

GC-8A Series

Shimadzu
Gas Chromatographs





**Personal Gas Chromatograph
GC-8A Series**

GC-8A Series

Shimadzu
Gas Chromatographs

Dedicated Single Detector Gas Chromatograph GC-8A Series

GC that meets increasing analytical requirements...

GC that can analyze instantaneously...

GC that is tough and useful...

The GC-8A is a gas chromatograph that makes these dreams come true.

Simple design with emphasis on functionality

Tough and strong diecast frame

Reliability backed by years of experience

Self-diagnostic monitor / thermometer for easy maintenance

Accommodates a range of stable, high-sensitivity detectors (TCD, FID, ECD, FPD)

Easy-to-use digital settings

Comprehensive accessories

Contents

P 4 - Column Oven

P 9 - GC-8AIF

P 12 - GC-8APF

P 5 - Sample Injection Ports

P 10 - GC-8AIE

P 13 - GC-8APFp

P 6 - Detectors

P 11 - GC-8APT

P 14 - Accessories

P 8 - GC-8AIT

Column Oven

Large-capacity, cubic oven

Almost cubic in shape, the column oven opens entirely at the front, making changing columns simple and easy. The column oven's door opens and closes by a simple one-touch operation. The lightweight door moves extremely smoothly.



Fig. 1 Column Oven

Two-stage overheat prevention for protection of columns

If the temperature exceeds the programmed (preset) temperature by 30°C, the heater will be automatically turned off. If the temperature reaches about 420°C, the heater will be automatically turned off.

Temperature control offers excellent stability and response

Excellent temperature control of the column oven is essential for a gas chromatograph. Fig. 2 shows the response and stability when the column oven's temperature setting is changed from 100°C to 101°C. It shows that the oven responds rapidly to a changed temperature setting and is able to immediately achieve stable temperature control.

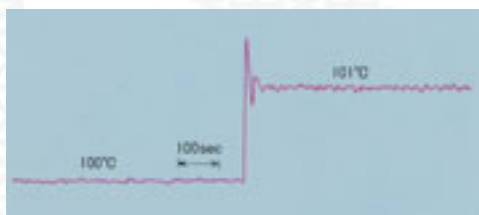


Fig. 2 Temperature Stability



Fig. 3 Operation of Column Oven Door

Rapid heating and cooling characteristics

Rapid heating and cooling characteristics of the column oven are also important for a gas chromatograph. Fig. 4 shows that heating from 100°C to 350°C requires just 12 minutes, while cooling takes less than one minute and re-stabilizing at the initial temperature takes about three minutes.



Fig. 4 Heating and Cooling Curve

Digital temperature programmer

All GC-8AP series instruments incorporate an internal temperature controller for digital temperature settings.



Fig. 5 Digital Temperature Programmer

Sample Injection Ports

Easy-to-use on-column sample injection ports

The standard injection ports are on-column type. Since sample solution is directly injected into the head of a glass column, the decomposition and adsorption of sample components are minimized.

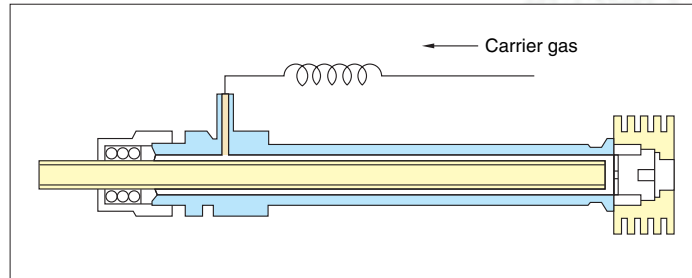


Fig. 6 On-Column Sample Injection Port

Capillary column adapter

Adding the optional CLH-800 capillary column holder allows simple mounting of the capillary column for both split and splitless sample injection.



Fig. 7 Quartz Capillary Column Mounted with CLH-800

Detectors

Thermal Conductivity Detector (GC-8AIT, GC-8APT)

Highly stable and sensitive filaments

The rhenium-tungsten filaments, each of which has a resistance of 100Ω , ensure the highest sensitivity and stability.

Constant current system

The bridge current is kept constant even when the detector temperature is changed. It is not necessary therefore to readjust the current after the detector temperature is stabilized.

Filament protection

If some air should flow into the TCD cell, for example, at the time of column replacement, the bridge current will automatically be turned off and the warning lamp will be lit.

