



Agilent 8860 Gas Chromatograph

Safety Manual



Notices

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Safety Notices

CAUTION

A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

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Important Safety Warnings

Before moving on, there are several important safety notices that you should always keep in mind when using the Agilent 8860 GC.

WARNING

When handling/using chemicals for preparation or use within the GC, all applicable local and national laboratory safety practices must be followed. This would include, but is not limited to, correct use of Personal Protective Equipment (PPE), correct use of storage vials, using vent hoods, and correct handling of chemicals, as defined in the laboratory's internal safety analysis and standard operating procedures. Failure to adhere to laboratory safety practices could lead to injury or death.

Many internal parts of the GC carry dangerous voltages

If the GC is connected to a power source, even if the power switch is off, potentially dangerous voltages exist on:

- The wiring between the GC power cord and the AC power supply, the AC power supply itself, and the wiring from the AC power supply to the power switch.

With the power switch on, potentially dangerous voltages also exist on:

- All electronics boards in the instrument.
- The internal wires and cables connected to these boards.
- The wires for the oven motor.
- The wires for the oven heater.

WARNING

All these parts are shielded by covers. With the covers in place, it should be difficult to accidentally make contact with dangerous voltages. Unless specifically instructed to, never remove a cover unless the instrument is unplugged.

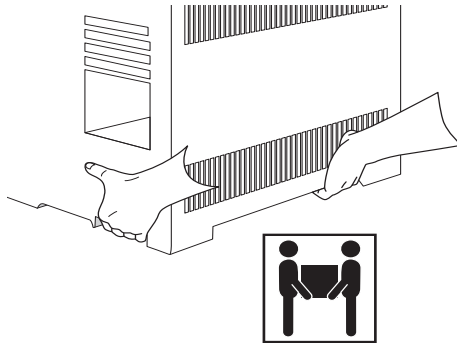
WARNING

If the power cord insulation is frayed or worn, the cord must be replaced. Contact your Agilent service representative.

Lifting

WARNING

The GC is heavy. To avoid injury, use a two-person lift.



CAUTION

Make sure that all samplers, trays, and detectors have been removed prior to moving or relocating the GC. Prior to moving, all covers and enclosures must also be seated properly. Make sure all covers and enclosures are secure.

CAUTION

Make sure your GC has adequate distance from the wall and other instruments.

Do not use an Uninterruptable Power Supply (UPS) with a GC

If the area where the GC is located suddenly loses power, an unsafe condition can result if the GC remains powered on. Do not use the GC with a UPS.

Electrostatic discharge is a threat to GC electronics

The printed circuit (PC) boards in the GC can be damaged by electrostatic discharge. Do not touch any of the boards unless it is absolutely necessary. If you must handle them, wear a grounded wrist strap and take other antistatic precautions. Wear a grounded wrist strap any time you must remove the GC right side cover.

Many parts are dangerously hot

Many parts of the GC operate at temperatures high enough to cause serious burns. These parts include but are not limited to:

- The inlet area
- The oven and its contents
- The detector area
- The column nuts attaching the column to an inlet or detector
- The valve box

You should always cool these areas of the GC to room temperature before working on them. They will cool faster if you first set the temperature of the heated zone to room temperature. Turn the zone off after it has reached the setpoint. If you must perform maintenance on hot parts, use a wrench and wear thermally protective gloves.

Whenever possible, cool the instrument part that you will be maintaining before you begin working on it. Do not open the oven door immediately after the heating sequence.

WARNING

Be careful when working behind the instrument. During cool-down cycles, the GC emits hot exhaust which can cause burns.

WARNING

The insulation around the inlets, detectors, valve box, and the insulation cups is made of refractory ceramic fibers. To avoid inhaling fiber particles, we recommend the following safety procedures: ventilate your work area; wear long sleeves, gloves, safety glasses, and a disposable dust/mist respirator; dispose of insulation in a sealed plastic bag; wash your hands with mild soap and cold water after handling the insulation.

Oven thermal leaks

WARNING

Objects passing through the oven door seal can cause thermal leaks which create hazardous hot spots which cause burns and melt equipment.

Do not allow wiring or temperature probes to pass through the oven door jam. Agilent recommends using one of the access holes. If the access hole is used, replace the insulation so there are no thermal leaks.

