

Auto Injector / Auto Sampler

AOC-20i / AOC-20s



Design goals set and surpassed in AOC-20 Series

...Ideal sample handling with high throughput, data reliability and traceability.

Auto Injector AOC-20i

Sample introduction is a key aspect of any gas chromatographic system. The auto injector must be able to inject samples into a variety of injection ports, including split/splitless, direct (WBI), cool on column (OCI) or programmed temperature vaporization (PTV). Injection parameters also must be controlled to best suit your sample analysis. The new AOC-20 (Automatic Operation Controller) does all of this and more, providing the ideal solution for your laboratory challenges.

The AOC-20 provides the highest degree of reliability. This means that the unit produces reproducible results, with a minimum of problems such as bent needles, evaporating samples, etc. Maintaining reproducible results requires that periodic maintenance be performed, such as changing the injection port septa or syringe. With the AOC-20, these procedures are simple and you can comfortably perform them without fear of adversely affecting instrument performance.

The challenge in today's laboratory is processing large sample numbers and various vial types in an automated fashion. In addition, ever decreasing detection limits demand increased flexibility for different injection techniques, including large volume injection (LVI), solvent flush, and solvent flush with a second solvent. The AOC-20 meets these challenges and enhances throughput to meet your productivity goals.



Auto Sampler AOC-20s

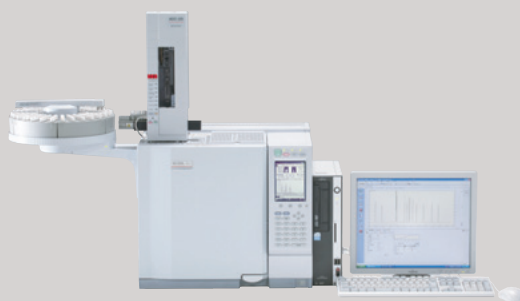
Flexible sample handling of up to 150 vials, greatly enhances laboratory productivity!

The AOC-20s Auto Sampler carousel and robotic arm provide for sample transport to the AOC-20i Auto Injector using 1.5 mL and 4.0 mL vials. The system is smart too! It can tell the difference between the vial types by reading the information from the vial tray in use. The AOC-20i/AOC-20s is a powerful automation tool for the GC laboratory that allows the user to take full advantage of the GC system's capabilities.





AOC-20i configured with the GC-2014



AOC-20i, 20s configured with the GC-2010 Plus/GC-2010



**AOC-20i, 20s configured with the GCMS-TQ8030 and GCMS-QP2010 Series
More Accurate, More Productive, More Convenient**

The AOC (Automatic Operation Controller) with ideal sample handling, and manageable too!

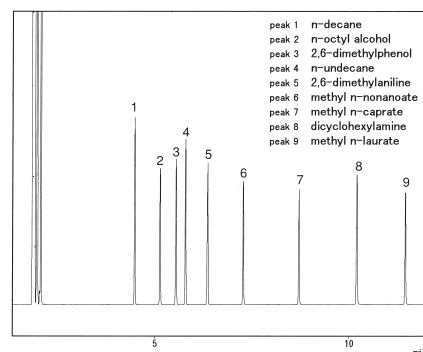
An auto injector is only as useful at its reproducibility and reliability.

Reproducibility and reliability are what make an auto injector valuable to a laboratory. Reproducibility can be adversely affected not only by less than optimum injection conditions, but through sample evaporation as well. Reliability is a measure of how well the instrument faithfully reproduces injection of the sample. The AOC-20i ensures that both of these needs are met.

To illustrate typical reproducibility of different types of compounds and demonstrate the inertness of the GC injection port, a 500 ppm Grob test mix standard sample was injected 10 times. Note that the coefficient of variation (C.V.%) was less than 0.3% for all compounds.

