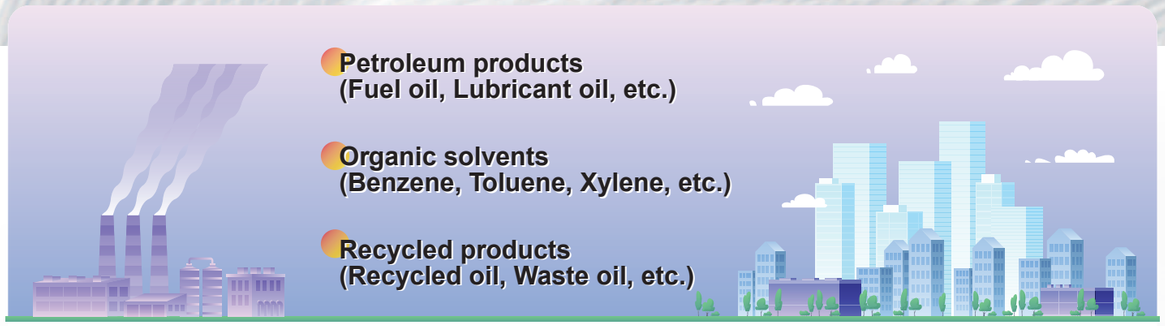
Sample application



- **Petroleum products (Fuel oil, Lubricant oil, etc.)**
- **Organic solvents (Benzene, Toluene, Xylene, etc.)**
- **Recycled products (Recycled oil, Waste oil, etc.)**

Nitrogen(CLD) sample application

	Amount, mg	n	Result, µg/mL or µg/g	RSD, %
Diesel	20 (µL)	3	52	2.1
Heavy oil	20 (µL)*1	3	2350	1.6
Lubricant oil	20 (µL)*1	3	375	1.8
Polycarbonate	13	5	2.5	4.5
Polyethylene	12	5	27	3.8
Epoxy resin	11	5	31	1.2
Tonner	8	5	355	1.5
Rubber	5	3	270	1.2
Pulp	3	5	3750	2.1

* Diluted by toluene

Sulfur(UVFL) sample application

	Amount, mg	n	Result, µg/mL or µg/g	RSD, %
Naphtha	10 (µL)	5	181	0.6
Diesel	10 (µL)	3	133	0.6
Kerosene	10 (µL)	3	25	1.2
Gasoline	10 (µL)	3	145	1.8
Lubricant oil	10 (µL)	3	2870	1.2
Heavy oil	10 (µL)	3	1340	0.5
PBT	30	5	303	2.6
Pulp	5	3	206	1.6

Chlorine(MCD) sample application

	Amount, mg	n	Result, µg/mL or µg/g	RSD, %
Toluene	100 (µL)	3	0.14	12
Naphtha	100 (µL)	3	0.17	14
Lubricant oil	50 (µL)	3	34	4.2
Waste oil	15 (µL)	3	3600	3.2
Crude oil	10	3	7.5	3.2
Polycarbonate	20	3	7.9	3.4
Aluminum foil	20	3	5.5	6.5
Rubber	10	3	580	2.1
Cement	10	3	280	4.1

Sulfur(MCD) sample application

	Amount, mg	n	Result, µg/mL or µg/g	RSD, %
Lubricant oil A	5 (µL)	3	1.2 (%)	3.5
Lubricant oil B	10 (µL)	3	0.76 (%)	3.5
Lubricant oil C	10 (µL)	3	520	4.3
Rubber	15	3	740	3.2
Epoxy resin	15	3	130	2.4
Coal	10	3	320	6.1
Coke	10	3	570	3.2
Crude oil	5	3	120	3.1

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 deferent from color printed. All screen images are inset synthesis.
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 operatiing the instrument, then always follow the manual for proper operation.

Nittoseiko Analytech
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CAT No.310101223111E

Trace Elemental Analyzer
NSX-5000H SERIES
Horizontal Furnace System

Nittoseiko Analytech Co.,Ltd.