Hydrogen Safety

Hydrogen gas may be used as carrier gas, and/or as fuel for the FID, FPD, NPD, and SCD. When mixed with air, hydrogen can form explosive mixtures.

WARNING

When using hydrogen (H₂) as the carrier gas or fuel gas, be aware that hydrogen gas can flow into the GC oven and create an explosion hazard. Therefore, be sure that the supply is turned off until all connections are made and ensure that the inlet and detector column fittings are either connected to a column or capped at all times when hydrogen gas is supplied to the instrument.

Hydrogen is flammable. Leaks, when confined in an enclosed space, may create a fire hazard. In any application using hydrogen, leak test all connections, lines, and valves before operating the instrument. Always turn off the hydrogen supply at its source before working on the instrument.

Hydrogen is a commonly used GC carrier gas. Hydrogen is potentially explosive and has other dangerous characteristics.

- Hydrogen is combustible over a wide range of concentrations. At atmospheric pressure, hydrogen is combustible at concentrations from 4% to 74.2% by volume.
- Hydrogen has the highest burning velocity of any gas.
- Hydrogen has a very low ignition energy.
- Hydrogen that is allowed to expand rapidly from high pressure into the atmosphere can self-ignite due to an electrostatic spark.
- Hydrogen burns with a nonluminous flame which can be invisible under bright light.

Hydrogen shutdown

Hydrogen gas may be used as a carrier or as fuel for some detectors. When mixed with air, hydrogen can form explosive mixtures.

The GC monitors inlet, detector, and auxiliary gas streams. If a stream shuts down because it is unable to reach its flow or pressure setpoint *and* if that stream is configured to use hydrogen, the GC assumes that a leak has occurred and declares a shutdown. The effects are:

- The offending channel and any associated channels (such as septum purge) are set off.
- The split valves in the inlets open.
- The oven (heater and fan) turns off.
- The small heated zones are turned off.
- An alarm tone sounds.

To recover from this state, fix the cause of the shutdown (tank valve closed, serious leak, others).

1 Introduction

Measuring hydrogen gas flows

WARNING

The GC cannot always detect small leaks in inlet and/or detector gas streams. For this reason, it is vital that column fittings should always be either connected to a column, or have a cap or plug installed. The H₂ streams must be configured for hydrogen so that the GC is aware of hydrogen use.

Measuring hydrogen gas flows

WARNING

Do not measure hydrogen together with air or oxygen. This can create explosive mixtures that can be ignited by the automatic ignitor.

To avoid this hazard turn the automatic ignitor off before you begin, and always measure gases separately.

Fume Hood

During normal operation of the GC with many detectors and inlets, some of the carrier gas and sample vents outside the instrument through the split vent, septum purge vent, and detector exhaust. If any sample components are toxic, noxious, otherwise hazardous, or if hydrogen is used, these exhausts must be vented to a fume hood. If the GC is in an enclosed small space then a fume hood should be used regardless of the GC gases connected. Place the GC in the hood or attach a large diameter venting tube to the outlet for proper ventilation.

Electron Capture Detector (ECD)

The ECD contains a cell plated with ^{63}Ni , a radioactive isotope. The beta particles released at the energy level in the detector have little penetrating power—the surface layer of the skin or a few sheets of paper will stop most of them—but they may be hazardous if the isotope is ingested or inhaled. For this reason, handle the cell with care. Cap the detector inlet and outlet fittings when the detector is not in use. Never introduce corrosive chemicals into the detector. Vent detector exhaust outside the laboratory environment.

Refer to the safety documentation provided with the detector for important details about safety, maintenance, and compliance with local government regulation.

WARNING

Materials that may react with the ^{63}Ni source, either to form volatile products or to cause physical degradation of the plated film, must be avoided. These materials include oxidizing compounds, acids, wet halogens, wet nitric acid, ammonium hydroxide, hydrogen sulfide, PCPs, and carbon monoxide. This list is not exhaustive but indicates the kinds of compounds that may cause damage to ^{63}Ni detectors.

WARNING

In the extremely unlikely event that the oven or the detector-heated zone should go into thermal runaway (maximum, uncontrolled heating in excess of 425 °C) and the detector remains exposed to this condition for more than 12 hours, take the following steps:

- 1 After turning off the main power and allowing the instrument to cool to room temperature, cap the detector inlet and exhaust vent openings. Wear disposable plastic gloves and observe normal laboratory safety precautions.
- 2 Contact your local Agilent Technologies sales office or distributor for ECD disposal instructions
- 3 Include a letter stating the condition of abuse.

