5D Thermal Aerosol Generator

Operator Manual

www.ATItest.com

ATI Air Techniques INTERNATIONAL

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1. Introduction

The following instructions cover the specifications, features, operation, maintenance, and troubleshooting for the ATI 5D Thermal Aerosol Generator.

The instructions also contain important information required for operation of the generator. Before using this equipment, all personnel associated with the generator's operation must read and understand this entire manual and become familiar with the terminology.

Failure to follow the specified procedures and precautions could result in **PERSONAL INJURY OR DEATH** and/or risk of **FIRE**.

The ATI 5D Thermal Aerosol Generator uses a heating element to vaporize liquid reagent. The unit then expels the vapor using inert gas, which rapidly cools, generating aerosol.

Condensation (quenching) happens at the 5D output collar, before the vapor comes into contact with enough oxygen to combust. This quenching requirement makes an air-gap mandatory between the aerosol output and the system the aerosol is entering for testing. The 5D has built-in air quenching holes behind the output collar, which should not be covered or restricted.

It is to be used to introduce aerosol into below ambient pressure systems.

1.1. User Responsibility

The user must:

- Read and understand the information contained in this manual before using the product
- Understand the electrical and mechanical system principles used in the operation of this generator
- Be trained in the use of high pressure gas equipment
- Properly use this product for its intended purpose and follow all regulations and procedures that apply to the location where this product is used
- Maintain the product as specified in this manual
- Maintain and keep in proper working condition along with any other equipment associated with the operation of this product
- Ensure there is adequate pressure and flow of inert gas supply to the product
- Ensure that the inert gas has a minimum pressure of 3.45 bar (50 psi)
- Verify the type and quality of liquid aerosol reagent to be used with this product. See Appendix B: Specifications for list.
- If using a hose during testing, use an ATI hose adapter and hose

2. Precautions

⚠ WARNING

Follow Instructions
Failure to follow instructions may injure person or harm equipment. Read all instructions prior to operating or servicing equipment.

⚠ WARNING

Risk of Fire
Improper use can lead to fire. To avoid injury or damage:
•Use only approved liquid aerosols. •Use inert gas only.
•Do not use compressed air or other flammable gas.
•Disconnect gas and purge unit before opening fill cap.
•Do not move the generator while it is on. •Do not drain until cool.
•Do not spill liquid aerosol reagent. •Use only on a level surface.
•Do not cover or restrict quenching holes.

⚠ WARNING

Burn Hazard
Don't touch the output collar while hot. To avoid burns, let unit cool before servicing.

⚠ WARNING

High Pressure Gas Hazard
High pressure gas exerts dangerous force and can lead to harm to person or equipment. Close gas bottle valve, purge gas from line, disconnect gas line.

⚠ WARNING

Shipping Hazard
Drain the generator before shipping. Do not drain until cool. Disconnect gas and purge unit before opening.

Precautions - Español

⚠ ADVERTENCIA

Seguir las instrucciones
No seguir las instrucciones puede provocar lesiones a la persona o dañar el equipo. Leer todas las instrucciones antes de utilizar o realizar el mantenimiento del equipo.

⚠ ADVERTENCIA

Riesgo de incendio
Su uso de manera inapropiada puede provocar un incendio.
Para evitar lesiones a la persona o daño el equipo:
•Utilizar solo en superficie nivelada.
•No mover el generador cuando esté encendido.
•No verter reactivo en forma de aerosol líquido. Utilizar solo aerosoles líquidos certificados. •No tape los orificios de enfriamiento ni limite el acceso a ellos.
•No utilizar aire comprimido u otro gas inflamable; utilizar solo gas inerte asegurando todas las conexiones. •No vaciar hasta que se enfríe.
•Desconectar gas y unidad de purga antes de abrir.

⚠ ADVERTENCIA

Riesgo de quemaduras
No tocar el collar de potencia de salida mientras esté caliente. Para evitar quemaduras, permitir que la unidad se enfríe antes del mantenimiento.

⚠ ADVERTENCIA

Riesgo de gas de alta presión
El gas de alta presión ejerce una fuerza peligrosa y puede provocar daños a la persona o al equipo. Para evitarlo, despresuziar la línea de gas antes de desconectar.

⚠ ADVERTENCIA

Riesgo de envío
Vaciar el generador antes de enviar.

