

Dimensions (unit: mm)





W 340 mm, D 560 mm, H 520 mm (from the installation surface)

SPL-M100 specifications

Dimensions Main unit Power supply and power consumption 100 V (500 VA) PC specs for software Number of specimens processed Up to 50 specimens Liquid delivery

Installation environment

Gas used

Liquid delivery part W 390 mm, D 570 mm, H 410 mm Windows XP or later Syringe method N2 gas or inert gas Temperature: 18-28°C Humidity: 40-70% RH, but no condensation.

such as dust, vibrations, ambient noise, corrosive gases, etc. Separately, the LVI-S250 Large Volume Injector for GC (sold separately) is required. (If you have LVI-S200, you can upgrade to LVI-S250.)



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www.aisti.co.jp



Online SPE-GC/MS system for

solid phase derivatization method



Derivatization revolution What used to take 2 days now just takes 10 minutes!



Solid phase derivatization method Patent registration



It is expected that the "solid phase derivatization method" can be used in a variety of fields.





Medical and pharmaceutical

Foods and drinks

Online SPE-GC system for metabolome analysis SPL-M100

Solid-phase extraction equipment is mounted on GC/MS to achieve fully-automated online processing. Fully-automated through GC/MS analysis by just setting the sample.

Flash-SPE cartridges enabling full-volume injection

A solid phase cartridge developed specifically for online SPE-GC. With a very low filling volume of 2 to 5 mg, the compact design of the Flash-SPE and the LVI-S250 large volume injector enable full-volume injection of samples.









Grain harvesting

Hardware functions and features

Capable of direct large volume injection of samples via robotic arm. Existing sample trays can be used as-is.

It can also be used for conventional analysis by replacing the existing autosampler. Sensors are installed at various locations to prevent operational problems.

Current status of pretreatment and derivatization in metabolomics and suggestions for improvement

About pre-treatment operations

The current major challenge is that pretreatment processes such as centrifugal concentration, freeze-drying, and derivatization are complicated, time-consuming, and require skilled techniques and experience.

About measurement of multiple samples-

When multiple samples are derivatized in a batch process, the time from derivatization to measurement differs for each sample.

Online from derivatization to measurement via SPE-GC

Solid phase derivatization method for

faster speed and automation

Fully automated from pretreatment (automated) pretreatment time of 5-10 minutes) to

xtractio

Analysis



Full-volume iniection



Use of autosampler

By separating the base plate, the front inlet can be used with an existing autosampler.





Online solid phase derivatization method



Various nozzles enable multi-stage liquid flow

Smooth multi-stage liquid flow processing is performed by using dedicated nozzles for each process (conditioning, sample aspiration loading, washing, nitrogen ventilation, and elution).

Working layout designed for efficiency

A working layout designed to fully automate processing from solid phase conditioning, purification, drying, and elution to GC/MS injection.

In addition, a syringe pump dedicated for each solvent is installed for liquid delivery, eliminating concern of mixing liquids.











Inject into GC at the same time as elution



Solid phase disposal receptacle

Performance evaluation of solid phase derivatization method

Simultaneous analysis of amino acids, organic acids, and nucleobases

SCAN total ion chromatogram

Fig. SCAN total ion chromatogram of mixed standard aqueous solutions (concentration in vial: 0.02nmoL / µL) obtained by the online solid phase derivatization SPE-GC/MS system



Reproducibility

Table: Peak area values and their RSD (%, n=9) for mixed standard aqueous solutions obtained by the online solid phase derivatization SPE-GC/MS system

