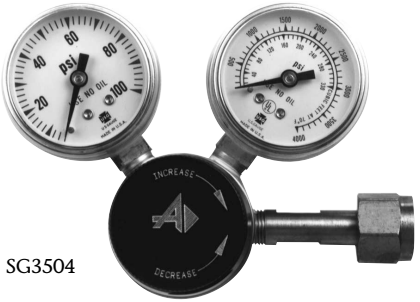
INSTRUCTIONS FOR SINGLE–STAGE LECTURE BOTTLE REGULATORS

THIS BOOKLET CONTAINS PROPRIETARY INFORMATION OF ADVANCED SPECIALTY GAS EQUIPMENT CORP. AND IS PROVIDED TO THE PURCHASER SOLELY FOR USE IN CONJUNCTION WITH MODELS SG3504, SG3505, AG3570 AND SG3550 SERIES REGULATORS.



Model SG3504

IMPORTANT

These instructions are for experienced operators who know the general principles and safety precautions to be observed in handling specialty gases and operating specialty gas equipment. If you are not certain you fully understand the safety precautions for handling gases, we urge you to obtain and read the Material Safety Data Sheet (MSDS) for each gas being used.

Do not permit untrained persons to install, operate, or maintain this regulator. Do not attempt to install or operate these regulators until you have read and fully understand these instructions. If you do not fully understand these instructions, contact your Advanced Specialty Gas Equipment Distributor.

Be sure this information reaches the operator. Your supplier has extra copies.

ADVANCED
Specialty Gas Equipment

SAFETY PRECAUTIONS

Protect yourself and others. Read and understand the following instructions before attempting to use these regulators. Failure to understand and follow these instructions could result in serious personal injury and/or damage to equipment.

- Know and understand the physical and chemical properties of the gas being used.
- Observe general precautions for the use of gases.
- Observe safety precautions for the gas being used.
- Read and follow precautions on cylinder labels.
- Never use this equipment with gases not compatible with the materials of construction. The use of gases not compatible with the materials of construction may cause damage to equipment or injury to personnel.
- If flammable gases are used with this equipment do not locate it near open flames or any other source of ignition.
- If toxic or flammable gases are used with this equipment, emergency equipment applicable to the gases in use should be available in the operating area.
- Many gases can cause asphyxiation by displacing oxygen in the atmosphere. Make certain the area where this equipment is operated is well ventilated. Provide a device to warn personnel of oxygen depletion in the work area.
- Do not release toxic or flammable gases in the vicinity of personnel. Use this equipment only in well ventilated areas. Vent gases to the outside atmosphere, and in an area away from personnel. Be sure that venting and disposal methods are in accordance with Federal, State and local requirements. Locate and construct vent lines to prevent condensation or gas accumulation. Be sure the vent outlet cannot be obstructed by rain, snow, ice, insects, birds, etc. Do not interconnect vent lines; if more than one vent is needed, use separate lines.
- Relief devices should be installed and properly vented in all gas handling systems to protect against regulator failure and overpressurization.
- The SG3550 Series regulator should not be used in Chlorine service or with any gas not compatible with Polyvinyl Chloride. These regulators are also not recommended for use in oxygen service.
- Never use oil or grease on this equipment. Oil and grease are easily ignited and may combine violently with some gases under pressure.
- Never connect a regulator to a supply source having a pressure greater than the maximum rated pressure of the regulator. Refer to Product Specifications (page 10) for maximum inlet pressures.

DESCRIPTION

These regulators are designed for mounting directly on lecture bottles. Models SG3504 and SG3505 are designed for noncorrosive gas service, while AG3570 and SG3550 Series regulators are designed for use with corrosive gases.

- Models SG3504 and SG3505 – these small lightweight regulators are recommended for high and ultra high purity, inert and noncorrosive gas service. They are available in two delivery pressure ranges (4–75 and 5–150 psig) and with either CGA 110, 170 or 180 connections.
- AG3570 Series – these regulators are intended for high and ultra high purity corrosive gas service. They are available in two delivery pressure ranges (2–30 and 4–75 psig) and with either CGA 110 or 180 connections.
- SG3550 Series – these regulators are specially designed for corrosive gas service and for low delivery pressures (1–6 psig). They are available with either CGA 110, 180 or 1/8 inch NPT female connections.