Precautions - Français

⚠ AVERTISSEMENT

Suivez les instructions
Tout non-respect de ces instructions peut engendrer des dégâts aux personnes ou aux biens. Lisez bien toutes ces instructions avant de mettre en route ou d'utiliser cet appareil.

⚠ AVERTISSEMENT

Risques d'incendie
Afin d'éviter des dégâts aux personnes ou aux biens:
•Utilisez cet appareil uniquement sur une surface plane.
•Ne déplacez pas le générateur lorsqu'il est en train de fonctionner.
•Ne versez pas de réactifs liquides sous forme d'aérosol; n'utilisez que des aérosols liquides spécialement approuvés. •N'utilisez pas d'air comprimé ou autres gaz inflammables; n'utilisez que des gaz inertes et sécurisez tous les branchements. •Ne videz pas l'appareil tant qu'il n'est pas froid; débranchez le gaz et nettoyez l'unité avant de l'ouvrir.
•Ne pas couvrir ou restreindre l'accès aux trous d'extinction.

⚠ AVERTISSEMENT

Risques de brulures
Ne touchez pas le collier de sortie lorsqu'il est chaud. Pour éviter les brulures, attendez que l'appareil refroidisse avant de l'utiliser.

⚠ AVERTISSEMENT

Risques liés aux gaz à haute pression
Les gaz à haute pression exercent des forces dangereuses susceptibles de provoquer des dégâts aux personnes ou aux biens. Pour éviter cela, dépressurisez la ligne de gaz avant de débrancher l'appareil.

⚠ AVERTISSEMENT

Risques lors du transport
Videz le générateur avant de le transporter.

Precautions - Svenska

⚠ VARNING

Följ instruktionerna
Underlåtenhet att följa instruktionerna kan skada personer eller utrustning. Läs alla instruktioner före drift eller service av utrustningen.

⚠ VARNING

Risk för brand
Felaktig användning kan leda till brand. För att undvika personskada eller skada på utrustningen:
•Använd endast godkända flytande aerosoler •Använd endast inert gas
•Använd inte tryckluft eller annan brandfarlig gas
•Töm inte ur innan den är sval. •Koppla från gas och rengör enheten före öppning. •Flytta inte generatorn medans den är igång.
•Spill inte flytande aerosolreagenser. •Använd endast en plan yta.
•Täck inte över eller begränsa kylande hål.

⚠ VARNING

Brännskaderisk
Rör inte output-hylsan när den är het. För att undvika brännskador, låt enheten svalna innan service.

⚠ VARNING

Högtrycksgas-risk
Högtrycksgas använder farlig kraft och kan leda till skador på personer eller utrustning. För att undvika detta, minska trycket i gasledningen innan du kopplar loss den.

⚠ VARNING

Fraktrisk
Töm u generatorn innan frakt.

Precautions - 中文

⚠ 警告

按照指示

不遵守指示可能会伤害人员或损害设备。在操作或维修设备之前阅读所有指示。

⚠ 警告

火灾风险

不正确的使用会导致火灾。为避免人身人身或设备损坏，请：

·仅在水平面上使用。
·不要盖住或限制淬火孔。
·启动机器时不要移动发电机。
·不要溅出液体气溶胶试剂。只使用经批准的液体气雾剂。
·不要使用压缩空气或其他易燃气体；只使用惰性气体，确保所有连接。
·直到温度下降前不要排空。打开前应断开气体并清理个体。

⚠ 警告

燃烧危险

灼热时不要接触输出口。为避免灼伤，请在维修之前让设备冷却。

⚠ 警告

高压气体危害

高压气体施加危险因素，可能导致对人员或设备的伤害。为避免危险，在断开之前对气体管线进行减压。

⚠ 警告

运输危险

发货前清空发电机。

3. What's Included

The standard 5D ships with the following.

Carefully unpack and remove the 5D Generator and all accessories from its shipping container. If the unit or any accessory has been damaged in transit, notify the shipper immediately. The 5D Generator consists of the base generator unit and items listed below. Optional accessories are listed on the following page.

Item #	Description	Part Number	Quantity
1	Base 5D Unit	9300408 (120V) or 9300409 (240V) 9300408-DOP (120V) or 9300409-DOP (240V)[1]	1
2	Shoulder Strap	11-00248-001	1
3	Power Cord, Black	6700179 (120V) or 6700180 (240V)	1
Not Shown	Operating Manual	73-00453-001	1

[1] For DOP reagent only, reagent level gauge not included.