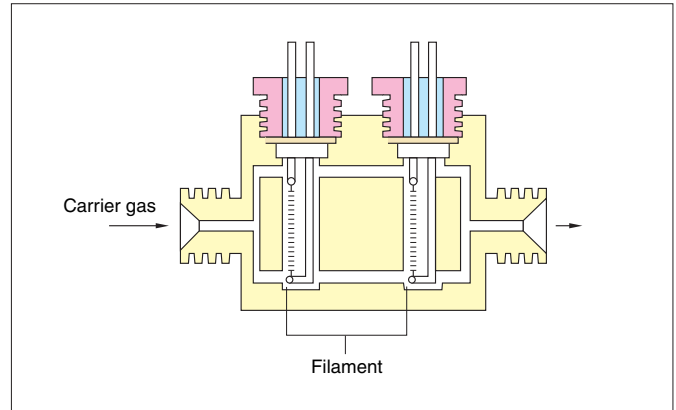


Fig. 8 TCD Cell (GC-8APT)

Flame Ionization Detector (GC-8AIF, GC-8APF)

Cylindrical collector

Combustion gases from the hydrogen flame pass from the nozzle straight through the cylindrical collector to be discharged externally. This reduces contamination of the detector to extremely low levels.

On-detector system

The dead space is eliminated at the connection of the column and the detector. Excellent repeatability is provided even in analysis of trace components.

External igniter

The flame igniter is mounted external to the detector to significantly reduce wire damage due to corrosive combustion components and to make replacement of the igniter filament cheap and simple.

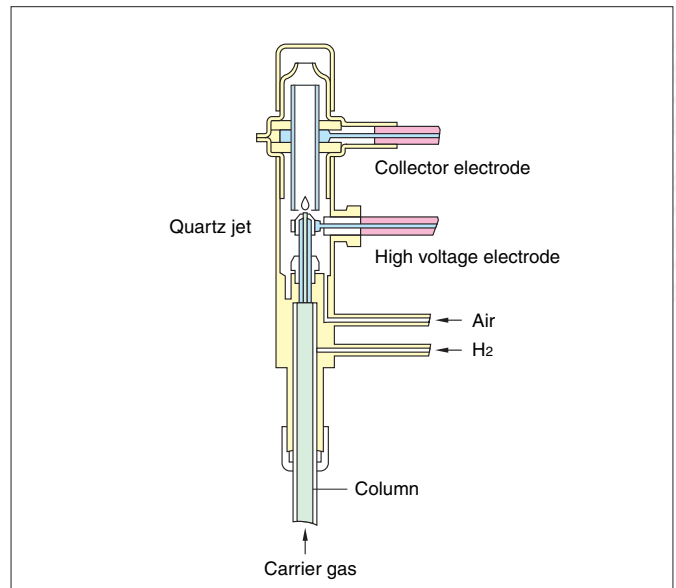


Fig. 9 FID Cell

Electron Capture Detector (GC-8AIE)

Linear ECD with high sensitivity and wide dynamic range

The constant-current ECD maintains a constant current flow in the detector. It offers excellent performance of a linear dynamic range of 10,000 and 0.2 pg (γ -BHC) minimum limit of detection, and greatly restricts peak abnormalities such as negative peaks.

Switchable detector current

The standing current flowing in the detector can be switched in three stages for convenient analysis of samples across a wide concentration range.

Comprehensive contamination countermeasures

The system features a programmed heating system to prevent detector contamination (column oven heating starts only after the detector reaches the set temperature) and a purge system to maintain carrier gas purging and keep the detector in standby status even when the detector is not being used for analysis.

Purge flow line reduces stabilization time

The purge flow line allows purging of the interior of the detector by carrier gas when the detector remains mounted in the gas chromatograph but is not used.

This prevents oxidation by oxygen in the air and ensures stable operation the next time the detector is used.

