NSX-5000V: List of relevant standard testing method

Element	Method	Number	Scope
Sulfur by UVFL	ASTM	D5453	Light hydrocarbons, Fuels, Oils
	ASTM	D6667	LPG, Gaseous hydrocarbons
	ASTM	D7183	Aromatic hydrocarbons
	ASTM	D7551	Gaseous hydrocarbons, LPG & NG
	DIN/EN/ISO	20846	Petroleum products
	JIS	K2541-6	Crude oil and petroleum products
	UOP	987 Part-A	Very volatile liquid hydrocarbons
Nitrogen by CLD	ASTM	D4629	Trace contents, Liquid petroleum hydrocarbons
	ASTM	D6069	Aromatic hydrocarbons
	ASTM	D7184	Ultra-traces, Aromatic hydrocarbons
	JIS	K2609	Crude oil and petroleum products
	UOP	936	LPG
	UOP	971	Light aromatic hydrocarbons
	UOP	981	Very volatile liquid hydrocarbons
Chlorine by coulometry	ASTM	D5808	Aromatic hydrocarbons
	ASTM	D4929	Crude oil
	ASTM	D7457	Aromatic hydrocarbons
	IP/EPA	9076	New and used petroleum products
	UOP	779	Petroleum products
	UOP	910	LPG and gases
Sulfur by coulometry	ASTM	D3120	Light petroleum hydrocarbons
	ASTM	D3246	LPG
	DIN/EN/ISO	16591	Petroleum products
	JIS	K2541-2	Crude oil and petroleum products
	JIS	K2240	LPG

Note: Follow instructions in manuals to correctly install, connect and operate the instruments. Contents of catalogues are subject to change without prior notice when improvements are made in performance.The actual color of the goods may appear different from color printed. All screen images are simulated.
*Company and product names contained herein are the trademarks or registered trademarks of the company concerned.

⚠ Safety Precautions	●Read through the user's manual first before installing, piping, wiring and operating this monitor, then always follow to the manual to correctly operate the monitor.

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CAT No.31010122021E

Trace elemental analyzer

NSX-5000V SERIES

Vertical furnace system

Nittoseiko Analytech Co.,Ltd.

NSX-5000V

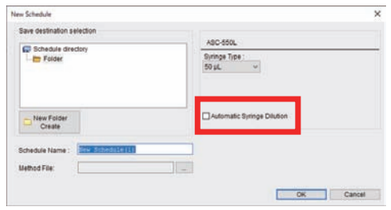
NSX-5000V series will contribute to the reduction of environmental impact through advanced technologies.

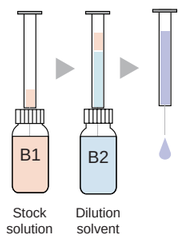
It enables automatic, safe and highly sensitive measurement of trace nitrogen, sulfur and chlorine in liquid or gas samples. Can be used in a wide range of applications such as quality control of petroleum/ chemical/ recycled products or automotive fuels and environmental analysis.

Features

Automatic syringe dilution (ASC-550L)

Automatic dilution can be performed accurately regardless of the proficiency of the operation by simply setting stock solution and solvent in the vials. Advance preparation for calibration curves is no need and waste solution can be reduced, resulting in reducing environmental load and low running costs.





User-friendly software

Simple and Advanced modes are available for a wide range of users such as in lab and product quality control.

Simple mode

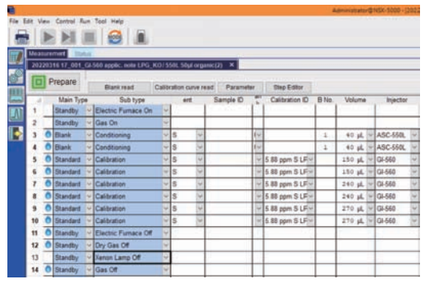
For steady sample measurement such as product inspections.
Easy and simple operation, no need to re-enter parameters.

Advanced mode

For unknown sample measurement or advanced operations.
Detailed setting for condition examination is possible.

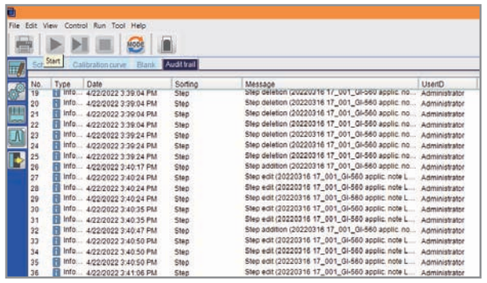
Automatic operation

Automated operation is available from "Furnace ON" to "Gas OFF". Also continuous run with various temperature settings are able to conduct.