Also note that neither the acidic (peaks 2 & 3) nor the basic compounds (peaks 5 & 8) show any evidence of tailing, indicating the inertness of the sample path in the GC.

	peak1	peak2	peak3	peak4	peak5	peak6	peak7	peak8	peak9
1	18687	16607	19118	29138	23337	15642	15126	20503	16802
2	18605	16523	19040	28976	23240	15601	15081	20400	16753
3	18526	16482	18973	28888	23168	15538	15039	20342	16716
4	18631	16555	19066	29049	23287	15623	15120	20440	16785
5	18668	16616	19139	29130	23346	15672	15161	20517	16862
6	18679	16616	19136	29111	23353	15666	15167	20508	16852
7	18622	16576	19070	29044	23282	15618	15090	20436	16796
8	18628	16574	19095	29080	23307	15629	15112	20456	16808
9	18654	16559	19085	29044	23282	15615	15116	20459	16806
10	18663	16601	19101	29112	23335	15624	15119	20424	16798
mean	18636.3	16570.9	19082.3	29057.2	23293.7	15622.8	15113.1	20448.5	16797.8
C.V.%	0.252	0.262	0.259	0.266	0.244	0.238	0.247	0.262	0.252



Note that sample reproducibility can vary significantly based upon the type of sample and the analytical conditions used. The results presented are illustrative and are not guaranteed for all sample types and analyses.

Needle Guide and Injection sequence management prevent needle bends.



The enhanced needle guide and injection sequence firmware management completely eliminate needle bends. The standard syringe cooling fan and minimal metal contact with the GC mainframe ensure that the syringe remains at a constant temperature and minimizes heat transfer from the injection port. This improves the reliability of the sample withdrawal step and insures that the prescribed sample volume is injected. Additionally, use of the optional sample cooling fan minimizes the temperature rise of the sample aligned with the injector even though it is directly over the high temperature injection port.

Sample Cooling Fan



Attachment and removal are easy!



Mounts on the GC without any nuts or screws No alignment necessary



Easy syringe replacement via front access door



Just one cable connection

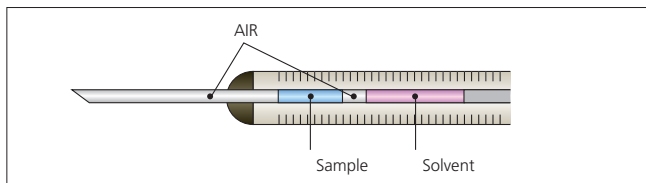
Ideal Sample Handling means that the sample is injected the way you want it to be!

Injection mode choices include traditional, solvent flush, solvent flush with a second solvent and large volume injection.

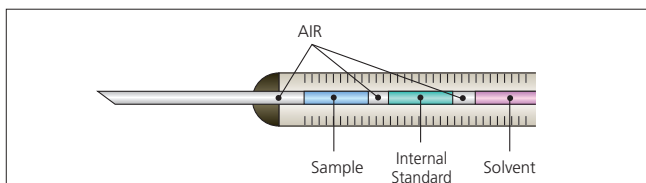
These choices provide solutions to various analytical challenges and problems. The traditional mode is used for most applications.

However, the solvent flush mode is effective in reducing the effects of boiling point discrimination, while the solvent flush with a second solvent mode allows for the addition of an internal standard for quantitative calculations or retention index. Large volume injection mode is effective in analyzing trace components.

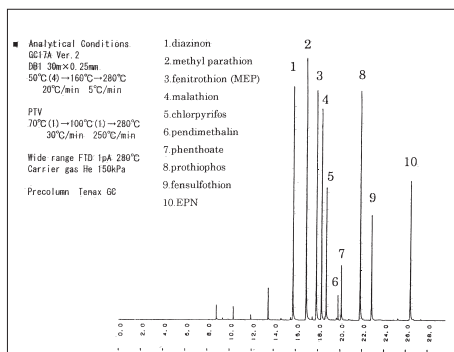
In solvent flush mode, after drawing the sample into the syringe, air may be drawn into the needle tip to prevent evaporation of the sample from the needle.



Solvent flush with a second solvent mode allows for the addition of an internal standard or a second solvent perhaps more conducive to the "solvent effect" in splitless injection.