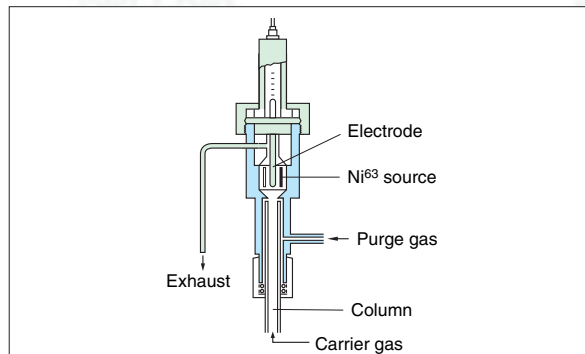


Fig. 10 ECD Cell

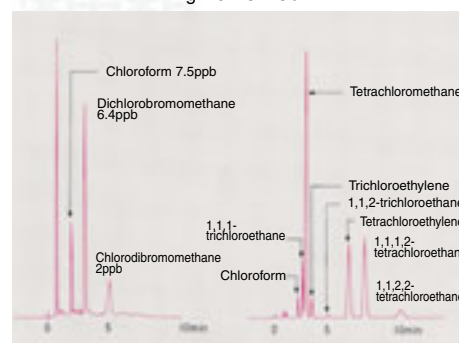


Fig. 11 Chromatogram of Trihalomethane

Flame Photometric Detector (GC-8APFp)

Flame

The FPD cell is designed so that the flame will not be extinguished by a solvent overload.

FID monitor electrode

The FID monitor electrode in the detector permits extraction of the FID signal.

*Requires the FID monitor kit (Special Accessory: P/N 221-23950-91)

Forced cooling system

To ensure a low noise level and long service life, the photomultiplier tube is kept cool by a blower when the detector is maintained at a high temperature.

Complete safety

The photomultiplier tube is protected against damage from exposure to high light levels by a sensing circuit which cuts power to the tube if anomalous conditions are detected.

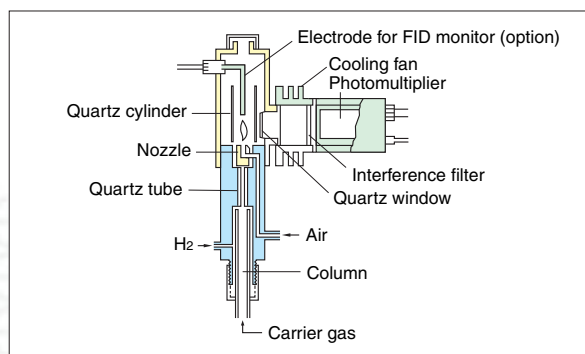


Fig. 12 FPD Cell



Fig. 13 Analysis of Trace Thiophene in Benzene (S mode)

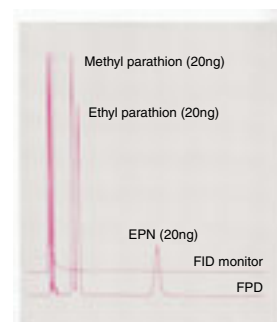


Fig. 14 Analysis of Organophosphorus Pesticides (P-mode)

GC-8AIT



Column Oven

- Temperature range : Ambient ~ 399°C
Temperature control : Proportional-integration type of zero cross switching system
Temperature control accuracy : $\pm 0.1^\circ\text{C}$
Temperature Readout (Monitor) : When the temperatures of the column oven and the injection port/detector have reached the set points, the respective READY lamps are lit.
Heating speed : From ambient to 350°C in 13 minutes.
Cooling speed : From 350°C to 100°C in 3.5 minutes.
Column : Stainless steel: 6m x 2
Glass: 5.4m x 2
Overheat Protection : Two-stage protection:
(1) If the temperature exceeds the programmed (preset) temperature by 50°C, the heater will be automatically turned off.
(2) If the temperature reaches about 420°C, the heater will be automatically turned off.

Temperature of Injection Port/Detector

- Temperature range : Ambient ~ 400°C (10°C steps)
Temperature control : Proportional-integration type of zero cross switching system
Temperature control accuracy : $\pm 0.1^\circ\text{C}$
Temperature Readout (Monitor) : When the temperatures of the column oven and the injection port/detector have reached the set points, the respective READY lamps are lit.
Overheat Protection : If the temperature reaches about 420°C, the heater will be automatically turned off.
Injection Port : On-column injection ports

Flow Control

- Carrier gas : Two pressure regulators
Two column inlet pressure gauges

Thermal Conductivity Detector (TCD)

- Detector : Differential type of semi-diffusion flow system
Four rhenium-tungsten filaments (100 Ω each)
Maximum temperature : 400°C
Bridge current : Constant current system (OFF, 60, 70, 80, 90, 100, 120, 140, 160, 180, 200mA)
Filament protection circuit : Incorporated

Others

- Dimensions : 440W x 405D x 435Hmm
Weight : 26.5kg
Power Requirements : AC100/115V or 200/220V as ordered.
Others : 1500VA max. 50/60Hz.
(1) Column oven heating starts after the injection port / detector reaches the set temperature.
(2) Cannot be used with a preparative system.