4. Optional Accessories

Item #	Description	Part Number
1	Heavy Duty Rolling Transport Case	9300410
2	Inert Gas CO_2 Regulator, CA 320 Fitting	9300411
3	Hose Adapter Assembly	0200445
4	Inert Gas Tubing, Blue, 6 mm OD	91-00468-BLU
Not Shown	Inert Gas N_2 Regulator, CA 580 Fitting	9300412
Not Shown	Inert Gas N_2 Regulator, BS341 #3 Fitting	9300436
Not Shown	Inert Gas CO_2 Regulator, BS341 #8 Fitting	9300437

5. Controls and Indicators

5.1. Back Panel

Item #	Feature	Function
1	Inert Gas Inlet	Connects user-provided tubing from inert gas source to unit
2	Power ON/OFF Switch	Turns main power ON and OFF
3	Main Power Input & Fuse	Connects power cord to unit

5.2. Top Panel

Item #	Feature	Function
1	Liquid Level Indicator Fill Cap	Used for filling the unit with liquid aerosol reagent
2	Purge Valve	Used to purge the unit after use
3	Aerosol ON/OFF Switch	Controls ON/OFF of aerosol reagent
4	Ready Light	Luminates red when unit is on; turns green when unit is ready for operation
5	Metering Valve	Controls the aerosol concentration level. Turn counter clockwise to increase concentration; turn clockwise to decrease concentration.
6	Inert Gas Pressure Gauge	Shows inert gas pressure

5.3. Front Panel

Item #	Feature	Function
1	Output Nozzle	Metal outlet for aerosol stream
2	Output Collar	Attaches user-provided 2-inch hose or hose adapter to unit
3	Quenching Holes	Allows ambient air flow into vapor stream. Do NOT block quenching holes, doing so will create a safety hazard.

6. Operation

6.1. Pre-Operation Procedure

Each time before starting operation of the generator, perform the following inspections. Any failure of these inspections must be addressed and corrected before attempting to start the generator.

Step 1. Inspect power cord for degradation, frays, prong damage, etc. Replace the power cord if necessary. Use only the ATI-supplied power cord (See Appendix C: Spare Parts List for replacement).

Step 2. Inspect inert gas source for proper gas type, adequate tank pressure, and regulator operation.

Step 3. Inspect inert gas line, checking for any leaks, cracks, kinks, or signs of wear. Replace the line if necessary.

Step 4. Inspect liquid aerosol reagent container label for proper identification. Also inspect liquid aerosol reagent for cleanliness and transparency.

Step 5. Fully close the Metering Valve and push the Aerosol Switch to OFF.

Step 6. Place the generator in the location where it will be used. Once the generator begins to heat up, it should not be moved.

Step 7. Position the generator so controls are readily accessible.

6.2. Operating the 5D

WARNING: Operator must be present for the safe operation of the 5D. Do not leave a running 5D unattended.

Step 1. Inspect unit knobs, valves and gas line for damage. Clean unit of any oil before use. Make sure aerosol switch is OFF and metering valve is completely closed (turned fully clockwise).

CAUTION: Paraffin Oil and Corn Oil should NEVER be used as reagents for Thermal Aerosol Generators.

Step 2. Press PURGE before loosening fill cap to ensure tank is not pressurized. Fill unit with appropriate reagent and replace cap when finished. Clean unit of any oil before use.

WARNING FIRE HAZARD: Ensure that the quenching holes are not blocked or covered. Failure to do so will result in a fire hazard.

Step 3. Connect inert gas and verify pressure setting of 3.45 bar ± 0.07 bar (50 psi ± 1.0 psi) at source regulator. NEVER use compressed air, non-inert or flammable gas.

Step 4. Turn main power ON. (|)

Step 5. Wait for READY light to turn green.

Step 6. Turn aerosol ON.

Step 7. Turn metering valve two turns counter clockwise to start flow. Unit will produce aerosol in about 10 seconds. Once started, adjust as needed.

WARNING: To achieve full output, turn the metering valve counter clockwise at a rate not to exceed two turns per minute. A rapid increase in aerosol output will result in a wet aerosol, which could result in a fire hazard.

6.3. Shut Down

Step 1. Push the aerosol switch to OFF.

Step 2. Close the metering valve by fully turning the metering valve knob clockwise.