No	Compound	1	2	3	4	5	6	7	8	9	Ave	BSD. %
1	Alanine-2TMS	2 780 202	2 814 678	2 805 838	2 570 446	2 663 543	2 676 876	2 632 581	2 692 127	2 718 118	2,706.045	3.0
2	Valine-2TMS	3,231,804	3,290,271	3,270,689	2,966,049	3,107,653	3.132.760	3.054.963	3.085.131	3,160,769	3.144.454	3.4
3	Phosphate (3:1)-3TMS	1.980.261	1.945.488	1.842.146	1.762.489	1.746.163	1.658.840	1.585.771	1.679.471	1.991.253	1,799.098	8.3
4	Norleucine-2TMS	3,860,754	3,995,800	3.961.145	3.572.341	3,750,253	3,798,730	3,712,869	3,729,371	3.834.508	3.801.752	3.4
5	Isoleucine-2TMS	3,166,213	3.281.486	3.263.756	2.942.720	3.112.611	3.105.804	3.057.182	3.062.330	3.129.208	3.124.590	3.4
6	Proline-2TMS	3.326.569	3.445.278	3.452.215	3,055,493	3.264.503	3,272,235	3.230.054	3.247.932	3.297.886	3.288.018	3.6
7	Glycine-3TMS	2,170,649	2,352,541	2,219,378	2,118,024	2,229,077	2,288,729	2,328,562	2,291,359	2,432,007	2,270,036	4.3
8	Succinic acid-2TMS	3,020,526	3,101,538	3,047,906	2,891,328	2,874,284	2,677,718	2,840,826	2,917,558	3,180,044	2.950.192	5.2
9	Fumaric acid-2TMS	1,768,634	1,813,725	1,790,816	1,626,601	1,697,384	1,608,388	1,635,905	1,710,549	1,825,272	1,719,697	4.9
10	Serine-3TMS	2,012,774	2,110,285	2,078,505	1,857,176	1,969,420	1,978,512	1,918,379	1,950,455	1,968,792	1,982,700	3.9
11	Threonine-3TMS	1,040,407	1,085,291	1,075,400	963,085	1,019,290	1,028,004	988,509	997,181	1,024,209	1,024,597	3.8
12	Malic acid-3TMS	485,209	496,725	505,695	464,603	471,484	446,942	451,563	459,884	497,251	475,484	4.5
13	Aspartic acid-3TMS	527,945	521,172	605,941	439,870	548,152	689,805	622,430	590,812	358,848	544,997	18.3
14	Methionine-2TMS	1,317,135	1,376,552	1,320,877	1,165,099	1,233,662	1,299,449	1,267,142	1,274,606	1,279,034	1,281,506	4.6
15	Proline-oxo-2TMS	1,972,283	2,178,513	2,188,232	2,213,001	2,171,464	2,218,260	2,414,150	2,348,929	2,386,591	2,232,380	6.1
16	Cytosine-2TMS	1,164,055	1,199,619	1,211,399	1,081,564	1,154,429	1,179,900	1,130,354	1,140,346	1,191,227	1,161,433	3.5
17	Aminobutyric acid-3TMS	1,903,218	2,080,359	1,832,270	1,718,333	1,911,954	1,983,878	1,952,195	1,884,295	2,036,145	1,922,516	5.6
18	Ketoglutaric acid-3TMS	179,954	187,293	167,292	138,034	169,160	156,600	151,045	147,256	178,112	163,861	10.1
19	Glutamic acid-3TMS	486,088	482,193	528,880	375,004	494,429	585,775	510,207	483,426	320,272	474,030	16.8
20	Phenylalanine-2TMS	1,553,897	1,642,952	1,616,874	1,422,103	1,528,499	1,564,042	1,507,985	1,508,373	1,520,941	1,540,630	4.2
21	Asparagine-3TMS	264,587	293,568	269,785	215,342	260,091	264,791	258,735	249,746	263,337	259,998	7.9
22	Putrescine-4TMS	1,097,163	1,143,662	1,022,892	1,069,833	1,140,680	1,218,672	1,113,605	1,075,243	1,130,409	1,112,462	5.0
23	Aconitic acid-3TMS	1,068,411	1,095,208	1,085,018	973,865	1,026,875	1,009,638	1,007,640	1,025,144	1,085,668	1,041,941	4.1
24	Citric acid-4TMS	2,509,279	2,585,329	2,551,370	2,326,885	2,437,909	2,410,546	2,372,287	2,395,838	2,470,814	2,451,140	3.5
25	Ornithine-4TMS	948,801	1,074,181	928,962	889,675	963,445	1,025,487	1,049,537	1,005,050	1,047,923	992,562	6.3
26	Adenine-2TMS	1,791,455	1,859,990	1,930,628	1,670,688	1,831,552	1,839,583	1,690,694	1,722,793	1,876,276	1,801,518	5.0
27	Lysine-4TMS	438,332	487,673	411,966	389,263	423,849	469,263	485,851	449,843	475,516	447,951	7.8
28	Tyrosine-3TMS	2,290,304	2,415,910	2,339,399	2,070,195	2,220,032	2,300,204	2,231,995	2,184,577	2,239,834	2,254,717	4.4
29	Guanine-3TMS	1,276,608	1,325,553	1,372,469	1,201,496	1,273,918	1,292,009	1,214,782	1,217,067	1,316,201	1,276,678	4.5