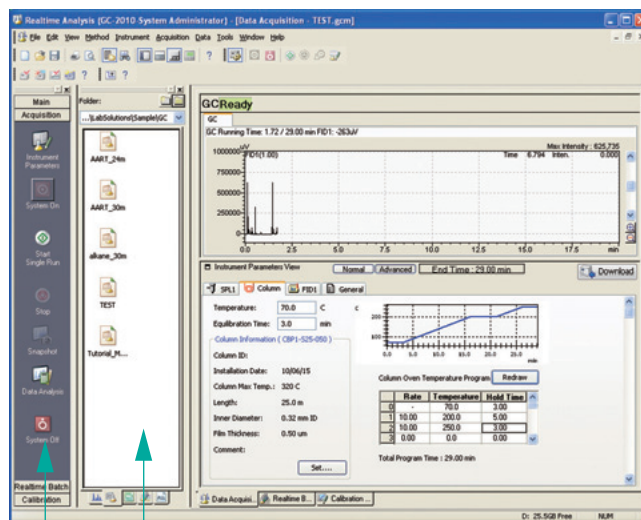


Large volume injection mode supports PTV trace analysis
Plunger speeds can be varied from fast, medium, to slow. Optional 50µL and 250µL syringes are also supported as is the multiple re-injection mode which allows volumes larger than the maximum syringe volumes to be injected.



5 x 200µL injections (1000µL total) of a 2ppb 10-component pesticide mixture in hexane.

LabSolutions software for further convenience!



Data Explorer
Assistant Bar

Easy Operation

LabSolutions offers both ease of operation and extensive functionality by utilizing a common operating environment shared throughout the LabSolutions series, including such features as an Assistant Bar and Data Explorer, to provide a user interface that can be operated intuitively and learned in a short time.

High Productivity

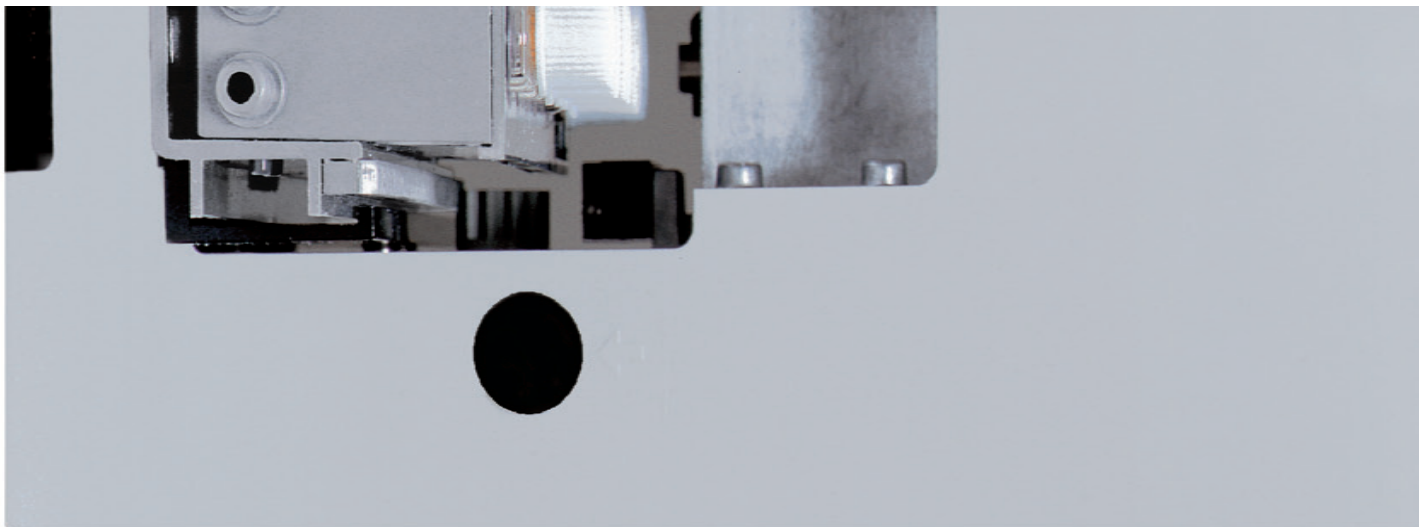
In a dual injection system, it permits chromatographic analysis of eight flowpaths simultaneously.

GLP/GMP Compliant

User management, audit trail, validation support, and precision management support functions achieve comprehensive GLP/GMP compliance.