  WARNING: The SG3550 Series regulator should not be used in Chlorine service or with any gas not compatible with Polyvinyl Chloride. These regulators are also not recommended for use in oxygen service.

INSTALLATION

WARNING: Before attempting to install and operate these regulators, read and fully understand the safety precautions on page 2 in this booklet. Failure to follow the safety precautions may result in serious personal injury and/or damage to equipment.

1. Inspect the regulator for physical damage or contamination. DO NOT connect the regulator if you detect oil, grease or damaged parts. If the regulator is contaminated or damaged, contact your Advanced Specialty Gas Equipment Distributor to have the regulator properly cleaned or repaired (see "Repairs").

   CAUTION: Oil or grease in the presence of high pressure oxygen is explosive.

2. Close the regulator by turning the pressure adjusting knob counterclockwise until it rotates freely. Turn the adjusting knob on the AG3570 Series regulator counterclockwise until it reaches the stop. Do not turn the adjustment knob past the stop. Damage to the regulator could result.
3. Close the outlet valve on the SG3550 Series regulator by turning hand knob clockwise.
4. Secure the lecture bottle in place using a suitable wall bracket or stand (such as the LB3547 wall mounting bracket or a LB3550 Series lecture bottle stand).
5. If the process gas is nonhazardous, connect regulator directly to the lecture bottle valve. Securely tighten CGA connection.

   If the process gas is hazardous (flammable and/or toxic) or sensitive to atmospheric contaminants, connect a purge assembly between the lecture bottle valve and regulator. See instructions provided with the purge assembly for installation procedure.
6. Ensure that the delivery line is at atmospheric pressure before connecting regulator. Connect the regulator outlet to the delivery line.

LEAK TESTING AND PURGING

WARNING: Never connect the regulator to a supply source having a pressure greater than the maximum rated pressure of the regulator. Refer to Product Specifications (page 10) for maximum inlet pressures.

1. If it is nonhazardous, use the process gas to leak test and purge the regulator and gas piping system.

   If the process gas is hazardous (flammable, toxic and/or corrosive) or sensitive to atmospheric contaminants, use clean dry nitrogen as a purge gas to leak test and purge the regulator and gas piping system. A purge assembly can be used to connect a regulated nitrogen source to the inlet of the regulator. See instructions provided with the purge assembly for operating instructions.
2. Isolate downstream side of gas delivery system by closing instrument or process isolation valve.
3. Stand to one side of the regulator and slowly introduce the purge gas into the regulator. Check inlet gauge on Models SG3504, SG3505 and AG3570 Series regulators.
4. Open the regulator by turning the pressure adjusting knob clockwise until the desired pressure is indicated on the outlet gauge. Slowly open outlet valve on the SG3550 Series regulator by turning knob counterclockwise until knob stops turning.
5. Leak check all connections with either a soap solution, such as Snoop® or a gas leak detector. If a leak is detected, vent system to atmospheric pressure and repair. Do not repair any leaks while system is under pressure.
6. Purge entire system of air if the process gas is hazardous or sensitive to atmospheric contaminants.
7. Vent system to atmospheric pressure. Close system vent valve. Close regulator by turning pressure adjusting knob counterclockwise. Close outlet valve on the SG3550 Series regulator by turning hand knob clockwise.

OPERATION

WARNING: Never operate a regulator under any circumstances if it is leaking or otherwise malfunctioning. DO NOT repair any leaks while system is under pressure. Damage to equipment and/or injury to personnel may result.