NSX-5000H

NSX-5000H series contributes to the reduction of environmental load through advanced technologies. It enables automatic, safe and highly sensitive measurement of trace nitrogen, sulfur and chlorine in liquid or solid samples. It can be used in a wide range of applications such as quality control of recycled petroleum respectively chemical products or automotive fuels and environmental analysis.

Features

User-friendly software

The improved user interface can be adjusted to the requirements of different operators.

Simple mode

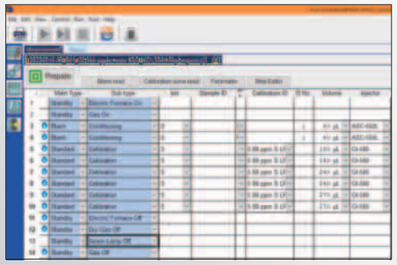
Simple mode allows easy operation in a routine environment, using predefined methods and guided start-up and shut-down procedures.

Advanced mode

Advanced mode gives full flexibility for method development, customization and access to quality control and audit trail functions.

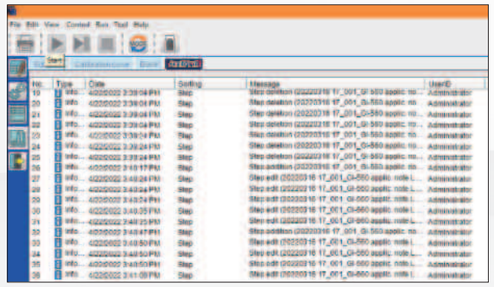
Automatic start-up and shut-down

Instrument start-up and shut-down procedures can be automated including flexible temperature and gas flow settings.



Audit trail

All operations and instrument conditions are recorded and allow full traceability of the measurement process.

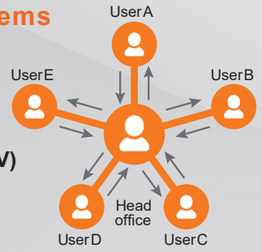


Import/Export function

Measurement related data and software related settings can be exported and (re-)imported. This is not only for data security and backups, but makes transferring methods and user settings to other computers and instruments easy.

Imported/Exported items

- Schedule
- Calibration curve
- Blank
- Method
- Measurement results (CSV)
- Combustion program
- Audit trail
- User authority



User management

Multiple users with different access levels help to protect data from unintended changes and support a cleanand easy to operate user interface.

Link to LIMS

Automatic output of measurement data to the network allow seamless integration into laboratory data management.

Easy Daily maintenance

Unique openable furnace and user-friendly connectors make routine visual checks and maintenance of the pyrolysis tube a matter of seconds, thus increasing consumable lifetime and performance.

Low running cost

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

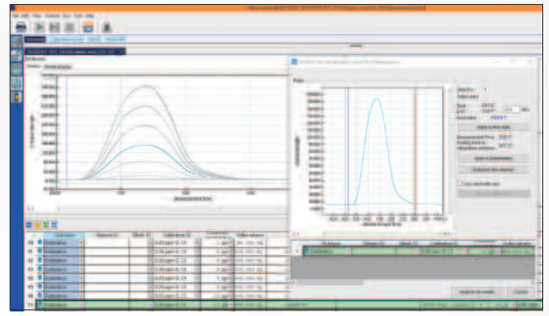
Rapid analysis with automatic boat control

Putting the sample boat into the electric furnace with an appropriately controlled speed prevents incomplete combustion and enables rapid measurement.
New programs can be created easily.

Reanalysis function

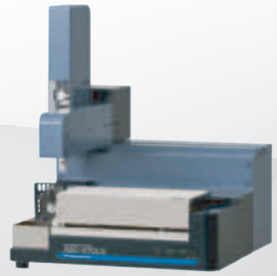
※Available at SD-500 or ND-500

The manual peak reintegration enables users to improve or correct integration results after measurement if required.