Step 3. Allow all visible aerosol to purge out of the output collar.

Step 4. Turn electrical power to the generator at the main power ON/OFF switch. (Ø)

Step 5. Turn off the inert gas flow to the 5D, but do not disconnect.

Step 6. Hold down the PURGE button until all of the gas is expelled. This purges the system of residual aerosol or wet liquid aerosol reagent and depressurizes the system.

Step 7. Disconnect the gas line, power cord, and any connections to the output collar.

Step 8. Allow the generator to cool for 10 minutes.

Step 9. If the generator will not be used for more than 24 hours, the reservoir should be drained of liquid aerosol reagent into a properly labeled container.

⚠ **CAUTION:** Failure to follow the Shut Down procedure may result in damage to the equipment.

6.4. Changing Liquid Aerosol Reagent

⚠ **CAUTION:** NEVER use Corn Oil or Paraffin Oil.

⚠ **CAUTION:** If using DOP reagent, use Base 5D Unit P/N 9300408-DOP (120V) or 9300409-DOP (240V). Do NOT use DOP with standard P/N 9300408 or 9300409.

Step 1. Remove fill cap.

Step 2. Drain reservoir.

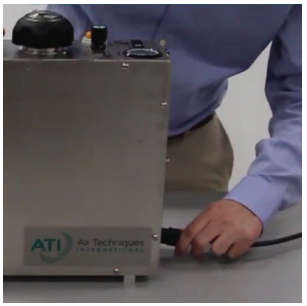
Step 3. Refill with new reagent.

Step 4. Replace cap.

Note: Unit's oil reservoir must drained before storage or shipping.

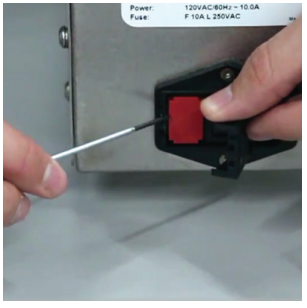
7. Maintenance

7.1. Replacing Main Power Fuses

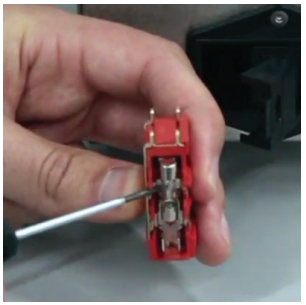


Step 1. Disconnect unit from power source.

Step 2. Identify voltage rating on manufacturer label.



Step 3. Remove fuse holder using a flat-head screwdriver.

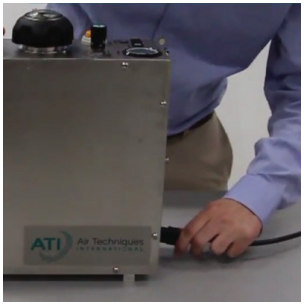


Step 4. Inspect fuses to see if they are blown. Replace fuses as needed according to the table below.

5D Model	Fuse Type
ATI P/N 9300408 (120V)	ATI P/N 41-00466-010, 5X20mm, 10A, 250V, FAST BLO
ATI P/N 9300409 (240V)	ATI P/N 41-00566-005, 5X20mm, 5A, 250V, FAST BLO

Step 5. Replace fuse holder and close cover.

Note: If unit continues to blow fuses, contact ATI.



Step 6. Reconnect unit to power source.

7.2. Preventative Maintenance

In order to keep the unit operating satisfactorily, perform the following procedure after every use.

Step 1. Clean and wipe off the outside of the unit to remove residual liquid aerosol reagent with a non-flammable cleaning agent.

Step 2. Check the unit for liquid aerosol reagent leakages. Check the output nozzle for blockage or deposits.

Step 3. Check the output collar for looseness. Tighten any loose fasteners as necessary.

Step 4. Check for looseness of fasteners around the unit. Tighten any loose fasteners as necessary.

Step 5. Clean nozzle of any residual aerosol.

7.3. Scheduled Maintenance

You can return the generator to ATI (or a factory authorized facility) for an annual factory inspection, adjustment, and any required service.

To return the generator for service, contact ATI Customer Service at:
+1 (410) 363-9696 for US, **+44 (0) 1462 676446** for EMEA or visit **www.ATItest.com**.

8. Appendix A: Warranty

Limitation of Warranty and Liability

Air Techniques International, hereinafter referred to as ATI, warrants the equipment purchased hereunder to be free from defect in materials and workmanship under normal use and service, when used for the purpose for which it is designed, for a period of (1) one year from the date of shipment. ATI further warrants that the equipment will perform in accordance with the technical specifications accompanying the formal equipment offer.