1. Close the regulator by turning the pressure adjusting knob counterclockwise until it rotates freely. Turn the adjusting knob on the AG3570 Series regulator counterclockwise until it reaches the stop. Do not turn the adjustment knob past the stop. Damage to the regulator could result.
2. Close the outlet valve on the SG3550 Series regulator by turning hand knob clockwise
3. Ensure that any purge and system vent valves are closed.
4. Stand to one side of the regulator and slowly open lecture bottle cylinder valve to admit process gas to regulator.
5. Turn regulator pressure adjusting knob clockwise until desired delivery pressure is indicated on delivery gauge.
6. Slowly open outlet valve on SG3550 Series regulator. Slowly open instrument or process isolation valve and adjust the delivery pressure gauge if necessary.

SHUTDOWN

1. If regulator is not to be removed from service, close lecture bottle cylinder valve. Always keep lecture bottle valve closed whenever the system is not in use.
2. Close regulator by turning pressure adjusting knob counterclockwise until it rotates freely. Turn the adjusting knob on the AG3570 Series regulator counterclockwise until it reaches the stop. This will prevent a sudden pressure surge from damaging downstream components when gas flow is restarted.
3. Close outlet valve on the SG3550 Series regulator by turning hand knob clockwise. Close instrument or process isolation valve.

REMOVAL FROM SERVICE

1. Close lecture bottle cylinder valve. Always keep lecture bottle valve closed whenever the system is not in use.

WARNING: Hazardous gases must be discharged into a safety vent. Be sure to use a venting procedure that is environmentally acceptable and complies with Federal, State and local requirements.

2. Vent the system until all gauges read zero psig. If regulator was used with a hazardous gas, purge the regulator and entire system with clean, dry nitrogen gas. Continue purging until the hazardous gas level in the system is below the TLV (Threshold Limit Value) for the gas.
3. After purging and/or venting is complete, close the regulator by turning the pressure adjusting knob counterclockwise until it reaches the stop or when it rotates freely. This will prevent a sudden pressure surge from damaging downstream components when gas flow is restarted.
4. Close outlet valve on the SG3550 Series regulator by turning hand knob clockwise. Close vent valve and/or process isolation valve.
5. Remove the delivery line from the regulator outlet. Cap or plug the delivery line. Using care not to damage the connection, remove regulator from the lecture bottle valve. Reinstall a cap or plug that was provided on the lecture bottle valve.
6. If regulator is not to be used on another lecture bottle, store it in a 2–3 mil polyethylene bag.

PERFORMANCE CHARACTERISTICS

Normal Operating Characteristics

- As flow is increased through a regulator, delivery pressure will drop (droop).
- As the inlet pressure to the regulator changes, the delivery pressure will vary (supply pressure effect). This effect is minimal in a two-stage regulator and more pronounced in a single-stage regulator.
- The difference in delivery pressure between flow and no-flow conditions is displayed on a regulator flow curve.

Abnormal Operating Characteristics

- Insufficient sealing of the valve seat assembly caused by foreign materials or wear will allow pressure to continue building in the low pressure chamber. The pressure rise may cease, or it may continue as a leak. If the latter occurs, the regulator must not be used until repaired.

CARE AND MAINTENANCE

Periodic checking of your regulator is essential to continued safe and satisfactory operation. How often you inspect will depend on the usage and type of gas.

It is recommended that regulators in non-corrosive gas service be inspected on at least a monthly basis and those in corrosive service at least once a week. We recommend that most regulators be serviced annually; those used in corrosive service may need servicing every six months. Generally, the valve seat assembly and diaphragm assembly will be replaced, especially if the regulator is used in corrosive gas
service. It is even possible that some regulators must be scrapped if badly corroded.