Options

Automatic Sample Changer for Liquid and Solid ASC-570LS

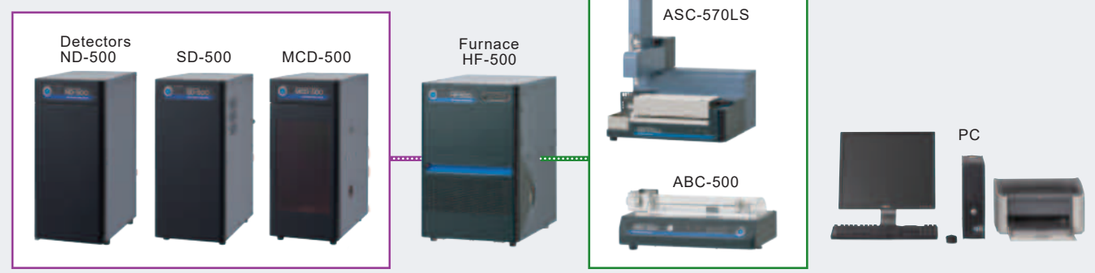


Samples tray type		Vial tray for liquid samples
		Boat tray for solid and non-volatile or viscous samples
Boat cooling		Electronic cooling (Peltier)
Ambient Temperature		10 to 35 °C (No fluctuation during measurement)
Power supply		AC 100/115/230/240 V, 50/60 Hz, 192 VA
Mass and weight		500 (W) × 460 (D) × 600 (H) mm, Approx. 27 kg
Solid	Volume	30 mg or less
	Sample boat quantity	49 pcs
	Boat operation	99 positions + end position + cooling position
	Sample boat material	Ceramic (Standard)
Liquid	Sample container	Vial with a septum, 4 mL or 2 mL capacity
	Sample vial quantity	4 mL- 84 pcs, 2 mL- 120 pcs
	Injection system	Gastight Microsyringe 25, 50, 100 µL

Automatic Boat Controller ABC-500

Sample type	Solid/Liquid
Sample volume	Solid: 30 mg or less, Liquid: 100 µL or less
Sample boat material	Ceramic, Quartz
Boat cooling	Electronic cooling (Peltier)
Power supply	AC 100/115/230/240 V, 50/60 Hz, 40 VA
Mass and weight	450 (W) × 250 (D) × 180 (H) mm, Approx. 9 kg

System Configuration



Trace Nitrogen Analyzer NSX-5000H /ND

Standard test method

ASTM D4629, D5762, D6069, D7184, JIS K2609

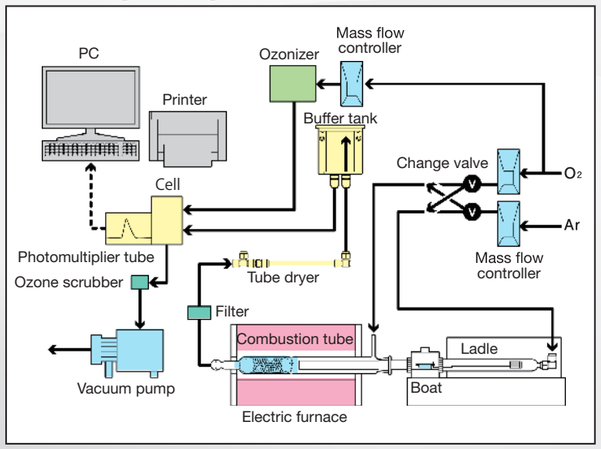
Measurement principle

Sample is loaded by sample boat into a high-temperature (900 to 1000 °C) pyrolysis tube with 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), and the following oxidation reaction occurs by the reaction of NO with ozone.

$$NO + O_3 \rightarrow NO_2 + O_2 + h\nu$$

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 wave-length range. After emitted light is detected by a photomultiplier tube and signal processing is performed, an area value is obtained. By using the calibration curve, the total nitrogen concentration in the sample is calculated. CO_2 and SO_X generated during oxidative combustion can cause interferences. However, the interferences can be decreased to not significant level by applying reduced pressure inside the reaction chamber.