Simultaneous analysis of saccharides

SCAN total ion chromatogram

Fig. SCAN total ion chromatogram of mixed standard aqueous solutions (concentration in vial: 0.02nmoL / µL) obtained by the online solid phase derivatization SPE-GC/MS system



Linearity

Fig. Relationship between concentration and area value

Alanine-2TMS









Effect of pH

Fig. Relationship between pH and relative area value





2nd: Automated derivatization and measurement Fractionation: 40 μL Flash-SPE AOS-3mg Conditioning • Water: 100 µL • Acetonitrile: 100 µL • Washing water-ACN (1/4): 100 µL • Dehydration ACN: 100 µL • Impregnation Methoxyamine-Pyridine-MSTFA: 8 µL Solid phase derivatization reaction: 2 mins • Elute acetone-hexane (1/4): 40 µL

SCAN total ion chromatogram

Table: SCAN total ion chromatogram for mouse serum obtained by the online solid phase derivatization SPE-GC/MS system



Additive recovery test

Table: Recovery rate (%) obtained by adding to mouse serum extract

		Ctandard	Mauro	Maura	DEC %
No.	Compound	Standard	Mause	Mause +51	HEG, 70
		SI	M	A	(A-M)/ST
1	Alanine-21MS	2,395,769	5,539,074	7,703,074	90
2	Valine-2TMS	2,857,898	2,759,114	5,744,538	104
3	Phosphate (3:1)-3TMS	1,691,961	4,279,367	6,787,045	148
4	Norleucine-2TMS	3,402,608	4,067,823	7,424,476	99
5_	Isoleucine-2TMS	2,801,029	1,086,415	4,096,438	107
6	Proline-2TMS	3,037,141	2,998,133	6,301,408	109
7	Glycine-3TMS	1,800,878	2,966,859	4,603,320	91
8	Succinic acid-2TMS	2,958,640	224,256	3,375,441	107
9	Fumaric acid-2TMS	1,676,379	13,946	1,869,217	111
10	Serine-3TMS	1,769,642	1,608,041	3,632,037	114
11	Threonine-3TMS	900,834	852,911	1,865,424	112
12	Malic acid-3TMS	475,088	20,319	551,360	112
13	Aspartic acid-3TMS	440,006	190,845	795,480	137
14	Methionine-2TMS	1,186,002	93,758	1,417,378	112
15	Proline-oxo-2TMS	1,684,508	740,135	3,085,018	139
16	Cytosine-2TMS	1,069,383	5,948	1,182,673	110
17	Aminobutyric acid-3TMS	1,425,778	82,936	1,774,441	119
18	Ketoglutaric acid-3TMS	162,941		163,614	100
19	Glutamic acid-3TMS	381,767	1,237,713	1,524,345	75
20	Phenylalanine-2TMS	1,361,973	705,325	2,285,882	116
21	Asparagine-3TMS	212,637		291,982	137
22	Putrescine-4TMS	928,721	35,714	1,124,501	117
23	Aconitic acid-3TMS	482,874	3,083	544,525	112
24	Citric acid-4TMS	2,365,829	334,488	3,143,411	119
25	Ornithine-4TMS	741,337	668,406	1,295,449	85
26	Adenine-2TMS	1.710.221	3,660	1.966,746	115
27	Lysine-4TMS	344,472	389,645	680,111	84
28	Tyrosine-3TMS	2,171,566	748.544	3.535.152	128
29	Guanine-3TMS	1,112,060	3,595	1,479,513	133