It is unlikely, even in this very unusual situation, that radioactive material will escape the cell. However, permanent damage to the ^{63}Ni plating within the cell is possible; therefore, the cell must be returned for exchange.

WARNING

Do not use solvents to clean the ECD.

WARNING

You may not open the ECD cell unless authorized to do so by your local nuclear regulatory agency. Do not disturb the four socket-head bolts. These hold the cell halves together. United States customers: removing or disturbing the four socket-head bolts is a violation of the terms of the exemption and could create a safety hazard.

When handling ECDs:

- Never eat, drink, or smoke.
- Always wear safety glasses when working with or near open ECDs.
- Wear protective clothing such as laboratory jackets, safety glasses, and gloves, and follow good laboratory practices. Wash hands thoroughly with a mild nonabrasive cleaner after handling ECDs.

- Cap the inlet and outlet fittings when the ECD is not in use.
- Connect the ECD exhaust vent to a fume hood or vent it to the outside. See the latest revision of 10 CFR Part 20 (including Appendix B), or the applicable state regulation. For other countries, consult with the appropriate agency for equivalent requirements.

Agilent Technologies recommends a vent line internal diameter of 6 mm (1/4-inch) or greater. With a line of this diameter, the length is not critical.

Fuses and Batteries

The GC requires two fuses (F1, F2) for proper operation. The replacement fuses are F1/F2-Ceramic body, 20 A, 250 V, Type F, but must only be accessed by Agilent trained service personnel.

There is a Real Time Clock component on the Logic board that includes a battery inside.

WARNING

Disconnect the appliance inlet coupler from the main supply before replacing the fuses.

Disconnect Device

WARNING

Appliance inlet coupler (main input power cord) is the power disconnect device. Do not position the instrument such that access to the coupler or plug is impaired.

WARNING


The front power switch does not disconnect power for the instrument. Pressing the disconnect switch places the instrument in a standby mode. To avoid an electric shock hazard, disconnect the device by unplugging the power cord before performing instrument service.

Safety and Regulatory Certifications

The Agilent 8860 GC conforms to the following safety standards:

- Canadian Standards Association (CSA): C22.2 No. 61010-1
- CSA/Nationally Recognized Test Laboratory (NRTL): ANSI/UL 61010-1
- International Electrotechnical Commission (IEC): 61010-1, 61010-2-010, 61010-2-081
- EuroNorm (EN): 61010-1

The Agilent 8860 GC conforms to the following regulations on Electromagnetic Compatibility (EMC) and Radio Frequency Interference (RFI):

- CISPR 11/EN 55011: Group 1, Class A
- IEC/EN 61326-1
-  AUS/NZ

The Agilent 8860 GC complies with the following company standard:

- Q31/0115000033CXXX-2018
- The China Pattern certificate number is 2018CXXX-31.

This ISM device complies with Canadian ICES-001. Cet appareil ISM est conforme a la norme NMB-001 du Canada.

- CAN ICES-1/NMB-1, ISM 1-A

CE Compliance



Your Agilent instrument has been designed to comply with the requirements of the applicable directives of the European Union, such as Electromagnetic Compatibility (EMC) Directive, Low Voltage Directive (LVD), Machinery Directive (MD), RoHS Directive, etc. Agilent has confirmed that each product complies with the relevant Directives by testing samples against the harmonized EN (European Norm) standards published on the Official Journal of the European Union (OJEU).

Proof that a product complies with these directives is indicated by:

- The CE Marking appearing on the rear of the product, and
- The documentation package that accompanies the product containing a copy of the Declaration of Conformity. The Declaration of Conformity is the legal declaration by Agilent that the product complies with the relevant directives listed above, and it shows the EN standards to which the product was tested to demonstrate compliance.

UK Compliance



Your Agilent instrument has been designed to comply with the requirements of the applicable regulations of the United Kingdom, such as The Electromagnetic Compatibility Regulations 2016, The Electrical Equipment (Safety) Regulations 2016, The Supply of Machinery (Safety) Regulations 2008, The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012, etc.