CLD Nitrogen Diagram



Specification for Trace Nitrogen Analyzer NSX-5000H /ND

	Nitrogen measurement
Sample	Liquid (non-aqueous)/ Solid
Analytical method	Oxidative combustion and chemiluminescence detection
Furnace	Max. 1,100 °C, Openable electric furnace, 2 heating zones
Measuring range*	Liquid: 0.05 ~ 10,000 µg/mL, Solid: 0.5 ~ 5,000 µg/g
Sample amount	Liquid: Max 100 µL, Solid: Max 30 mg
Measurement time	Approx. 8 min * It depends on the sample volume and measurement condition.
Vacuum pump	Diaphragm type dry vacuum pump
Gas supply	Argon: Purity 99.98 % or more, 0.3 ± 0.1 MPa, Oxygen: Purity 99.7 % or more, 0.3 ± 0.1 MPa
Power supply	HF-500: AC100/115 V (50/60 Hz), 1100 VA, AC230/240 V (50/60 Hz), 1800 VA ND-500: AC100~240 V, 300 VA
Mass and weight	HF-500: Approx. 320(W) ×430(D) ×500(H) mm, Approx. 25 kg ND-500: Approx. 220(W) ×375(D) ×500(H) mm, Approx. 22 kg

*Actual measuring range depends on the sample, the matrix, the purity of reagents, gases and the condition of the unit.

Trace Sulfur Analyzer NSX-5000H /SD

Standard test method

ASTM D5453, D7183, ISO 20846, JIS K2541-6

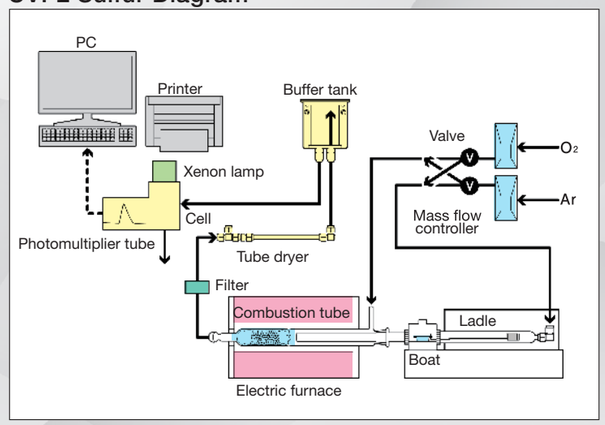
Measurement principle

Sample is loaded by sample boat into a heated (800 to 1100 °C) pyrolysis tube with argon carrier gas. After sulfur compounds in the sample are pyrolyzed, they are oxidized by O_2 gas. The produced SO_2 gas is excited by irradiating ultraviolet light v_1 (190 to 230 nm). On returning to ground state, this SO_2* emits energy as fluorescent ray.

$$SO_2 + h\nu_1 \rightarrow SO_2^* \rightarrow SO_2 + h\nu_2$$

This fluorescent light v_2 (300 to 400 nm) is converted into an electrical signal which is integrated for analysis. The sulfur concentration is obtained using a calibration curve preliminarily drawn with standard solutions.

UVFL Sulfur Diagram



Trace Sulfur Analyzer NSX-5000H /SD (/ND)

	Sulfur measurement	Nitrogen measurement (optional)
Sample	Liquid (non-aqueous) / Solid	
Analytical method	Oxidative combustion and UV fluorescence detection	Oxidative combustion and chemiluminescence detection
Furnace	Max. 1,100 °C, Openable electric furnace, 2 heating zones	
Measuring range*	Liquid: 0.05 ~ 10,000 µg/mL Solid: 0.1 ~ 10,000 µg/g	Liquid: 0.05 ~ 10,000 µg/mL Solid: 0.5 ~ 5,000 µg/g
Sample volume	Liquid: Max 100 µL, Solid: Max 30 mg	
Measurement time	Approx. 8 min	
Vacuum pump	——	Diaphragm type dry vacuum pump
Gas supply	Argon: Purity 99.98 % or more, 0.3 ± 0.1 MPa, Oxygen: Purity 99.7 % or more, 0.3 ± 0.1 MPa	
Power supply	HF-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 weigtht	HF-500: Approx. 320(W) ×430(D) ×500(H) mm, Approx. 25 kg SD-500: Approx. 220(W) ×375(D) ×500(H) mm, Approx. 21 kg , ND-500: Approx. 220(W) ×375(D) ×500(H) mm, Approx. 22 kg	

*Actual measuring range depends on the sample, the matrix, the purity of reagents, gases and the condition of the unit.
*Sulfur and Nitrogen simultaneous measurement is available by connecting SD-500 in series with ND-500.