Reproducibility

derivatization SPE-GC/MS system

No.	Compound	1	2	3	4	5	6	7	8	9	Ave.	RSD, %
1	Alanine-2TMS	5,541,262	5,554,574	5,750,943	5,697,229	5,588,344	5,721,789	5,850,742	5,681,853	5,706,369	5,677,012	1.8
2	Valine-2TMS	2,755,712	2,771,037	2,893,545	2,911,101	2,803,596	2,871,371	2,926,797	2,853,359	2,867,084	2,850,400	2.1
3	Phosphate (3:1)-3TMS	4,201,912	4,356,822	4,434,444	4,412,647	4,201,988	4,259,611	4,389,792	4,266,977	4,210,194	4,303,821	2.2
4	Norleucine-2TMS	4,056,211	4,080,919	4,276,463	4,306,038	4,157,663	4,270,224	4,312,737	4,223,433	4,227,870	4,212,395	2.2
5	Isoleucine-2TMS	1,078,007	1,080,660	1,131,523	1,141,625	1,094,518	1,124,087	1,139,671	1,121,838	1,118,968	1,114,544	2.2
6	Proline-2TMS	2,990,521	3,000,081	3,191,334	3,154,192	3,053,991	3,162,046	3,244,535	3,101,102	3,103,402	3,111,245	2.8
7	Glycine-3TMS	3,037,839	2,895,879	3,107,951	3,217,887	3,354,424	3,293,368	3,059,023	3,070,554	3,113,071	3,127,777	4.5
8	Succinic acid-2TMS	29,040	29,234	29,610	29,118	26,403	27,322	28,530	28,003	27,169	28,270	3.9
9	Fumaric acid-2TMS	14,400	13,605	14,528	13,757	13,469	13,211	12,847	12,142	11,996	13,328	6.7
10	Serine-3TMS	1,617,736	1,601,793	1,691,622	1,701,792	1,664,881	1,718,251	1,759,025	1,685,417	1,696,241	1,681,862	2.9
11	Threonine-3TMS	854,196	855,270	914,762	923,062	882,377	911,832	928,177	920,805	914,839	900,591	3.2
12	Malic acid-3TMS	20,457	20,641	21,151	21,808	19,071	20,283	20,751	19,941	19,094	20,355	4.4
13	Aspartic acid-3TMS	195,512	183,707	208,840	210,072	204,684	225,449	240,856	233,191	238,539	215,650	9.3
14	Methionine-2TMS	93,568	94,791	100,427	104,122	101,698	103,386	105,816	97,718	99,320	100,094	4.2
15	Proline-oxo-2TMS	719,078	784,164	740,721	869,323	610,496	641,127	674,841	868,861	839,473	749,787	13.0
16	Cytosine-2TMS	5,878	5,728	5,647	5,592	5,629	5,516	4,974	5,028	5,413	5,489	5.6
17	Aminobutyric acid-3TMS	87,027	83,832	70,197	83,924	75,857	76,002	85,355	82,175	87,546	81,324	7.3
18	Glutamic acid-3TMS	1,268,042	1,206,401	1,296,449	1,342,892	1,281,052	1,393,273	1,513,486	1,405,403	1,516,263	1,358,140	8.0
19	Phenylalanine-2TMS	699,562	714,084	762,498	773,628	724,391	758,118	786,916	753,925	773,827	749,661	4.0
20	Citric acid-4TMS	335,441	333,534	337,541	334,091	312,166	321,946	322,681	314,421	317,960	325,531	3.0
21	Ornithine-4TMS	663,367	673,444	787,729	789,718	771,470	808,655	771,975	652,659	737,745	739,640	8.2
22	Adenine-2TMS	4,077	3,243	3,358	3,410	3,217	2,885	3,216	2,978	3,005	3,265	10.8
23	Lysine-4TMS	384,118	400,505	466,485	466,911	449,562	483,398	450,203	364,748	433,653	433,287	9.5
24	Tyrosine-3TMS	739,551	763,670	838,110	848,309	773,737	850,307	875,807	790,095	852,336	814,658	5.9
25	Guanine-3TMS	3,773	3,789	3,207	3,438	2,485	2,720	2,968	3,136	2,457	3,108	16.1



Table: Peak area values and their RSD (%, n=9) for mouse serum obtained by the online solid phase

Software

Software functions and features

Intuitive and easy-to-use software

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メニューバー メソッド・シーケンス作成や環境設定。

スケジュールを直接ス 力(シーケンスファイル として保存可能)。 処理したいサンプルは チェックを入れ、スター をクリック。

Method creation is possible

- List of preset registered methods
 - Simultaneous analysis of amino acids, organic acids, nucleobases, and saccharides
 - Simultaneous analysis of amino acids, organic acids, and nucleobases
 - Simultaneous analysis of amino acids and nucleobases
 - Analysis of amino acids
 - Analysis of organic acids
 - Analysis of fatty acids
 - Analysis of nucleobases
 - Analysis of saccharides

Also possible to create other original methods. By registering frequently used methods, anyone can easily work with them.

Various log functions record operating conditions

Flexible with

convenient

features

動作状況をリアルタイム

で表示。

Operation log & error log

Log files are automatically saved in one-month increments for easy management.



Print functions

The ability to print sequences, logs, and more helps in document management and equipment management.

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	Target		Product name	
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	Amino acids	•	•	×
	Amines	•	•	×
	Nucleobases	•	•	×
	Organic acids	•	×	•
	Fatty acids	•	×	•
	Saccharides	•	×	•