Audit trail

All operations are recorded in preparation to an audit, and it can be viewed in Advanced mode.

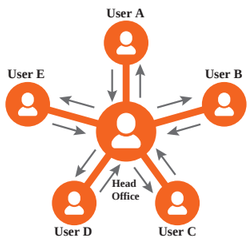


Import/Export function

Various setting such as “schedule”, “methods” and “the others” can back up and restore.
This is useful function when using multiple systems need to be operated at the same condition.

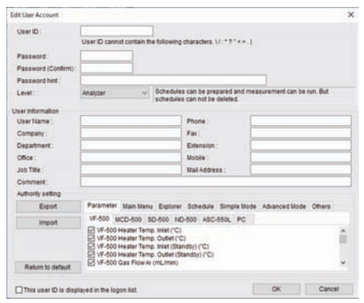
Imported/Exported items

- **Schedule**
- **Calibration curve**
- **Blank**
- **Method**
- **Measurement results** (CSV)
- **Combustion program**
- **Audit trail**
- **Authority setting**



User management

Three levels of login function enable to protect method and data from unintended change or deletion.



Features

Wide range, Easy of use

High/Low, simplified selection of sensitivity for each detector.

		High sensitivity	Low sensitivity
ND-500		0.03～250 µg/mL	1～10,000 µg/mL
SD-500		0.02～100 µg/mL	1～10,000 µg/mL
MCD-500	chlorine	0.05～200 µg/mL	1～5,000 µg/mL
	Sulfur	0.1～1,000 µg/mL	

※ For TCL-5000V chlorination, a high-density electrolyte solution is used for quantitation of 10µL or more in a single measurement.

Liquid sample temperature control system
STC-500L (Option)

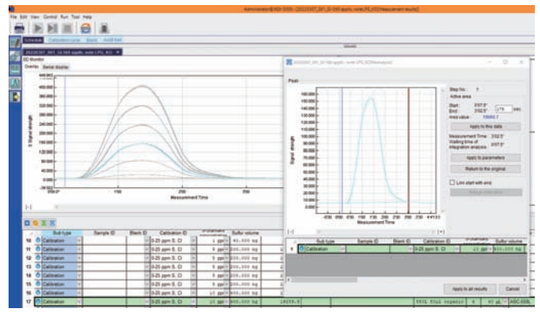
By cooling a “vial (containing a highly volatile liquid)” and a “microsyringe” to low temperature, it is possible to suction stably and inject the sample as a liquid state.

Easy Daily maintenance

Unique open/close type furnace provides easy operation and easy visual check of the condition of pyrolysis tube.

Reanalysis function
※Available only for TN-5000V, TS-5000V

After measurement, the “start time of measurement” and “end time” for chart date can be corrected if necessary to optimize.