GC-8AIF



Column Oven

Temperature range	: Ambient ~ 399°C
Temperature control:	: Proportional-integration type of zero cross switching system
Temperature control accuracy	: ±0.1°C
Heating speed	: From ambient to 350°C in 13 minutes.
Cooling speed	: From 350°C to 100°C in 3.5 minutes.
Column	: Stainless steel: 6m x 2 Glass: 5.4m x 2
Overheat Protection	: Two-stage protection: (1) If the temperature exceeds the programmed (preset) temperature by 30°C, the heater will be automatically turned off. (2) If the temperature reaches about 420°C, the heater will be automatically turned off.

Temperature of Injection Port/Detector

Temperature range	: Ambient ~ 400°C (10°C steps)
Temperature control	: Proportional-integration type of zero cross switching system
Temperature control accuracy	: ±0.1°C
Overheat Protection	: If the temperature reaches about 420°C, the heater will be automatically turned off.
Injection Port	: On-column injection ports

Temperature Readout

The three temperatures (injection port/detector, column oven, and auxiliary) are selectively indicated on the pyrometer, the selection being made by pushbuttons.

Flow Control

Carrier gas	: Two pressure regulators Two column inlet pressure gauges
Hydrogen	: Two pressure regulators Two pressure gauges
Air	: One pressure regulator One pressure gauge

Flame Ionization Detector (FID)

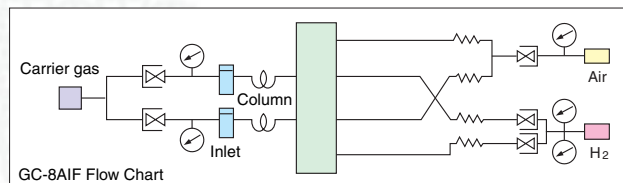
Detector	: Dual cell with cylindrical collectors
Maximum temperature	: 400°C
Detection limit	: 3×10^{-12} g/s for diphenyl
Dynamic range	: 10^7
Jet	: Mode of quartz

Electrometer

Sensitivity	: 1×10^{-12} A/mV
Noise	: Below 10^{-14} A
Drift	: Below 2×10^{-14} A/h (Constant ambient temperature)
Input attenuation	: 1, 10, 10^2 , 10^3 , 10^4
Output attenuation	: 1 ~ 1024 (binary step) and ∞
Linearity	: Wider than 10^5 (fixed input attenuation)
Background suppression	: $\pm 6.4 \times 10^{-10}$ A (NORM mode)
Signal output	: 0 ~ 1mV for recorder 0 ~ 1V for data processor

Others

Dimensions	: 440W x 405D x 570Hmm
Weight	: 34.5kg
Power Requirements	: AC100/115V or 200/220V as ordered. 1500VA max. 50/60Hz.



GC-8AIE



Column Oven

Temperature range	: Ambient ~ 399°C
Temperature control	: Proportional-integration type of zero cross switching system
Temperature control accuracy	: ±0.1°C
Temperature Readout (Monitor)	: When the temperatures of the column oven and the injection port/detector have reached the set points, the respective READY lamps are lit.
Heating speed	: From ambient to 350°C in 13 minutes.
Cooling speed	: From 350°C to 100°C in 3.5 minutes.
Column	: Stainless steel: 12m x 1 Glass: 5.4m x 1
Overheat Protection	: Two-stage protection: (1) If the temperature exceeds the programmed (preset) temperature by 50°C, the heater will be automatically turned off. (2) If the temperature reaches about 420°C, the heater will be automatically turned off.