Regulator Checking Procedure

1. Inspect gauges. The gauge(s) should read zero when all pressure has been relieved from the system.
2. Turn the pressure adjusting knob counterclockwise until it reaches the stop. Close the regulator outlet valve. Slowly open the cylinder valve. The high pressure gauge should read the cylinder pressure.
3. Leave the regulator in the pressurized state for five or ten minutes. The delivery pressure gauge should not register any pressure increase. A pressure increase indicates internal valve assembly leakage. If a pressure increase is indicated, the regulator must be repaired to prevent damage to downstream equipment.
4. Next, turn the pressure adjusting knob clockwise and set a nominal delivery pressure. If you are unable to attain the normal delivery pressure setting, faulty operation is indicated. This condition may be attributed to blockage caused by a stuck valve seat within the regulator. If the set delivery pressure continues to rise above the set point, the regulator valve seat may be worn. This condition is called “creep”; and a regulator exhibiting this condition should be sent for repair.
5. Close the supply valve and isolate the regulator from the downstream system (this can be done by closing the outlet shutoff valve if the regulator is so equipped) and note the pressure on both the high and low pressure gauges. After five or ten minutes a drop in pressure on either gauge indicates a leak in the system. The leak may be at the CGA connection, any threaded port, through the diaphragm, pressure gauge, or through the regulator outlet valve. If the leak is at the valve connection, relieve all pressure from the regulator and then tighten. If the leak is elsewhere, the regulator must be repaired.

REPAIRS

If a regulator leaks or malfunctions, take it out of service immediately. Do not attempt to repair these regulators. Repairs should be made only by Advanced Specialty Gas Equipment Corp. who has the special tools, test equipment and trained personnel required to make a safe repair. Tampering with the regulator voids the warranty. Contact your Advanced Specialty Gas Equipment Distributor to arrange for repair.

Repairs to regulators done after the initial warranty period has expired are chargeable to the customer. Upon receipt at the factory, the regulator will be inspected and you will be contacted with a repair cost estimate. No item will be repaired until approval is received. There will be an evaluation charge assessed for equipment not repaired. All repairs should be arranged through your Advanced Specialty Gas Equipment Distributor.

Note: All equipment being returned must be purged of all hazardous materials using a clean, dry inert gas (e.g. Dry Nitrogen) prior to return.

SPECIFICATIONS

Maximum Inlet Pressure:	3000 psig
Inlet Pressure Gauge:	
Models SG3504 and SG3505	0–4000 psig
AG3570 Series	0–4000 psig/0–275 bar
SG3550 Series	none
Delivery Pressure Range:	See Table 1
Delivery Pressure Gauge:	See Table 1
Gauge Size:	
Models SG3504 and SG3505	1½ in. Dial
AG3570 Series	2 in. Dial
SG3550 Series	2½ in. Dial
Operating Temperature Range:	
Models SG3504, SG3505 and AG3570 Series	-40°F to 140°F
SG3550 Series	0°F to 125°F
Regulator Flow Coefficient:	
Models SG3504, SG3505 and AG3570 Series	C_V = 0.06
SG3550 Series	C_V = 0.11
Outlet Valve Coefficient:	
SG3550 Series	C_V = 0.35
Flow Capacity:	See Figures 1–3
Supply Pressure Effect:	
Models SG3504, SG3505 and AG3570 Series	1.0 psi per 100 psi
SG3550 Series	not available
Inlet Connections:	
Models SG3504 and SG3505	CGA 110, 170 or 180 as ordered
AG3570 Series	CGA 110 or 180 as ordered
SG3550 Series	CGA 110, 180 or ⅛" NPT female as ordered
Outlet Connection:	
Models SG3504 and SG3505	⅛" NPT female
AG3570 Series	¼" NPT female
SG3550 Series	¼" NPT male (on outlet valve)
Weight (approx.):	2 lbs.

MATERIALS OF CONSTRUCTION

Body:	
Models SG3504 and SG3505	Brass Bar Stock
AG3570 Series	Type 316 SS Bar Stock
SG3550 Series	Polyvinyl Chloride (PVC)
Outlet Valve:	
SG3550 Series	Type 316 Stainless Steel
Gauges:	
Models SG3504 and SG3505	Brass
AG3570 and SG3550 Series	Type 316 Stainless Steel
Bonnet:	
Models SG3504 and SG3505	Anodized Black Aluminum
AG3570 Series	300 Series Stainless Steel
SG3550 Series	Polyvinyl Chloride (PVC)
Other Metal Parts Exposed to Gas:	
Models SG3504 and SG3505	Brass and Stainless Steel
AG3570 and SG3550 Series	Type 316L Stainless Steel
Seat:	
Models SG3504, SG3505 and AG3570 Series	PCTFE
SG3550 Series	PCTFE with synthetic sapphire poppet
Diaphragm:	
Models SG3504, SG3505 and AG3570 Series	Type 316L Stainless Steel
SG3550 Series	Teflon®
Seals:	
Models SG3504, SG3505 and AG3570 Series	Teflon®
Series SG3550 Series	PCTFE and Teflon®