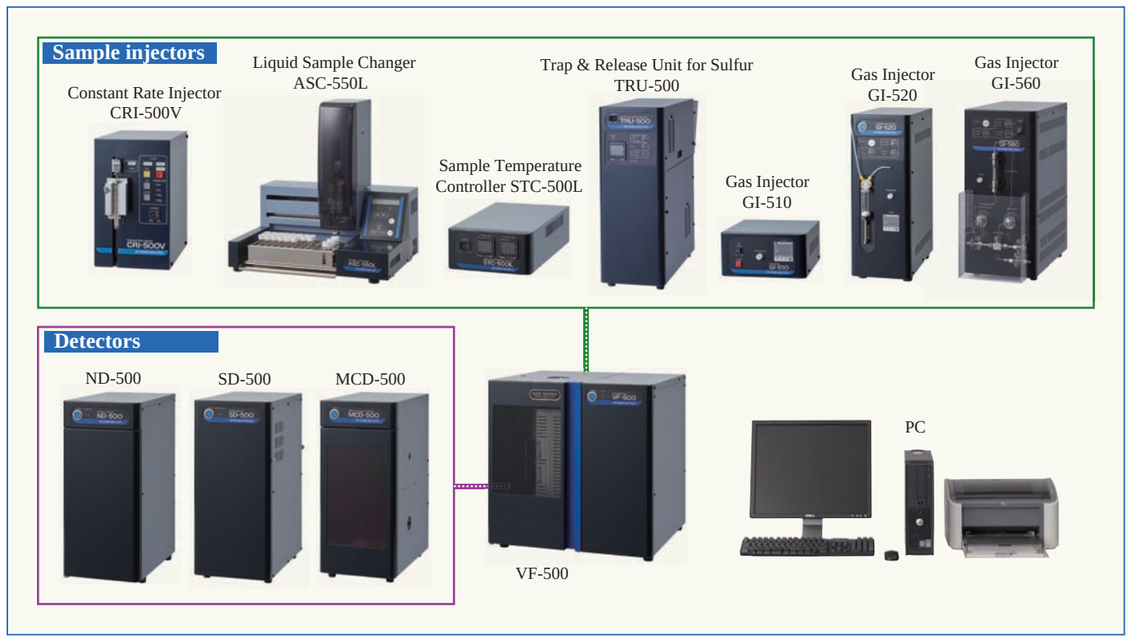
Low running cost

Less gas consumption than before. It is also available to shut-off the gas at the end of measurement automatically.

LINK to LIMS

Software makes data handling easier. It can output the result data to specified folder automatically.

System configuration



NSX-5000V MEASUREMENT PRINCIPLE

UV fluorescence sulfur detector SD-500

Sulfur Measurement

Sample is injected into a heated (800 to 1100 °C) pyrolysis tube by argon carrier gas. After sulfur compounds in the sample are pyrolyzed, they are oxidized by O_2 gas.

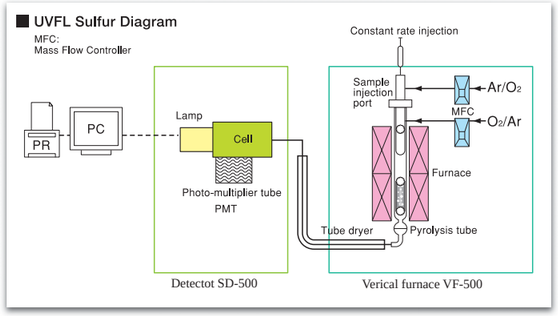
$$R\text{-}S + O_2 \rightarrow SO_2 + SO_3 + \text{combustion product}$$

The produced SO_2 gas is excited by irradiating the ultraviolet ray v1 (190 to 230 nm). Then, SO2* emits the energy (fluorescent ray) and returns to the ground state.

$$SO_2 + hv1 \rightarrow SO_2^* \rightarrow SO_2 + hv2$$

This fluorescent ultraviolet ray v2 (300 to 400 nm) is received by the photomultiplier tube and area value is obtained. The sulfur concentration is obtained by a calibration curve preliminarily drawn using standard solution.

■ UVFL Sulfur Diagram



■ UVFL Sulfur applications

	Injection (µl)	Analysis (ppm)	RSD (%)
Diesel	40	9.95	0.43
Kerosene	40	1.41	2.95
Gasoline	40	3.79	0.38
BDF	40	1.01	7.07
BTX	40	0.60	0.50
Desulfured light naphtha	40	0.61	6.77
Propane	10ml	2.77	0.76
Butane	25ml	0.18	2.97

■ Simultaneous applications for Nitrogen and Sulfur

	N (ppm)	RSD (%)	S (ppm)	RSD (%)
Heavy oil	0.32%	0.84	0.48%	1.47
Lub oil	2.11	2.61	7.72	1.42
Diesel	2.91	0.41	9.79	0.27
Gasoline	6.92	0.19	3.79	0.38
Naphtha	4.6	1.78	26.4	0.42

※ The above values are measured by the previous model NSX-2100V series. NSX-5000V series have as same level of capability as NSX-2100V series.

■ Liquid cooling option for auto sampler

By preventing sample vaporization during syringe handling, cooling option is very effective for high volatile sample.

Low B.P. sample	Sample Temperature Control	
	OFF (22℃)	ON (15℃)
Result (n=5) ppm	3.59	7.54
RSD (%)	21.1%	1.0%

■ SD-500 Detector

Chemiluminescence nitrogen detector ND-500

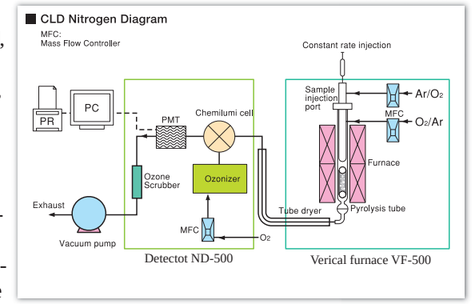
Nitrogen measurement

Sample is injected into a high-temperature (900 to 1000 ℃) pyrolysis tube by argon carrier gas. After nitrogen compounds in the sample are pyrolyzed, it is combusted, oxidized, and converted to nitric oxide (NO). After removing moisture from the combustion gas by a dehumidifier (tube dryer), the following oxidation reaction occurs by the reaction of NO with ozone.