Temperature of Injection Port/Detector

Temperature range	: Ambient ~ 350°C (10°C steps)
Temperature control	: Proportional-integration type of zero cross switching system
Temperature control accuracy	: ±0.1°C
Temperature Readout (Monitor)	: When the temperatures of the column oven and the injection port/detector have reached the set points, the respective READY lamps are lit.
Overheat Protection	: If the temperature reaches about 350°C, the heater will be automatically turned off.
Injection Port	: On-column injection ports

Flow Control

Carrier gas	One pressure regulator
	One column inlet pressure gauge

Electron Capture Detector (ECD)

Detector	: Coaxial type cell and purge flow line
Radiation source	: ⁶³ Ni370MBq
Detection limit	: 0.2pg for γBHC
Dynamic range	: 10 ⁴
Maximum temperature	: 350°C
Standing current	: 0.5, 1.0, 2.0mA

Others

Dimensions	: 440W x 405D x 435Hmm
Weight	: 26.0kg
Power Requirements	: AC100/115V or 200/220V as ordered. 1500VA max. 50/60Hz.
Other	: Column oven heating starts after the injection port / detector reaches the set temperature.

GC-8APT



Column Oven

- Temperature range : -100°C ~ 400°C (The optional cryogenic work attachment and cryogenic valve unit are necessary for sub-ambient temperature operation.)
- Temperature control : Proportional-integration type of zero cross switching system
- Temperature control accuracy : $\pm 0.1^\circ\text{C}$
- Heating speed : From ambient to 350°C in 13 minutes.
- Cooling speed : From 350°C to 100°C in 3.5 minutes.
- Column : Stainless steel: 6m x 2
Glass: 5.4m x 2
- Overheat Protection : Two-stage protection:
(1) If the temperature exceeds the programmed (preset) temperature by 30°C, the heater will be automatically turned off.
(2) If the temperature reaches about 420°C, the heater will be automatically turned off.

Temperature Programmer/Timer

- Initial temperature : -100°C ~ 399°C (1°C steps)
- Final temperature : 0°C ~ 400°C (10°C steps)
- Programming rate : 0.5, 1, 2, 3, 4, 5, 6, 8, 10, 16, 20, 32°C/min.

Temperature of Injection Port/Detector

- Temperature range : Ambient ~ 400°C (10°C steps)
- Temperature control : Proportional-integration type of zero cross switching system
- Temperature control accuracy : $\pm 0.1^\circ\text{C}$
- Overheat Protection : If the temperature reaches about 420°C, the heater will be automatically turned off.
- Injection Port : On-column injection ports

TCD Oven

- Temperature range* : Ambient ~ 400°C (10°C steps)
- Temperature control : Proportional-integration type of zero cross switching system
- Temperature control accuracy : $\pm 0.1^\circ\text{C}$
- Overheat Protection : If the temperature reaches about 420°C, the heater will be automatically turned off.

*The temperature setting dial is common to the sample injection ports.

Temperature Readout

The three temperatures (column oven, injection port/detector, and auxiliary (TCD)) are selectively indicated on the pyrometer, the selection being made by pushbuttons.

Flow Control

- Carrier gas : One primary pressure regulator
One primary column inlet pressure gauge
Two differential flow controllers
Two column inlet pressure gauges

Thermal Conductivity Detector (TCD)

- Detector : Differential type of semi-diffusion flow system
Four rhenium-tungsten filaments (100 Ω each)
- Maximum temperature : 400°C
- Bridge current : Constant current system (OFF, 60, 70, 80, 90, 100, 120, 140, 160, 180, 200mA)
- Filament protection circuit : Incorporated

Others

- Dimensions : 440W x 405D x 625Hmm
(Electric control: 440W x 330D x 135Hmm)
- Weight : 36.0kg
- Power Requirements : AC100/115V or 200/220V as ordered.
1500VA max. 50/60Hz.

GC-8APF



Column Oven

Temperature range	: -100°C ~ 400°C (The optional cryogenic work attachment and cryogenic valve unit are necessary for sub-ambient temperature operation.)
Temperature control	: Proportional-integration type of zero cross switching system
Temperature control accuracy	: ±0.1°C
Heating speed	: From ambient to 350°C in 13 minutes.
Cooling speed	: From 350°C to 100°C in 3.5 minutes.
Column	: Stainless steel: 6m x 2 Glass: 5.4m x 2
Overheat Protection	: Two-stage protection: (1) If the temperature exceeds the programmed (preset) temperature by 30°C, the heater will be automatically turned off. (2) If the temperature reaches about 420°C, the heater will be automatically turned off.

Temperature Programmer/Timer

Initial temperature	: -100°C ~ 399°C (1°C steps)
Final temperature	: 0°C ~ 400°C (10°C steps)
Programming rate	: 0.5, 1, 2, 3, 4, 5, 6, 8, 10, 16, 20, 32°C/min.