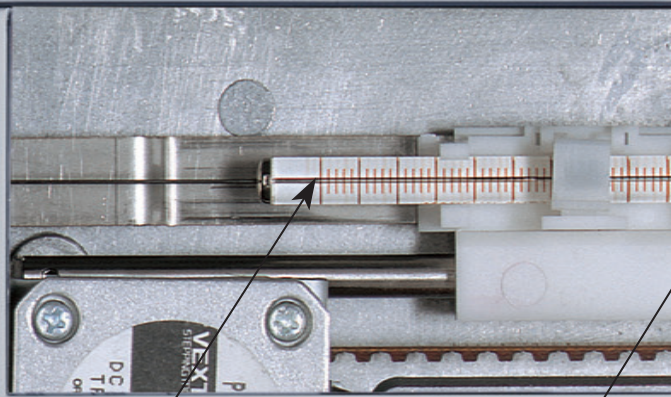
Flexible Report Functions

The Hyper-report functions offer a flexible report format, similar to Microsoft Word. These functions permit simple and efficient report generation and maintenance of analysis data. Summary report output is possible.

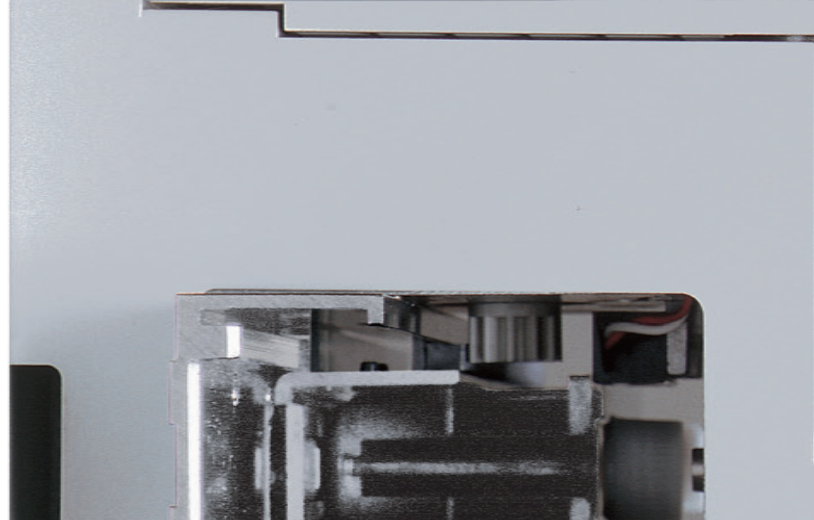
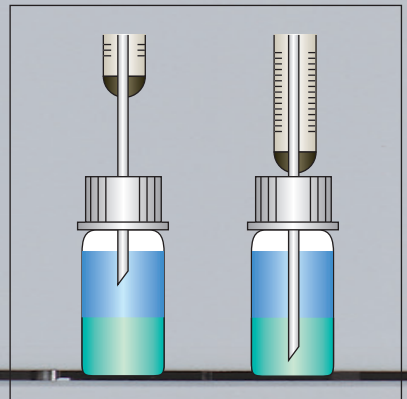


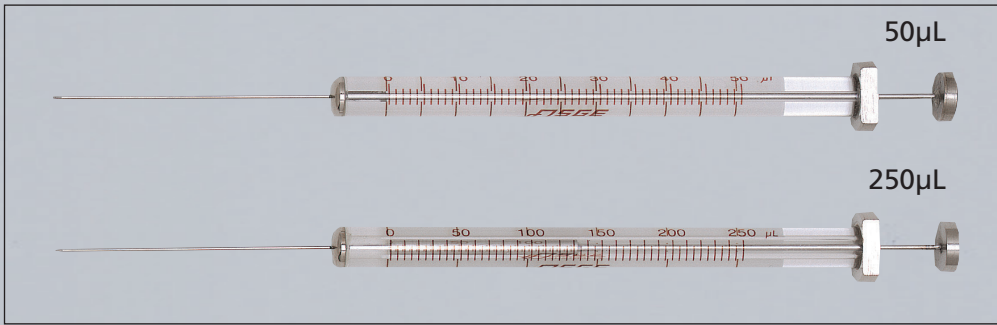
Control panel with the following buttons and indicators:

- SAMPLE WASH
- SOLVENT WASH
- NUMBER OF INJECTIONS
- SAMPLE SIZE
- MONITOR
- FUNCTION
- ENTER
- RESET
- RUN
- STOP
- START