$$NO + O_3 \rightarrow NO_2 + O_2 + hv$$

By this reaction, 590 to 2,500 nm of emitting light is generated. The optical intensity of this light is proportional to the NO concentration at a wide wavelength range. After emitted light is detected by a photomultiplier tube and signal processing is performed, an area value is obtained. Using the calibration curve, the total nitrogen concentration in the sample is calculated. Some of samples generate interference substances such as SOx and CO_2 in the process of oxidative combustion. However, the interference can be decreased to an irrelevant level by the contribution of reduced pressure method.

■ CLD Nitrogen Diagram



■ Nitrogen, standard sample

	Recovery (%)	RSD (%)
10.0 ppm Quinoline	98.5	0.9
0.32% Heavy oil	99.1	0.7
0.11% Heavy oil	104.0	0.1
0.0064% Heavy oil	100.6	0.1

■ Nitrogen, application sample

	Analysis (ppm)	RSD (%)
Naphtha	0.8	4.2
Kerosene	3.2	2.2
Diesel	4.1	1.7
Gasoline	2.5	1.7

■ Nitrogen aqueous applications

	Analysis (ppm)	RSD (%)
River Water	3.1	1.70
Factory Disposal	2.6	2.10
Seawater*	0.2	4.80
Sewage Plant (Treated Sewage)	2.2	1.80

* Sea water option

※ The above values are measured by the previous model NSX-2100V series. NSX-5000V series have as same level of capability as NSX-2100V series.

■ ND-500 detector with vacuum pump

Specification for Trace Sulfur Analyzer NSX-5000V/SD

	Sulfur measurement	Nitrogen measurement (optional)
Sample	Liquid/Gas	
Analytical method	Oxidative combustion and UV fluorescence detection	Oxidative combustion and chemiluminescence detection
Furnace	Max. 1,100 °C, Openable electric furnace, 2-section type	
Measuring range	2 to 20,000 ng (up to 10,000 µg/mL) LOQ: 0.02 µg/mL*	Non-aq. 3 to 20,000 ng (up to 10,000 µg/mL) Aq. 1 to 10,000 ng (up to 5,000 µg/mL) LOQ: Non-aq. 0.03 µg/mL*, Aq. 0.01 µg/mL *
Sample volume	Liquid: Max 200 µL	
Measurement time	less than 5 min	
Vacuum pump	——	Diaphragm type dry vacuum pump
Gas used	Argon: Purity 99.98 % or more, 0.3 ± 0.1 MPa , Oxygen: Purity 99.7 % or more, 0.3 ± 0.1 MPa	
Power supply	VF-500:AC100 / 115 V (50 / 60 Hz), 1100 VA, AC230 / 240 V (50 / 60 Hz), 1800 VA SD/ND-500:AC100-240 V 300 VA	
Mass and weight	VF-500:500(W) ×430(D)×500(H) mm, approx. 35 kg SD-500:220(W) ×375(D)×500(H) mm, approx. 21 kg ND-500: 220(W) x 375(D) x 500(H) mm, approx. 22 kg Vacuum pump:160 (W) × 320 (D) × 220 (H) mm, approx. 7.5 kg	

* It depends on the sample volume, the matrix, the purity of reagents and the condition of the unit.