Temperature of Injection Port/Detector

Temperature range	: Ambient ~ 400°C (10°C steps)
Temperature control	: Proportional-integration type of zero cross switching system
Temperature control accuracy	: ±0.1°C
Overheat Protection	: If the temperature reaches about 420°C, the heater will be automatically turned off.
Injection Port	: On-column injection ports

Temperature Readout

The three temperatures (column oven, injection port/detector, and auxiliary) are selectively indicated on the pyrometer, the selection being made by pushbuttons.

Flow Control

Carrier gas	: One primary pressure regulator One primary column inlet pressure gauge Two differential flow controllers Two column inlet pressure gauges
Hydrogen	: Two pressure regulators Two pressure gauges
Air	: One pressure regulator One pressure gauge

Flame Ionization Detector (FID)

Detector	: Dual cell with cylindrical collectors
Maximum temperature	: 400°C
Detection limit	: 3×10^{-12} g/s for diphenyl
Dynamic range	: 10^7
Jet	: Mode of quartz

Electrometer

Sensitivity	: 1×10^{-12} A/mV
Noise	: Below 10^{-14} A
Drift	: Below 2×10^{-14} A/h (Constant ambient temperature)
Input attenuation	: 1, 10, 10^2 , 10^3 , 10^4
Output attenuation	: 1 ~ 1024 (binary step) and ∞
Linearity	: Wider than 10^5 (fixed input attenuation)
Background suppression	: $\pm 6.4 \times 10^{-10}$ A (NORM mode)
Signal output	: 0 ~ 1mV for recorder 0 ~ 1V for data processor

Others

Dimensions	: 440W x 405D x 570Hmm
Weight	: (Electric control: 440W x 330D x 135Hmm)
Power Requirements	: 34.5kg : AC100/115V or 200/220V as ordered. 1500VA max. 50/60Hz.

GC-8APFp



Column Oven

Temperature range	: -100°C ~ 400°C (The optional cryogenic work attachment and cryogenic valve unit are necessary for sub-ambient temperature operation.)
Temperature control	: Proportional-integration type of zero cross switching system
Temperature control accuracy	: $\pm 0.1^\circ\text{C}$
Heating speed	: From ambient to 350°C in 13 minutes.
Cooling speed	: From 350°C to 100°C in 3.5 minutes.
Column	: Stainless steel: 12m x 1 Glass: 5.4m x 1
Overheat Protection	: Two-stage protection: (1) If the temperature exceeds the programmed (preset) temperature by 30°C, the heater will be automatically turned off. (2) If the temperature reaches about 420°C, the heater will be automatically turned off.

Temperature Programmer/Timer

Initial temperature	: -100°C ~ 399°C (1°C steps)
Final temperature	: 0°C ~ 400°C (10°C steps)
Programming rate	: 0.5, 1, 2, 3, 4, 5, 6, 8, 10, 16, 20, 32°C/min.

Temperature of Injection Port/Detector

Temperature range	: Ambient ~ 400°C (10°C steps)
Temperature control	: Proportional-integration type of zero cross switching system
Temperature control accuracy	: $\pm 0.1^\circ\text{C}$
Overheat Protection	: If the temperature reaches about 420°C, the heater will be automatically turned off.
Injection Port	: On-column injection ports

Temperature Readout

The three temperatures (column oven, injection port/detector, and auxiliary) are selectively indicated on the pyrometer, the selection being made by pushbuttons.

Flow Control

Carrier gas	: One primary pressure regulator One primary column inlet pressure gauge One differential flow controller One column inlet pressure gauge
Hydrogen	: One pressure regulator One pressure gauge
Air	: One pressure regulator One pressure gauge

Flame Photometric Detector (FPD)

Selective detection of sulfur and phosphorus (by filter interchange)	
Optional filter	: 394nm (S), 526nm (P)
Detection limit	: 5×10^{-11} gS/s for S in thiophene 1.4×10^{-12} gP/s for P in DDVP or parathion
Power supply	: -700V, stabilized
Maximum temperature	: 350°C (air cooling)

Electrometer

Sensitivity	: 1×10^{-10} A/mV
Noise	: Below 10^{-12} A
Drift	: Below 2×10^{-12} A/h (Constant ambient temperature)
Input attenuation	: 1, 10, 10^2 , 10^3
Output attenuation	: 1 ~ 1024 (binary step) and ∞
Linearity	: Wider than 10^5 (fixed input attenuation)
Background suppression	: $\pm 6.4 \times 10^{-8}$ A
Signal output	: 0 ~ 1mV for recorder 0 ~ 1V for data processor