Agilent has confirmed that each product complies with the relevant Regulations by testing samples against the designated standards published on GOV.UK.

Proof that a product complies with these regulations is indicated by:

- the UK CA Marking appearing on the rear of the product, and
- the documentation package that accompanies the product containing a copy of the Declaration of Conformity. The Declaration of Conformity is the legal declaration by Agilent that the product complies with the relevant regulations listed above, and shows the designated standards to which the product was tested to demonstrate compliance.

Regulatory compliance identification number

For the purpose of regulatory compliance certifications and identification, your product has been assigned a unique Agilent Regulatory Model Number (RMN). The 8860 GC RMN2790A can be found on the product nameplate label, along with all required approval markings and information. When requesting compliance information for this product, always refer to this RMN. The RMN should not be confused with the marketing name or model number of the product.

EMC Declaration for South Korea

사용자안내문

이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.

This equipment has been evaluated for its suitability for use in a commercial environment. When used in a domestic environment, there is a risk of radio interference.

Detachable Power Cord Declaration for Japan

(弊社提供の電源コードセットが汎用性がない旨を示す)

電源コードセットの取扱いについて (日本国内向け)

製品には、同梱された電源コードセットをお使いください。同梱された電源コードセットは、他の製品では使用できません。

Notice - The power cords for Japanese market

Your product must only use the power cord that was shipped with this product. Do not use this power cord with any other product.

Information

The Agilent Gas Chromatograph meets the following IEC (International Electro-technical Commission) classifications: Safety Class 1, Transient Overvoltage Category II, Pollution Degree 2.

This unit has been designed and tested in accordance with recognized safety standards and is designed for use indoors in non-classified locations. If the instrument is used in a manner not specified by the manufacturer, the protection provided by the instrument may be impaired. Whenever the safety protection of the Agilent Gas Chromatograph has been compromised, disconnect the unit from all power sources and secure the unit against unintended operation.

Refer servicing to qualified service personnel. Substituting parts or performing any unauthorized modification to the instrument may result in a safety hazard.

Symbols

The apparatus is marked with this symbol when the user should refer to the instruction manual in order to protect risk of harm to the operator and to protect the apparatus against damage.



Indicates a hot surface or hot exhaust gases. Keep hands, electrical cables, gas lines, chart paper, combustible material, and other items safely clear of the hot surface and/or exhaust stream. Hot gas streams may be present in several locations such as the oven exhaust and the detector exhaust.



Indicates hazardous voltages.



Indicates earth (ground) terminal.



Indicates potential explosion hazard.



Indicates radioactivity hazard.



Indicates electrostatic discharge hazard.



Indicates a hazard. See the Agilent GC user documentation for the item labeled.



Indicates that you must not discard this electrical/electronic product in domestic household waste



To prevent personal injury, two person lift recommended



Manufacturing date.



Power symbol indicates **On/Off**. The apparatus is not completely disconnected from the main supply when the power switch is in the **Off** position.



Warnings in the manual or on the instrument must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions violates safety standards of design and the intended use of the instrument. Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.

Electromagnetic compatibility

This device complies with the requirements of CISPR 11. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try one or more of the following measures:

- 1 Relocate the radio or antenna.
- 2 Move the device away from the radio or television.
- 3 Plug the device into a different electrical outlet, so that the device and the radio or television are on separate electrical circuits.
- 4 Make sure that all peripheral devices are also certified.
- 5 Make sure that appropriate cables are used to connect the device to peripheral equipment.
- 6 Consult your equipment dealer, Agilent Technologies, or an experienced technician for assistance.
- 7 Changes or modifications not expressly approved by Agilent Technologies could void the user's authority to operate the equipment.

Sound Emission Certification for Federal Republic of Germany

Sound pressure

Sound pressure $L_p < 70$ dB(A) according to DIN-EN 27779.

Schalldruckpegel

Schalldruckpegel $LP < 70$ dB(A) nach DIN-EN 27779.

Intended Use

Agilent products must only be used in the manner described in the Agilent product user guides. Any other use may result in damage to the product or personal injury. Agilent is not responsible for any damages caused, in whole or in part, by improper use of the products, unauthorized alterations, adjustments or modifications to the products, failure to comply with procedures in Agilent product user guides, or use of the products in violation of applicable laws, rules or regulations.