Table 1

Part No.	Range (psig)	Gauge (dual scale) (psig)	(bar)
SG3504-(CGA)	4–75	0–100	NA
SG3505-(CGA)	5–150	0–200	NA
AG3570-(CGA)	2–30	-30" Hg–0–60	-1–0–4
AG3571-(CGA)	4–75	-30" Hg–0–100	-1–0–7
SG3550	1–6	0–15	NA
SG3551	1–6	0–15	NA
SG3552	1–6	0–15	NA

Note: Where "(CGA)" is indicated above, insert appropriate Compressed Gas Association connection number to complete the part number. Example: SG3504-110.

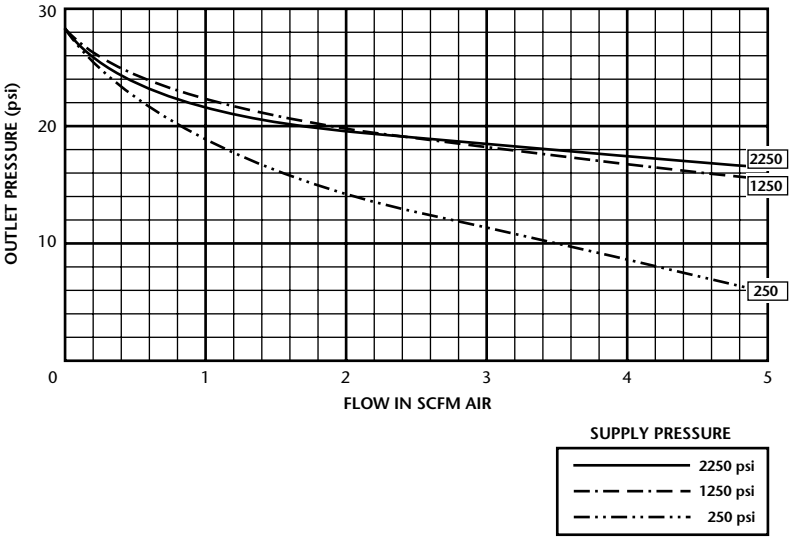


Figure 1 - Typical Performance
Model SG3504

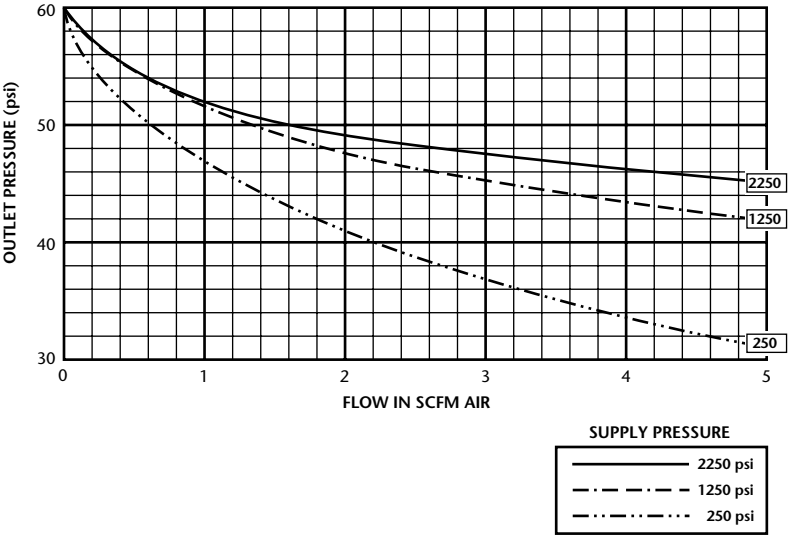


Figure 2 - Typical Performance
Model SG3505

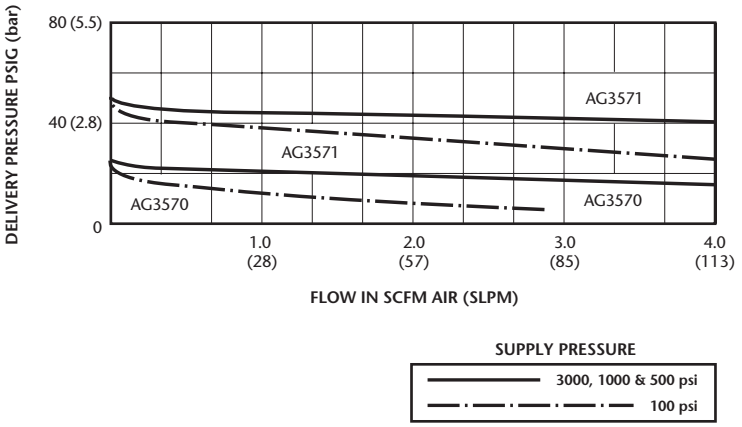


Figure 3 - Typical Performance
Models AG3570 and AG3571

WARRANTY

Advanced Specialty Gas Equipment Corp., (the Company), warrants to the initial purchaser of each regulator described herein, that such equipment will be free from defects in material and workmanship which result in breakdown or failure under normal use during a period of 12 months from date of shipment by the Company if used and maintained according to Advanced Specialty Gas Equipment written instructions. This warranty does not cover damage or malfunction due to corrosion. Purchaser is aware that this equipment is designed for specific applications and that using this equipment for the wrong application may damage or corrode the unit and cause personal injury. Purchaser must confirm that this equipment is compatible with the gas being passed through it. If there is any doubt about compatibility, consult your Advanced Specialty Gas Equipment Corp. distributor.