Others

Dimensions	: 440W x 405D x 650Hmm (Electric control: 440W x 330D x 135Hmm)
Weight	: 35.0kg
Power Requirements	: AC100/115V or 200/220V as ordered. 1500VA max. 50/60Hz.
Special accessories	: FID monitor and electrometer for monitor (P/N 221-23950-91) Filter for S (P/N 221-00892-01) Filter for P (P/N 221-00897-01)

Accessories

Hydrogen Generator

Compact hydrogen generator by ion exchange membrane water electrolysis. High-purity hydrogen is formed through electrolysis of pure water. The compact design fits perfectly beside a GC-8A gas chromatograph. Requires deionized water with a specific resistance of 5 MWcm min.

Model	OPGU-2200S
Cat. No.	221-45131-91
Max. delivery flow rate	225 mL/min
Max. delivery pressure	20~400kPa



Air Compressors

These supply clean (oil mist free) compressed air to support combustion in FID and FPD.

Output: 1/4HP

Delivery pressure: 400±50kPa

Maximum delivery flow rate: 20L/min. (NTP)

Model	Oil-less	Oil-less, silent
Cat. No.	221-72380	670-12138
Weight	16kg	44kg
Noise	—	58db



Oil-less type

PPR Series Pressure Regulator for High Purity Gases

Dedicated GC gas pressure regulator that provides a high-purity, high-accuracy supply of carrier gas or hydrogen from the gas cylinder.

The air-purge valve on the primary side prevents ingress of air when the cylinder is changed. This ensures rapid baseline recovery after cylinder replacement and extends the column life by restricting oxidative degradation of the solid phase.

Model		Cat. No.
PPR-N ₂	Nitrogen and Argon (Blue)	221-35999-01
PPR-H ₂	Hydrogen (Red)	221-35999-02
PPR-He	Helium (Yellow)	221-35999-03



Accessory/Supply Set (Cat. No. 221-38650-90)

Contains all the items required to operate the gas chromatograph. Major contents: a carrier gas supply pipe, a gas filter, leak check fluid, tools, a pocket-type timer, a mirror for flame checking, a microliter syringe, column tags, quartz beads, color markers, a power outlet, a case, etc.

The separate FID accessories set (Cat. No. 221-38651-90) is also required for a gas chromatograph with FID.



Economy Set of Microsyringes

A range of analytical syringes is available.

- Economy type 10 μL (6 per pack)
- Standard microsyringe 25 to 100 μL
- Gas-sealed microsyringe 25 to 100 μL
- Plunger-guide microsyringe 5 to 25 μL
- Plunger-in-needle microsyringe 0.5 to 5 μL
- Large-capacity gas-tight syringe 1 to 100 mL



Set of Devices for Packing Columns (Cat. No. 221-37387-91)

Contains all the items required to fill or re-pack the column. It allows the column to be easily repacked. Includes detailed instructions and a convenient carrying case.

Major contents: funnels, aspirator, vibrator (electric engraver), trap bottles, column tags, silica wool, column packing, rubber tubes, connectors, etc.



Columns (Tube for packed column)

Length (m)	Stainless Steel Columns	Glass Columns	
	3mm ID, 4mm OD	3.2mm ID, 5mm OD	2.6mm ID, 5mm OD
0.5	201-48705-05	221-22949-05	221-22950-05
1.0	201-48705-10	221-22949-10	221-22950-10
1.5	201-48705-15	221-22949-15	221-22950-15
2.0	201-48705-20	221-22949-20	221-22950-20
2.5	201-48705-25	221-22949-25	221-22950-25
3.0	201-48705-30	221-22949-30	221-22950-30

* Columns exceeding 3 m also available. Consult your Shimadzu representative for details.



JQA-0376

Founded in 1875, Shimadzu Corporation, a leader in the development of advanced technologies, has a distinguished history of innovation built on the foundation of contributing to society through science and technology. We maintain a global network of sales, service, technical support and applications centers on six continents, and have established long-term relationships with a host of highly trained distributors located in over 100 countries. For information about Shimadzu, and to contact your local office, please visit our Web site at www.shimadzu.com



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