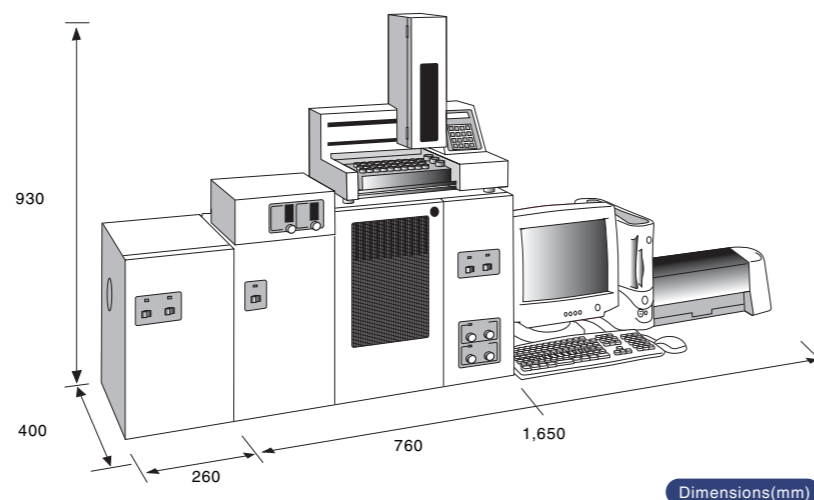


■ Specifications

	Sulfur measurement (standard)	Nitrogen measurement (option)																															
Samples	Liquid and gaseous samples																																
Analytical method	Oxidative pyrolysis-ultraviolet fluorescence method	Oxidative pyrolysis-chemiluminescence method																															
Sample introduction method	Directly introduced using microsyringe																																
Sample size	Liquid samples: 5-200 $\mu$ l*1, Gaseous sample: 1-10 ml*2																																
Measuring range	20ppb – 10,000ppm	0.1ppm – 5,000ppm																															
Measurement precision	<table border="1"> <thead> <tr> <th>Concentration(ppm)</th> <th>Sample size (<math>\mu</math>l)</th> <th>RSD(%)</th> </tr> </thead> <tbody> <tr> <td rowspan="2">0.05</td> <td>150</td> <td>10</td> </tr> <tr> <td>90</td> <td>20</td> </tr> <tr> <td rowspan="2">0.1</td> <td>150</td> <td>5</td> </tr> <tr> <td>90</td> <td>10</td> </tr> <tr> <td>1</td> <td>40</td> <td>5</td> </tr> <tr> <td>10</td> <td>20</td> <td>3</td> </tr> </tbody> </table>	Concentration(ppm)	Sample size ( $\mu$ l)	RSD(%)	0.05	150	10	90	20	0.1	150	5	90	10	1	40	5	10	20	3	<table border="1"> <thead> <tr> <th>Concentration(ppm)</th> <th>Sample size (<math>\mu</math>l)</th> <th>RSD(%)</th> </tr> </thead> <tbody> <tr> <td>0.1</td> <td>90</td> <td>10</td> </tr> <tr> <td>0.5</td> <td>90</td> <td>5</td> </tr> <tr> <td>10</td> <td>40</td> <td>3</td> </tr> </tbody> </table>	Concentration(ppm)	Sample size ( $\mu$ l)	RSD(%)	0.1	90	10	0.5	90	5	10	40	3
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10	40	3																															
Measurement time	5-10min./measurement																																
Furnace temperature	Max. 1,100°C																																
Gas requirements	Argon (purity: 99.98% or more, 0.2-0.4MPa) Oxygen (purity: 99.7% or more, 0.2-0.4MPa)																																
Power supply	Main unit: AC 100/115/230/240V, 50/60Hz, 1,300 VA Sulfur detector: AC 100/115/230/240V, 50/60Hz, 52VA																																
Dimensions and weight	Main unit: Approx. 500(W) x 400(D) x 500(H)mm, Approx. 35kg Sulfur detector: Approx. 260(W) x 360(D) x 430(H)mm, Approx. 19kg Controller: Approx. 260(W) x 310(D) x 110(H)mm, Approx. 5.5kg																																

\*1: The optional ASC-150L or CRI-100V is required when measuring liquid samples. Optional microsyringe is also required when measuring over 50 $\mu$ l samples.