Specification for Trace Nitrogen Analyzer NSX-5000V/ND

	Nitrogen measurement (non-aqueous system)	Nitrogen measurement (aqueous system)
Sample	Liquid/Gas	
Analytical method	Oxidative combustion and chemiluminescence detection	
Furnace	Max. 1,100 °C, Openable electric furnace, 2-section type	
Measuring range	3 to 20,000 ng (up to 10,000 µg/mL) LOQ: 0.03 µg/mL* Liquid: Max. 200 µL	1 to 10,000 ng (up to 5,000 µg/mL) LOQ: 0.01 µg/mL * Liquid: Max. 100 µL
Sample volume	Liquid: Max 200 µL	Liquid: Max 100 µL
Measurement time	less than 4 min	
Vacuum pump	Diaphragm type dry vacuum pump	
Gas used	Argon: Purity 99.98% or higher, 0.3 ± 0.1MPa , Oxygen: Purity 99.7% or more, 0.3 ± 0.1MPa	
Power supply	VF-500: 100/115 VAC, 50/60 Hz: 1,100 VA, 230/240 VAC, 50/60 Hz: 1,800 VA ND-500: 100/115/230/240 VAC, 50/60 Hz: 300 VA	
Mass and weight	VF-500:500(W) ×430(D)×500(H) mm, approx. 35 kg ND-500:220(W) ×375(D)×500(H) mm, approx. 22 kg Vacuum pump:160 (W) × 320 (D) × 220 (H) mm, approx. 7.5kg	

* It depends on the sample volume, the matrix, the purity of reagents and the condition of the unit.

MEASUREMENT PRINCIPLE

Micro coulometry detector MCD-500

Chlorine analysis

Samples are combusted in an argon/oxygen atmosphere.
The resulting hydrogen chloride is led into a titration cell where it is automatically titrated by silver ions generated by electrolysis.
The amount of chlorine is calculated from the quantity of electricity required for the titration.

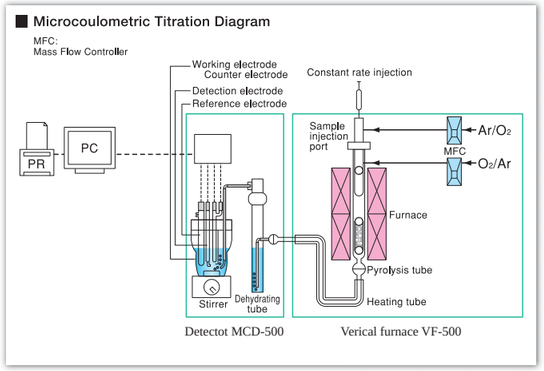
$$HCL + Ag^{+} \rightarrow H^{+} + AgCl \text{ (titration)}$$
$$Ag \rightarrow Ag^{+} + e^{-} \text{ (electrolysis)}$$

Sulfur analysis

Samples are combusted in an argon/oxygen atmosphere.
The resulting sulfur dioxide is led into a titration cell where it is automatically titration by triiodide ions generated by electrolysis.
The amount of sulfur is calculated from the quantity of electricity required for the titration.

$$SO_2 + I_3^{-} + H_2O \rightarrow SO_3 + 3I^{-} + 2H^{+} \text{ (titration)}$$
$$3I^{-} \rightarrow I_3^{-} + 2e^{-} \text{ (electrolysis)}$$

■ Microcoulometric Titration Diagram



■ **MCD-500 detector**

● **Sample applications**

■ **Chlorine**

	Injection (µl)	Analysis (ppm)	RSD (%)
Naphtha	200	0.08	9.8
Gasoline	200	0.53	5.3
Kerosene	200	0.09	5.0
Lub oil	90	1.35	3.2
Diesel 1	200	0.18	7.6
Diesel 2	200	0.05	13.5
Xylene	90	2.47	3.1

■ **Sulfur**

	Injection (µl)	Analysis (ppm)	RSD (%)
High Octane	50	7.3	2.3
Gasoline	50	5.5	1.7
Kerosene	50	13.7	1.3
Diesel	50	1.3	3.9
Lub oil 1	50	126	2.1
Lub oil 2	50	37	1.2
Lub oil 3	50	13	2.3

※ The above values are measured by the previous model NSX-2100V series.
NSX-5000V series have as same level of capability as NSX-2100V series.

Specification for Trace Chlorine/Nitrogen Analyzer NSX-5000V/MCD

	Chlorine measurement	Sulfur measurement
Sample	Liquid/Gas	
Analytical method	Oxidative combustion and chemiluminescence detection	
Furnace	Max. 1,100 °C, Openable electric furnace, 2-section type	
Sensing electrode	Silver electrode	Platinum electrode
Measuring range	10 to 500,000 ng (up to 5,000 µg/mL) LOQ: 0.05 µg/mL*	20 to 50,000 ng (up to 1,000 µg/mL) LOQ: 0.1 µg/mL*
Sample volume	Liquid: Max 200 µL	
Measurement time	less than 10 min	
Gas used	Argon: Purity 99.98 % or more, 0.3 ± 0.1 MPa , Oxygen: Purity 99.7 % or more, 0.3 ± 0.1 MPa	
Power supply	VF-500: 100/115 VAC, 50/60 Hz: 1,100 VA, 230/240 VAC, 50/60 Hz: 1,800 VA MCD-500: 100/115/230/240 VAC, 50/60 Hz: 300 VA	
Mass and weight	VF-500:500(W) ×430(D)×500(H) mm, approx. 35 kg MCD-500:220(W) ×375(D)×500(H) mm, approx. 14 kg	

* It depends on the sample volume, the matrix, the purity of reagents and the condition of the unit.

