*Sulfur and Halogen analysis incl. Fluorine and* ***PFAS***
*Fast, Versatile and Robust*

***Official testing methods***
***ASTM: D5987, D7359, D8150, UOP 991, ISO 19242, EN 17813***


## Automatic Quick Furnace for Combustion Ion Chromatography

# *AQF-5000H*

Horizontal Furnace Model

**Nittoseiko Analytech Co., Ltd.**

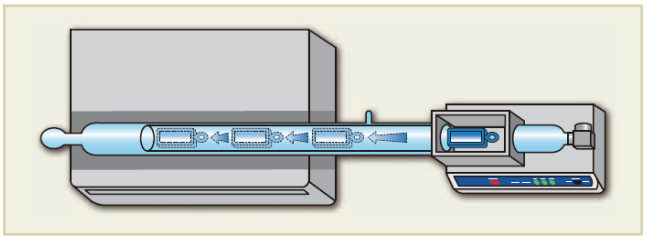
# AQF-5000H

**Advanced, developed to the third generation powerful, fast solution for sulfur and halogen analysis.**
**(Halogen: Fluoride, Chloride, Bromide and Iodide)**
**Effective for "PFAS screening tests", "Halogen analysis in battery materials", "environmental samples" and more …**

## Features

### ■EASY, SECURE AND REPEATABLECOMBUSTION

Easily customizable combustion programs that provide reliable combustion with full recovery.



### ■HUMIDIFICATION COMBUSTIONSYSTEM

Halogens can be measured with high precision because thermal hydrolysis is performed by stable humidification. The liquid volume can be adjusted to three levels, so it can accommodate a wide range of concentrations.

### ■ABSORBENT CORRECTION

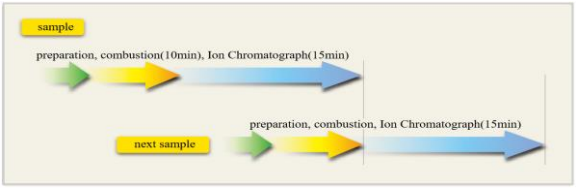
Constant volume function enables highly accurate analysis and easier operation. Since there is no longer a need to use Internal standards, samples with complex matrices can be measured.

### ■VARIOUS SAFETYMEASURES

Equipped with a three-stage electric furnace overheating prevention function. An alert is displayed when the electric furnace was opened, ensuring safety and allowing use it with confidence.

### ■EFFICIENTLY CONTROLLEDCOMBUSTION

Established program controls total analysis and able to start Combustion of the next sample to minimize analysis time.




## New Function

### ■AUTOMATIC DILUTION of Absorption solution

After injecting the absorbent into the ion chromatograph, it is possible to automatically dilute the absorbent and perform re-measurement. By using the automatic dilution, samples containing both low and high concentration components can be measured in one combustion.

### ■AUTOMATIC ADJUSTMENT of calibration standard

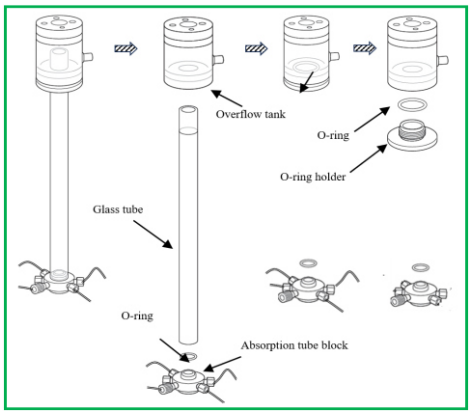
Using the optional syringe pump, it can be prepared calibration standard of different concentrations from one standard by automatic dilution. The function saves time for preparing calibration standards.

### ■AUTOMATIC SWITCHING of Absorbent

Absorption can be performed by selecting either a solution with redox agent or pure water. Automatic switching is possible according to the measurement item.