\*2: The optional Gas Injector is required when measuring gaseous samples.



Dimensions(mm)

# Trace Sulfur Analyzer Model TS-100V Vertical Furnace Combustion Type



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The combination of the Ultra Violet Fluorescence method as a Sulfur detector and the vertical furnace combustion system using Oxygen control (patent pending) realize more defined trace Sulfur measurements for Petroleum, Petrochemical and Fuels.

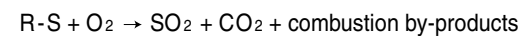
## Features

- Dry Method : The UVFL detection needs no wet chemical reagents.
- Highly sensitive analysis : Oxygen controlled combustion system realizes the ppb order Sulfur measurement.
- Rapid measurement : Vertical Furnace Combustion cuts down the heating and cooling time.
- Simultaneous Nitrogen and Sulfur measurements : Nitrogen detector (Option) can be attached easily.
- Standard method : This analysis is used for the certified method indicated below.  
Sulfur ASTM D5453 / Oxygen digestion and UVFL  
Nitrogen ASTM D4629, D5176, D5762, D6069

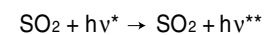
## Measurement Principle

### ■ Sulfur

The sample is injected into a reaction tube maintained at a high temperature (800-1,000°C) using Argon for the carrier gas. Sulfur compounds in the sample are broken down by pyrolysis and then oxidized by O<sub>2</sub> gas resulting in the formation of SO<sub>2</sub> at a constant ratio.



When SO<sub>2</sub> is irradiated with ultraviolet light\* (190-230nm), the ultraviolet rays are absorbed and SO<sub>2</sub> molecules in the resulting excited state emit energy generated in the form of fluorescent ultraviolet rays after which they return to the ground state.



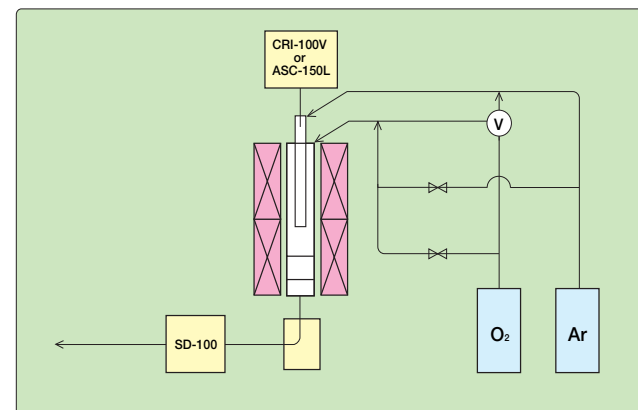
These ultraviolet fluorescent rays\*\* (350-450nm) are captured with a photomultiplier and converted into an AREA value following waveform processing. The total sulfur concentration in the sample is then determined using a calibration curve prepared in advance with standard solutions.

### ■ Nitrogen

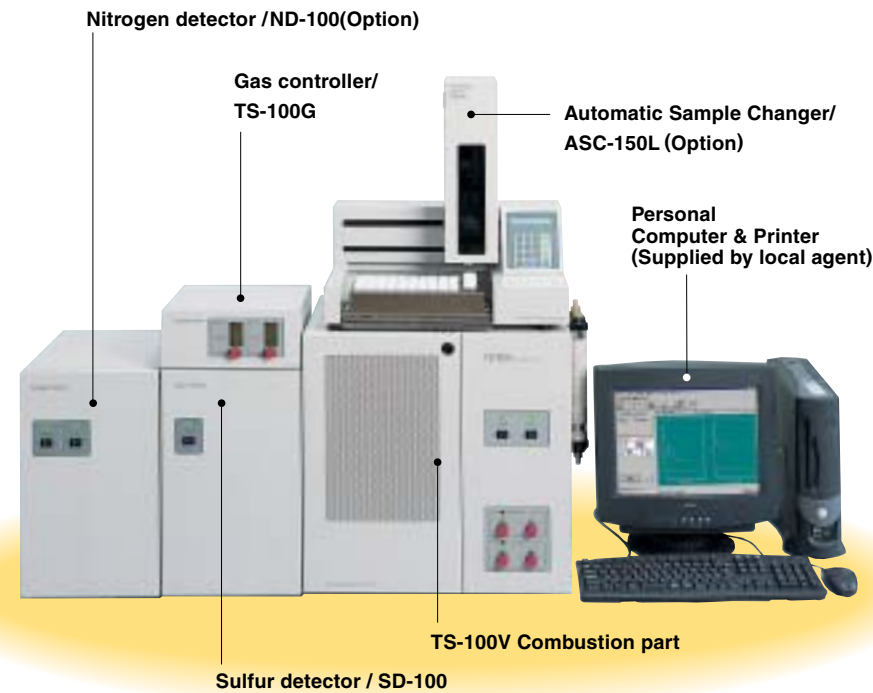
The sample is injected into the reaction tube maintained at a high temperature (800-1,000°C) using Argon for the carrier gas. Nitrogen compounds in the sample are broken down by pyrolysis followed by oxidation by O<sub>2</sub> gas yielding NO. The NO gas that is formed has the moisture removed with a dryer and is reacted with O<sub>3</sub> gas resulting in the occurrence of an oxidation reaction as indicated in the reaction equation below.