Trace Chlorine/Sulfur Analyzer NSX-5000H /MCD

Standard test method

Chlorine : ASTM D4929, D5808, D7457
Sulfur : ASTM D3120, D3961

Measurement principle

Chlorine

Samples are combusted in an argon/oxygen atmosphere. The resulting hydrogen chloride is transferred 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 electrical charge required for the titration.

$$HCl + Ag^+ \rightarrow AgCl\downarrow + H^+$$
$$Ag \rightarrow Ag^+ + e^-$$

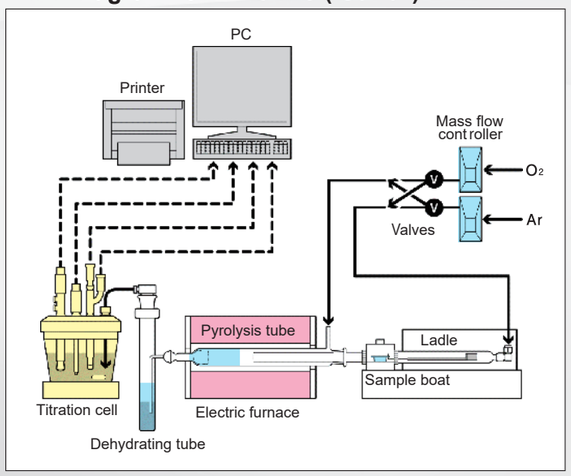
*Chlorine measurement in inorganic samples requires optional pyrolysis tube and humidification kit.

Sulfur

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

$$SO_2 + I_3^- + H_2O \rightarrow SO_3 + 3I^- + 2H^+$$
$$3I^- \rightarrow I_3^- + 2e^-$$

MCD Diagram for Chlorine (/Sulfur)



Specification for Trace Chlorine/Sulfur Analyzer NSX-5000H/ MCD

	Chlorine measurement	Sulfur measurement
Sample	Liquid / Solid	
Analytical method	Oxidative combustion and microcoulometric detection	
Furnace	Max. 1,100 °C, Openable electric furnace, 2 heating zones	
Detection electrode	Silver electrode	Platinum electrode
Measuring range*	Liquid: 0.1 ~ 5,000 µg/mL Solid: 0.5 ~ 50,000 µg/g	Liquid: 0.2 ~ 1,000 µg/mL Solid: 1.0 ~ 5,000 µg/g
Sample size	Liquid: Max. 100 µL, Solid: Max. 30 mg	
Measurment time	Approx. 10minutes for 2 µg Cl/S	
Gas supply	Argon: Purity 99.98 % or more, 0.3 ± 0.1 MPa , Oxygen: Purity 99.7 % or more, 0.3 ± 0.1 MPa	
Power supply	HF-500: AC100/115 V (50/60 Hz), 1100 VA, AC230/240V (50/60 Hz), 1800 VA MCD-500: AC100-240V, 150 VA	
Mass and weight	HF-500: Approx. 320(W) ×430(D) ×500(H) mm, Approx. 25 kg, MCD-500: Approx. 220(W) ×375(D)×500(H) mm, Approx. 14 kg	

*Actual measuring range depends on the sample, the matrix, the purity of reagents, gases and the condition of the unit.

Adsorbable Organic Halogens (AOX) Analysis

By using activated carbon technology and coulometric titration technology, adsorbable organic halogens in environmental water such as river water, lake water, and various industrial wastewater can be measured easily, quickly, and with high accuracy.

Total Organic Halogen Adsorption Unit Model TXA-04

A sample can be passed through a column filled with activated carbon, adsorbed, and rinsed with an aqueous nitrate solution. Adsorption and rinse are switched manually.