The Company's liability under this warranty shall be limited to the repair, or at its option, replacement or refund of the purchase price, of such equipment which proves to be defective, provided; however, that this warranty shall only apply if the purchaser (1) gives the Company written notice within (10) days after discovery of such defect, (2) immediately on discovery of the claimed defect, discontinues all use of such equipment, and (3) returns such equipment freight prepaid to plant of manufacture. **THERE ARE NO EXPRESS WARRANTIES OTHER THAN THOSE SPECIFIED HEREIN. NO WARRANTIES BY ADVANCED SPECIALTY GAS EQUIPMENT CORP. (OTHER THAN WARRANTY OF TITLE AS PROVIDED IN THE UNIFORM COMMERCIAL CODE) SHALL BE IMPLIED OR OTHERWISE CREATED UNDER ANY APPLICABLE LAW, INCLUDING BUT NOT LIMITED TO WARRANTY OF MERCHANTABILITY AND WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.**

No claim against the Company of any kind, whether as to equipment delivery or for nondelivery of equipment and whether or not based on contract, warranty, negligence, strict liability in tort or otherwise, shall be greater in amount than the purchase price of the equipment in respect of which such claim is made. Without limiting the generality of the foregoing, Advanced Specialty Gas Equipment Corp. shall not be liable for any special, indirect, or consequential damage, such as failure of parts resulting from corrosion.

If it is determined by Advanced Specialty Gas Equipment Corp. that the equipment is to be repaired or replaced under the terms of this warranty, the cost of returning said equipment to the initial purchaser will be paid by the Company. If, however, equipment returned to the Company in connection with a claim under this warranty is found by the Company not to be defective hereunder, then such equipment will be returned to the initial purchaser, shipping charges collect, and additionally, a service will be paid by the purchaser to the Company to cover the cost of handling and testing such equipment.

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Printed In U.S.A.
AI 2035R
3/03