Cleaning and Disinfecting

The United States Centers for Disease Control and Prevention (CDC) lists a variety of chemicals and commercial products for disinfection, however, some of these are not suitable for cleaning Agilent instruments. A compatible, CDC-recommended cleaning solution for external instrument surfaces is a solution of 70% isopropanol (isopropyl alcohol) and 30% water. This solution is commonly sold in stores as rubbing alcohol.

Concentrations of isopropanol above 70% may damage the instrument.

WARNING

When working with solvents observe appropriate safety procedures (for example, goggles, safety gloves and protective clothing) as described in the safety data sheet supplied by the solvent vendor, especially when toxic or hazardous solvents and flammable liquids are used. For this cleaning procedure, the appropriate personal protective equipment (PPE) consists of nitrile or similar gloves, safety glasses, and a laboratory coat.

General procedure

Use the following procedure to clean often-touched external surfaces of Agilent instruments.

NOTE

Any thermal zone on an instrument is likely to already be decontaminated, provided it was operated above 121 °C for at least one hour. For example, on a gas chromatograph, the inlets, oven, columns, transfer lines, and detectors can be decontaminated by setting the temperature zones to 200 °C for at least one hour. To avoid burns, cool these temperature zones to room temperature before accessing.

- 1 Before beginning, establish the current baseline performance as appropriate. For example, if using an MS perform an autotune and generate a report.
- 2 Put on the appropriate PPE.
- 3 Cool all thermal zones and allow them to reach room temperature.
- 4 Wait until the instrument is cool, then turn off the instrument and disconnect the power cord. Never clean an instrument while it is powered on or plugged in. Never clean an instrument while it is hot.
- 5 Remove any external devices, if necessary, to allow cleaning access to all potentially contaminated surfaces. For example, remove an ALS and clean separately. (If desired you can disconnect a GC or LC from a mass spectrometer or other connected instrument as

described in its user documentation to allow cleaning between the instruments. Be sure to use all of the recommended procedures and two persons if it is necessary to move the instruments.)

- 6 If needed, create an amount of 70% isopropanol/30% water solution that is sufficient to clean the instruments.

WARNING

Never spray any liquids directly onto the product.

- 7 Moisten a clean, lint-free cloth with the mixture of 70% isopropanol/30% water.
 - Do not use a paper towel or other fibrous material.
 - The cloth should be moist, not dripping wet.
- 8 Gently wipe external surfaces to be cleaned using the moistened cloth. Do not allow any liquid to drip into the instrument. Many areas inside Agilent instruments contain electrical wiring, printed circuit boards, and other parts that can be damaged by liquids or potentially create an electrical safety hazard when wet.
 - Start with the top and side surfaces, and end with external cabling, external gas supply lines, and transfer lines.
 - Wipe the outer surface of cables and their connectors but do not touch the electrical connections (for example, pins and plugs inside the cable or connection port).
 - When cleaning a display or touchscreen, carefully wipe in one direction, moving from the top to the bottom.
- 9 Allow all surfaces to completely air-dry. No moisture should be present on the instrument surfaces.
- 10 Plug in the instruments. If separated, return instruments to their original locations on the lab bench, and restore to normal operating conditions as described in the instrument user documentation.
- 11 Verify performance after reassembly, as appropriate.
- 12 Discard the gloves and other personal protective equipment or clean them in an approved process, then wash your hands.

Refer to the instrument documentation for stabilization times after turning everything back on.

You may notice some visible changes to cosmetic finishes over time as a result of the cleaning techniques mentioned in this document.

Other cleaners

While there are many other common household cleaners and disinfectants recommended by the CDC for disinfecting surfaces, many of these can damage painted surfaces and electronic products. Do not use: bleach (including sodium hypochlorite), peroxides (including hydrogen peroxide), acetone, ammonia, quaternary ammonium-based cleaners, ethyl alcohol, methylene chloride,

sodium dichloroisocyanurate (sodium dichloro-S-triazinetrione), or any petroleum-based solvents (for example gasoline, paint thinner, benzene, or toluene). This includes wipes, liquids, and sprays. Read the product labels.

Recycling the Product



Instructions for Disposal of Waste Equipment by Users in the European Union. This symbol on the product or its packaging indicates that this product must not be disposed of with other waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city recycling office or the dealer from whom you originally purchased the product.

For recycling, contact your local Agilent sales office.

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