Injection	Disposable syringe 20 mL
Flow method	Automatic syringe system
Maximum flow volume	Samples: 300 mL (10 × n mL (n=1 to 30)) Rinse: 50 mL (5 × n mL (n=1 to 10))
Flow rate	3.0 mL/min (by official methods)
Syringe quantity	5 pcs (for flowing samples or washing inorganic halide)
Column	3 mm ×40 mm two-stage glass column
Filling volume of activated carbon	About 40 mg/column
Power supply	AC100/115 V, 50/60 Hz 50 VA AC 230/240 V, 50/60 Hz 50 VA
Mass and weight	330 (W) × 220 (D) × 500 (H) mm, Approx. 8 kg

Relevant standard test method

AOX: ISO 9652 TOX: EPA 9020

Measurement principle

1. Adsorption and rinse

A liquid sample is passed through two columns filled with activated carbon. AOX, adsorbable organic halogen, remains in the column after rinsing to remove inorganic halogen compounds.

2. Combustion

After the activated carbon is extruded from the column into the boat, the AOX sample is pyrolyzed in the furnace to generate hydrogen halides.

3. Titration

Hydrogen halide is titrated with Ag ions produced by electrolysis. The amount of halogen is calculated from the amount of electricity required for titration.

$$HX + Ag^+ \rightarrow H^+ + AgX\downarrow$$
$$Ag \rightarrow Ag^+ + e^-$$

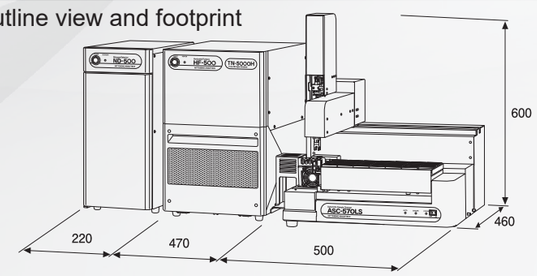
	Volume, mL	n	Result, µg/L	RSD, %
River water	50	3	78	4
Distilled water	100	3	3.8	10
Industrial waste water	20*	3	54 (mg/L)	0.8

*Diluted by pure water

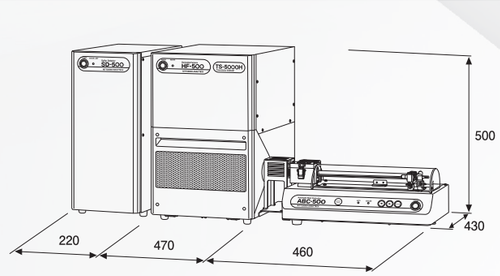
Material of sample boat and its characteristics

Appearance	Material	Description
	Ceramics	Mainly used for solid sample measurement. It is weaker than quartz against heat changes, and repeated use may damage the port. On the other hand, it is characterized by its high strength against substances that corrode quartz, and the capacity of the sample that can be loaded from the porcelain port is large. It can be used for automatic measurement in solid measurement mode of ASC-570LS.
	Quartz	It is mainly used for liquid sample measurement with quartz wool stuffed. Resistant to heat changes and suitable for repeated use. On the other hand, if a sample containing alkali metals or alkaline earth metals is measured, it will devitrify, so care must be taken when using it. Cannot be used for automatic measurement in solid measurement mode of ASC-570LS.
	Sintered quartz	It has the same shape as the ceramic port and is made of quartz. Resistant to heat changes and suitable for repeated use. On the other hand, if you measure a sample containing alkali metals or alkaline earth metals, it will devitrify, so be careful when using it. It can also be used for automatic measurements in the solid measurement mode of the ASC-570LS.
	Porcelain	Mainly used for solid sample measurement. Since it is relatively inexpensive, it is recommended to use it when the residue after burning is disposable. It cannot be used for automatic measurement in solid measurement mode of ASC-570LS.
	Nickel (inner boat)	An inner port that is installed inside a ceramic or sintered quartz port to prevent corrosion of the port. Since corrosive components remain in the inner port, the inner port is disposable. For sulfur determination, we do not recommend using the inner boat as it may result in lower readings.

Outline view and footprint



In combination with ASC-570LS



In combination with ABC-500