Option

Liquid Sample Changer ASC-550L

Sample	Liquid (non-aqueous, aqueous)
Injection	Gastight microsyringes: 25, 50, 100, 250 µL
Rinse vial	28 mL vials with septum
Number of samples	50 or 105 bottles
Vial size / Sample tray	6 mL / 50 bottles 4 mL / 50 bottles 2 mL / 50 bottles 2 mL / 105 bottles
Power	100/115/230/240 VAC (50/60 Hz) 180 VA
Dimensions	460(W) ×320(D)×470(H) mm Approx.
mass	16 kg

Sample Temperature Controller STC-500L

Sample	Liquid
STC vial rack	2 mL vial / 24 bottles 4 mL vial / 24 bottles 6 mL vial / 24 bottles
Rinse vials	2 pcs. 28 mL
Cooling temperature	STC vial rack: 15 °C to room temperature STC syringe holder: 10 °C to room temperature
Power	100/115/230/240 VAC (50/60 Hz) 400 VA
Dimensions and mass	Temperature controller: 220 (W) × 375 (D) × 100 (H) mm, 4 kg
	STC vial tray: 2.7 kg
	STC syringe holder: 0.45 kg

Constant Rate Injector for Vertical Furnace CRI-500V

Sample	Liquid(non-aqueous)
Syringe	Gastight microsyringe 25, 50, 100 and 250 µL
Injection	Minimum injection volume 10 µL Maximum injection volume 200 µL (with 250 µL gas-tight microsyringe)
Injection rate	0.4~1.6 µL/sec
Power	100/115/230/240 VAC (50/60 Hz) 30 VA
Dimensions and mass	150 (W) × 248 (D) × 240 (H) mm 5.6 kg

Gas Injector GI-510

Sample	Non-pressurized gas, Volatile liquid
Injection	Gas: 10 mL with gastight syringe Liquid: 10 µL with gastight microsyringe
Carrier gas	Argon (Purity 99.98 % or more, 300±100 kPa)
Heater	80 °C for vaporization of liquid
Power	AC100-240 V(50/60 Hz) 45 VA
Dimensions	220(W) ×250(D)×110(H) mm
Mass	4 kg

Gas Injector GI-520

Sample	Non-pressurized gas, Volatile liquid
Injection	1-10 µL liquid 2-25 mL gas (max. 999 mL)
Carrier gas	Argon (purity 99.9 8 % or more, 300±100 kPa)
Heat	80 °C for vaporization of liquid
Power	AC100-240 V(50/60Hz) 70 VA
Dimensions	180(W) ×360(D)×500(H) mm
Mass	13 kg

Gas Injector GI-560

Sample	(1) Gas (Use a gastight syringe.) Nitrogen, sulfur, and chlorine in gas (2) Volatile liquid (Use a gastight microsyringe.) Nitrogen, sulfur, and chlorine in volatile liquid (3) Liquefied petroleum gas (Use an LPG cylinder.) Nitrogen, sulfur, and chlorine in liquefied petroleum gas (LPG) * Liquefied natural gas (LNG) is not acceptable.
Injection	Gas: Syringe port (max. 10 mL/ min) Volatile liquid: Syringe port (max. 10 µL) LPG: 30 µL sampling loop
Carrier gas	Argon
Heater temperature	From room temperature to 105 °C (Recommended value: 85 °C)
Sample gas pressure	6.5 MPa or less
Power	100/115/230/240 VAC (50/60 Hz) 108 VA
Dimensions	220 mm (W) × 370 mm (D) × 490 mm
Mass	18 kg

Trap & Release Unit for Sulfur TRU-500(SD-500)

Sample	Liquid, Gas
System	SO2 Gas Adsorption and Desorption
Measuring range	5 ppb to 1 ppm
Temperature	100〜1,050 °C
Power	100/115/230/240 VAC (50/60 Hz) 1500 VA
Dimensions	180 (W) × 540 (D) × 500 (H) mm
Mass	16 kg