ATI will repair or replace any such defective items that may fail within the stated warranty period, PROVIDED:

A. That any claim of defect under this warranty is made within thirty (30) days after discovery thereof and that inspection by ATI, if required, indicates the validity of such claim to ATI's satisfaction.

B. That the defect is not the result of damage incurred in shipment to or from our factory.

C. That the equipment has not been altered in any way whether as to design or use, whether by replacement parts not supplied or approved by ATI, or otherwise.

D. That any equipment or accessories furnished but not manufactured by ATI, or not of ATI design, shall be subject only to such adjustments as ATI may obtain from the supplier thereof.

ATI's obligation under this warranty is limited to the repair or replacement of defective parts with the exception noted above. If the equipment includes a scattering chamber, ATI's warranty does not extend to contamination of the scattering chamber by foreign material.

At the discretion of ATI, any defective equipment that fails within the warranty period shall be returned to ATI's factory for inspection, properly packed with shipping charges prepaid. No equipment shall be returned to ATI without prior issuance of a return authorization by ATI.

No warranties, express or implied, other than those specifically set forth herein shall be applicable to any equipment manufactured or furnished by ATI and the foregoing warranty shall constitute the Buyer's sole right and remedy. In no event does ATI assume any liability for consequential damages, or for loss, damage or expense directly or indirectly arising from the use of ATI products, or any inability to use them either separately or in combination with other equipment or materials or from any other cause.

Service Policy

If the unit is defective or not working properly, contact ATI Customer Service to obtain a return authorization.

For Americas & Asia Pacific

Address	Air Techniques International 11403 Cronridge Drive Owings Mills, MD 21117 USA
Phone	+1 (410) 363-9696
Fax	+1 (410) 363-9695
E-mail	info@atitest.com

For Europe, Middle East & Africa

Address	ATI EMEA Headquarters 4 Campus Five Letchworth Business Park Letchworth Garden City Hertfordshire UK SG6 2JF
Phone	+44 (0) 1462 676446
Fax	+44 (0) 1462 486078
E-mail	salesuk@atitest.com

9. Appendix B: Specifications

Operational Requirements

Ambient Temperature	0 to 40º C (32 to 104º F with no condensation or icing)
Ambient Pressure	Standard atmosphere
Ambient Humidity	5% to 95%
Storage Requirements	-25 to 55º C (-13 to 131º F with no condensation or icing) Less than 95% relative humidity non-condensing

Product Specifications

Dimension (L x W x H)	430 mm x 125 mm x 360 mm (17 in. x 5 in. x 15 in.)
Weight	9 kg (20 lbs.) empty
Power	120 VAC, 60 Hz, 10 Amps (for P/N 9300408 and 9300408-DOP) 240 VAC, 50 Hz, 5 Amps (for P/N 9300409 and 9300409-DOP)
Power Consumption	1050 Watts
Electrical Fuses (120V)	5 x 20 mm, 10A, 250V, FAST BLO (2)
Electrical Fuses (240V)	5 x 20 mm, 5A, 250V, FAST BLO (2)
Aerosol Reagent	PAO-4, DOS (DEHS), Ondina EL, Mineral Oil: (P/N 9300408, 9300409) DOP (DEHP): (P/N 9300408-DOP, 9300409-DOP)
Liquid Aerosol Reagent Capacity	1.1 liters (64 fl oz) of reservoir capacity
Compressed Inert Gas Input	3.45 bar ± 0.07 bar (50 psi ± 1.0 psi)
Compressed Inert Gas Consumption Rate (Continuous)	6 lpm (0.21 cfm)
Duct System Requirement	Negative pressure required. Positive duct pressure may require a Positive Injection Pump (sold separately).
Duty Cycle	Intermittent ON/OFF or <4 hours ON and >1 hour OFF

Performance Specifications

Generation	Thermal condensation
Warm Up Time	<2-3 minutes to reach operating temperature of 370° C (698° F)
System Flow Rates	833-119,000 m^3/hr (500 – 70,000cfm)
Max. Aerosol Concentration	100mg/m^3 @ 11,900m^3/hr (100µg/l @ 7,000 cfm) 10mg/m^3 @ 119,000 m^3/hr (10µg/l @ 70,000 cfm)
Max. Oil Consumption	19.8 g/min (0.776 oz)
Runtime	41 minutes (at maximum oil consumption)
Particle Distribution	Meets ANSI/ASME N509/510