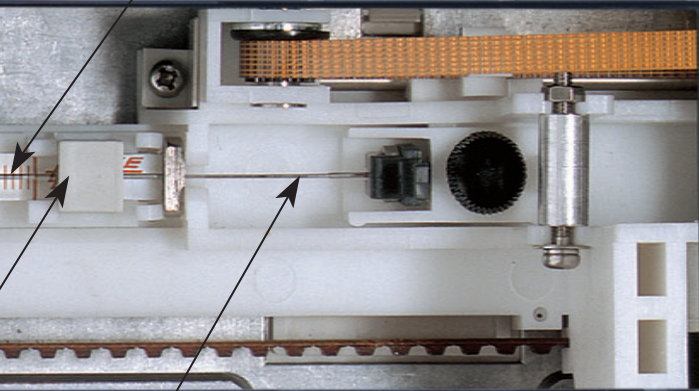
- Variable height for syringe insertion ensures...
- The sample extraction from two layers is perfect.





Depth 78mm

- Optional large volume syringe for large volume injection (LVI) with PTV.



- Variable plunger speed at injection facilitates standard and LVI techniques.

Width 126mm



Variable syringe injection speed allows for optimization based upon injection port mode.

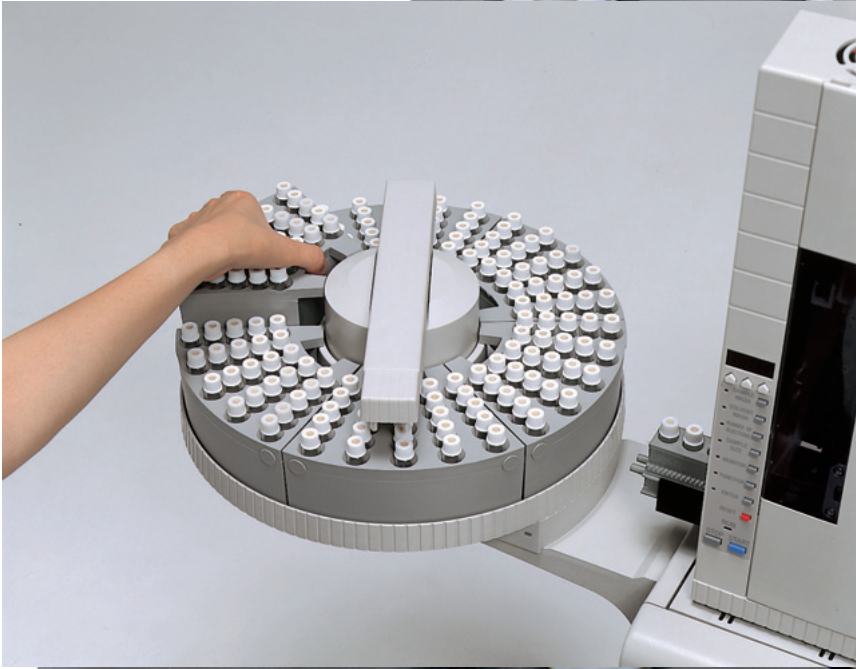
Ensures that the smallest of sample volumes can be sampled. Possible.

Depth 78mm

This photograph depicts actual size.

Height 380mm

Racks can be exchanged with one hand and the AOC-20s can identify them automatically.



Diameter 320mm

Programmable for a variety of applications

The "Teaching" function can be used to program the robotic arm to transport vials to different locations in preparation for subsequent use in other applications.

Ideally designed for productivity and intelligent too!

• Sample capacity: 96 4mLvials

For 4mLvials

For 1.5mLvials

• Sample capacity: 150 1.5mLvials

Self correcting software ensures reliable sample transport

The end point position of the sample transport is monitored by the firmware. If the position changes, for example from replacement of the tower after septa replacement, the system automatically compensates for the new position, thus ensuring continued productivity.

This photograph depicts actual size.