Light having a wavelength of 590-2500nm is emitted during the course of this reaction. The intensity of this light is proportional to the NO concentration over a broad range. The emitted light is captured with a photomultiplier tube and converted to an AREA value after waveform processing. The total nitrogen concentration in the sample is then determined using a calibration curve prepared in advance with standard solutions. Furthermore, although inhibiting substances such as SO<sub>x</sub> and CO<sub>2</sub> are formed during the course of decomposition into NO, depending on the sample, the use of a reduced pressure, chemiluminescence method minimizes their effects.



### ■ System Configuration of TS-100V



## Absorption

## OPTION

### ■ Example of Sulfur analysis for fuel oils

	Sample volume (μl)	No. of measurements	Measured Value (ppm)	RSD (%)
Diesel oil (A)	20	3	91.2	0.9
Diesel oil (B)	20	3	11.1	1.5
Diesel oil (C)	40	3	0.19	8.3
Kerosene	20	3	29.8	1.2
Regular gasoline	20	3	28.9	2.1
High-octane gas	20	3	8.3	2.3
Naphtha (A)	40	3	0.36	5.6
Naphtha (B)	150	3	0.03	8.1

### ■ Liquid Auto Sampler Model ASC-150L

Liquid Auto Sampler Model ASC-150L is an auto-sampler in which liquid samples (max. 50 bottles) are injected automatically.



Sample	Liquid samples
Syringe	50μl microsyringe Option: 25, 100, 250μl microsyringe
Sample Vial	6ml/50 places
Rinse Vial	28ml/2 places
Sample Inj. Times	1-30 times/1 vial
Rinsing Function	0-5 times
Power Supply	AC100/115/230/240V, 50/60Hz, 60VA
Dimensions	Approx. 460(W) x 320(D) x 470(H)mm
Weight	Approx. 16kg

### ■ Constant Rate Injector Model CRI-100V

Non-aqueous samples are injected at a constant rate using a microsyringe



Syringe	Standard: 50μl microsyringe Option: 25, 100, 250μl microsyringe
Injection rate	0.2-1.3μl/sec variable*
Power Supply	AC100/115/230/240V, 50/60Hz, 17VA
Dimensions	Approx. 250(W) x 150(D) x 286(H)mm
Weight	Approx. 7kg

\*Normally used at 1μl/sec

### ■ Nitrogen Detector Model ND-100

Connecting this Nitrogen detector to the TS-100V system allows measurement of total Nitrogen.



Detection method	Oxidation decomposition, chemiluminescence
Power Supply	AC100/115/230/240V, 50/60Hz, 194VA
Dimensions	Approx. 260(W) x 360(D) x 430(H)mm
Weight	Approx. 17kg

\*Vacuum pump is in standard.

### ■ Gas Injector Model GI-100

This system is used for analysis of gaseous samples.



Sample	Gaseous sample
Sample size	Liquid standard sample: Max. 20μl (gas-tight microsyringe) Gaseous standard sample: Max. 10ml (gas-tight microsyringe)
Gas requirements	Argon (purity: 99.98% or more)
Power Supply	AC100/115/230/240V, 50/60Hz, 30VA
Dimensions	Approx. 120(W) x 250(D) x 235(H)mm
Weight	Approx. 4kg