10. Appendix C: Spare Parts List

Item Description	Part Number
Replacement Line Cord, 120V / 240V	6700179 / 6700180
Replacement Fill Cap	65-00244-001
Operation and Maintenance Manual	73-00453-001
Fuses, 120V / 240V	41-00466-010 / 41-00466-005
Inert Gas Inlet Fitting	5100013
PAO-4, 1 Gallon	T000-1075
PAO-4, 5 Gallon	T000-0795
PAO - 2L, 2 Liters	990-807/2
PAO - 10L, 10 Liters	990-807/10
PAO - 20L, 20 Liters (EMEA only)	990-807/20
Ondina x420 Oil, 2 Liters	990-803/2
Ondina x420 Oil, 10 Liters	990-803/10
Ondina x420 Oil, 20 Liters (EMEA only)	990-803/20

11. Appendix D: Troubleshooting

Contact ATI for any major repair service.

Symptom: No aerosol output

Probable Cause	Remedy
Liquid aerosol reagent reservoir is empty	Fill reservoir with liquid aerosol reagent.
Aerosol switch in OFF (Ø) position	Move the aerosol switch to ON. (|)
Metering valve is closed	Turn metering knob counterclockwise to open.
Green ready light is not lit	Ensure inert gas is connected to unit. Wait a minimum of three minutes for unit to warm up.
The fill cap is leaking	Tighten the fill cap. Replace if necessary.
Inert gas pressure is incorrect	Set inert gas pressure to 3.45 bar ± 0.07 bar (50 psi ± 1.0 psi).
Heater block tubing is blocked	Return for service.
Internal solenoid valve is defective	Return for service.

Symptom: Unit takes too long or never gets to operating temperature

Probable Cause	Remedy
Not enough time allowed for the unit to warm up	Wait a minimum of three minutes for unit to warm up.
Cartridge heater(s) is defective	Return for service.
Temperature controller is defective	Return for service.

Symptom: Inconsistent aerosol output

Probable Cause	Remedy
Heater block is blocked or partially blocked	Return for service.
Fill cap is loose or leaking	Tighten fill cap. Replace if necessary.
Operating temperature is incorrect	Switch OFF the aerosol and wait a minimum of 2-3 minutes for the temperature to stabilize.
Inert gas pressure is incorrect	Set inert gas pressure to 3.45 bar ± 0.07 bar (50 psi ± 1.0 psi).
Inert gas line is blocked, kinked, or leaking	Check inert gas line. Replace as necessary.
Internal regulator is defective	Return for service.
Internal solenoid valve is defective	Return for service.

Symptom: Wet aerosol

Probable Cause	Remedy
Generator was not purged before starting operation	Turn OFF aerosol switch and PURGE gas flow for one minute.
Improper inert gas pressure	Set inert gas pressure to 3.45 bar ± 0.07 bar (50 psi ± 1.0 psi).
Metering valve knob turned counterclockwise beyond recommended setting	Switch OFF the aerosol, PURGE line and wait a minimum of two minutes for temperature to stabilize. Turn the aerosol switch to ON. Turn the metering valve knob counterclockwise for two turns.
Improper operating temperature	Switch OFF the aerosol and wait a minimum of three minutes for temperature to stabilize. Tighten the fill cap. Replace if necessary.
Internal regulator is defective	Return for service.

Symptom: Gas sounds like it is escaping from inside unit (not only from output nozzle)

Probable Cause	Remedy
Inert gas pressure is incorrect	Set inert gas pressure to 3.45 bar ± 0.07 bar (50 psi ± 1.0 psi).
Gas is leaking inside the unit	Return for service.

12. Appendix E: Manual Revision History

Revision	Date	Notes
A	July 2017	Initial release
B	November 2017	Corrected inert gas input setting
C	February 2018	Corrected operating temperature listed in the Performance Specification Table
D	March 2018	Revised format
E	June 2018	Updated sequence of operation
F	January 2019	Updated shut down procedure
G	December 2019	Revised safety and warning callouts
H	January 2025	Added information for the DOP-compatible generator without level gauge

Air Techniques INTERNATIONAL

Protecting People, Products & Critical Infrastructure

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