Specifications

AOC-20 Series Automatic Liquid Sample Injection System

	AOC-20i	AOC-20s
Sample injection method	Liquid sample injection via special microsyringe	
Sample volume	0.1–8.0µL, 0.1µL steps (using 10µL syringe) 0.5–40µL, 0.5µL steps (using 50µL syringe) 2.5–200µL, 2.5µL steps (using 250µL syringe)	
Number of samples	6 vials (with option, 12 possible)	1.5mL sample vials 150 vials 4mL sample vials 96 vials
Sample vials	Glass construction, 1.5mL, 4mL, screw top, Teflon-coated septum	
Rinse solvent vial	Glass construction, 4mL, screw top, Teflon-coated septum	
Number of sample injections	1–99 injections per sample	
Syringe speed	2 Modes: Fast and Slow	
Plunger speed	3 Modes: Fast, Medium and Slow	
Wait time	0–99.9sec following sample aspiration (in 0.1sec steps)	
Type of sample injection	3 Modes: Traditional, Solvent Flush and Solvent Flush with a Second Solvent	
Injection volume linearity	±0.5% (injection volume 1–5µL, sample n-C ₁₂)	
Cross contamination	Less than 10 ⁻⁴ (as determined with a 1% diphenyl in hexane using 4 solvent rinses)	
Priority sample	A priority sample injection can be injected during a sample sequence, then the sequence can be resumed.	
Dual injection system	Available on GC-2010 platform	One set of AOC-20s can feed sample vials to two sets of AOC-20i
Sample cooling / heating		0–60°C, with optional cooling rack connected to a general laboratory circulating water bath
External control	Includes optional optical link or RS232C interface	
Power requirements	AC100/115/220V±10% 50/60Hz 100VA	
Dimensions, weight	AOC-20i W126mm x D78mm x H380mm 2.5kg AOC-20s External diameter 320mm, Height 135mm 2.4kg Power supply W260mm x D420mm x H70mm 2.8kg	
Instrument Compatibility	GC-2010/2010 Plus, GC-2014 Series	

Double your productivity with the dual tower AOC-20 (GC-2010/2010 Plus only)

The AOC-20 series includes a dual tower auto injector option which doubles the productivity of a single dual injector, dual detector gas chromatograph.

It may be operated in seven different modes from the keyboard or random access from GCsolution. The AOC-20s provides sample transport. The highest productivity is then assured for applications such as simple high sample throughput on identical GC analysis channels or for dual column confirmation. In either case, the AOC-20 dual tower configuration is a powerful tool for laboratory productivity.



Instrument, Accessory, Supplies

AOC-20 Series Main Bodies

Name		P/N	Remarks
AOC-20i Auto Injector	GC-2010	221-72315-38(100-240V)	Includes: Injector, Built-in power supply, Installation kit, Standard accessories kit
	GC-2014	221-72314-38(100-240V)	
AOC-20s Auto Sampler		221-72300-31	Includes: sample carousel and 6 1.5mL sample vial racks

Optional Accessories and Supplies

For AOC-20i Auto Injector

	Name	P/N	Remarks
①	Long Sample Rack Assembly	221-45622-91	Provides rack for the injection of 12 samples
②	Small Vial Holder 6 position	221-45609-91	Rack for 1.5mL Vials
③	Large Vial Holder 2 position	221-32949-01	Rack for 4 mL Vials
④	Microsyringe (10µL)	221-34618	
⑤	Microsyringe (50µL)	221-45243	
⑥	Microsyringe (250µL)	221-45244	
⑦	1.5mL sample vial set	221-34274-91	100 pc., white cap, w/septum
⑧	4mL sample vial set	221-34269-91	50 pc., white cap, w/septum
⑨	1.5mL sample vials	221-34272-92	100 pc.
⑩	Septa for 1.5mL sample vials	221-41239-91	100 pc.
⑪	Caps for 1.5mL sample vials	221-34273-92	100 pc.
⑫	4mL sample vials	221-34267-92	50 pc.
⑬	Septa for 4mL sample vials	221-34266-92	50 pc.
⑭	Caps for 4mL sample vials	221-34268-92	50 pc.
⑮	Sample cooling fan	221-44995-91	Provides cooling for samples in the sampler

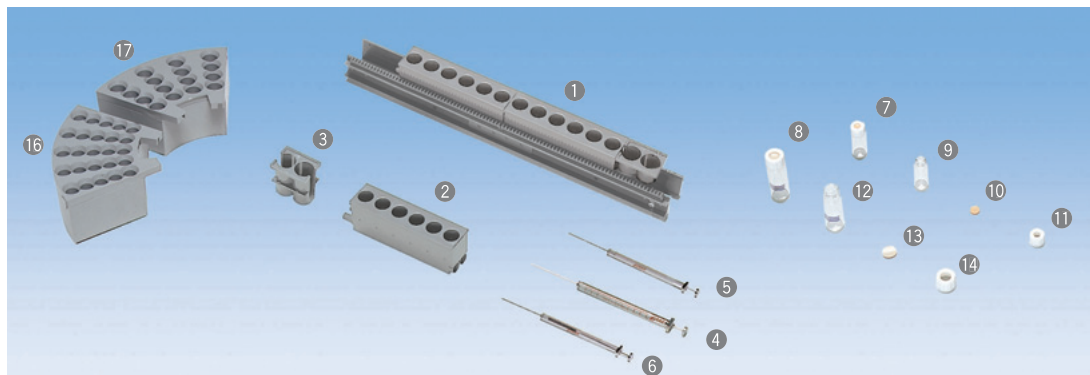
For AOC-20s Auto Sampler

	Name	P/N	Remarks
⑯	Small Vial Rack 25 position	221-44709-91	Single Rack for 1.5 mL vials
⑰	Large Vial Rack 16 position	221-44878-91	6 Rack set for 4.0 mL vials
⑱	Isothermal Cooling Rack Small Vials	221-44998-91	25 Position Rack for 1.5 mL vials used in conjunction with circulating water bath*(5 Rack set)
⑲	Isothermal Cooling Rack Large Vials	221-44999-91	16 Position Rack for 4 mL vials used in conjunction with circulating water bath*(5 Rack set)

*Cooling Racks require the use of a general purpose, temperature controlled, circulating water bath.

Communication hardware for C-R7A plus Chromatopac and GC Workstation

	Name	P/N	Remarks
⑳	Optical link cable / 2m	070-92025-52	
㉑	Optical Link Interface 3 Channel FC-57N	223-03727-91	Required for installation in a Chromatopac or CBM-102 Communication Bus Module for GC Workstation



Gas Chromatographs

GC-2010 Plus series



The Shimadzu GC-2010 Plus represents a new generation in top end capillary GC analysis, redefining sensitivity limits for trace analysis, fast GC applications, and easy, robust operation. Advanced Flow Technology (AFT) capability further extends the applications scope of the instrument allowing multidimensional GC, capillary backflush, and other specialized flow applications. AFT additionally enables reduced analysis times, enhanced chromatographic resolution, and application-specific configurations without compromising key performance features. The new detector line-up, featuring sensitivity specifications among the highest in the industry, ensures quality data across a broad range of applications.

GC-2014 series



Good expandability by mounting multiple injection units and detectors, and using both packed columns and capillary columns. High performance, including excellent reproducibility and highly sensitive detectors. The electronic flow controller and clear menu text make operation a breeze. The GC-2014 is a multipurpose, space-saving GC that features today's leading-edge technologies.

Workstation, Data Processor

Shimadzu LC/GC workstation LabSolutions

LabSolutions Ver.5 chromatography workstation can control LCs and GCs from a single PC. With LabSolutions Ver.5, LCs and GCs can be operated via the same interface. Up to four LCs and/or GCs or a mix of these systems can be controlled simultaneously on a single PC. This allows the operating status of all currently connected systems to be centrally monitored and displayed.

GC workstation GCsolution Ver.2

Adopts the LabSolutions Series operation interface, featuring the Assistant Bar and Data Explorer, for ease-of-use, high performance, and high productivity.

Controls and conducts data processing for four independent GC Systems. In a dual injection system, it permits chromatographic analysis of eight flowpaths simultaneously.

The GC-LAN connection option permits connection of GC instruments via a LAN adapter to PCs on a LAN (Local Area Network).

Chromatopac C-R8A



This compact instrument incorporates all the functions required for chromatography.

- The numerous peak processing functions and quantitative calculations are included.
- The hardware validation software (accessed with the VP key) supports GLP/GMP and ISO requirements.
- The C-R8A includes a high speed RS-232C port (19,200 bps) as standard for networking.



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