### ■ASSEMBLING ABSORPTIONTUBE

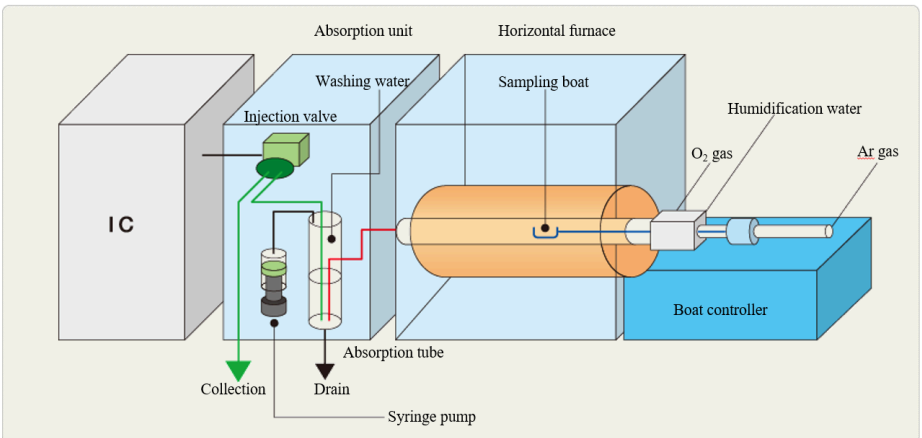
Easy maintenance since it is an assembled absorption tube consisting of a gas blowing pipe and the absorption unit body.



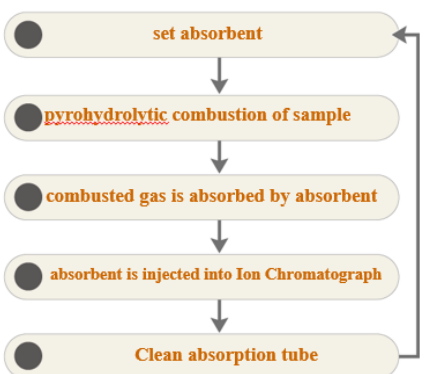

## Measuring Principle

After samples are thermally digested in the Argon atmosphere they are combusted with oxygen and $H_2O$. Sulfur in the samples changed to SOX and Halogens turn to Hydrogen Halide and Halogen gas. These elements will be trapped by the absorbent solution, then injected for IC analysis.

| Sample | | | In the Combustion tube | | In the absorbent | | |
|---|---|---|---|---|---|---|---|
| | Sulfur | → | | $SO_X$ | | $SO_4^{2-}$ | → to Ion Chromatograph |
| | Halogen | → | | HX, $X_2$ | | $X^- SO_4^{2-}$ | |




**Process Flowchart**



# Options

## ■Auto Sample Changer Model ASC-570LS for Solid and Liquid samples

ASC570LS can automatically measure each measurement target by switching between liquid measurement mode and solid measurement mode.

| | | |
|---|---|---|
| Samples tray type | | Vial tray for liquid samples |
| | | Boat tray for solid and non-volatile or viscous samples |
| Sample volume | | Liquid: 100µl or less |
| | | Solid: 150mg or less |
| Liquid | Injection system | Gastight Microsyringe 25, 50, 100µl |
| | Sample container | Vial with a septum, 2ml or 4ml capacity |
| | Sample vial quantity | 2ml- 120pcs, 4ml- 84pcs |
| Solid | Sample boat material | Ceramic (Standard) |
| | Sample boat quantity | 49pcs |
| Boat cooling | | Electronic colling (Peltier) |
| Power supply | | AC 100/115/230/240V, 50/60Hz, 192VA |
| Mass and weight | | 500(W) x 460(D) x 600(H), Approx. 27kg |

## ■Automatic Boat Controller Model ABC-500

Manually inject liquid samples and set up boats. The boat is introduced into the horizontal furnace according to a set program.

| | |
|---|---|
| Sample type | Solid/Liquid |
| Sample volume | Liquid: 100µl or less, Solid: 150mg or less |
| Sample boat | Ceramic, Quartz |
| Boat cooling | Electronic colling (Peltier) |
| Power supply | AC 100/115/230/240V, 50/60Hz, 40VA |
| Mass and weight | 450(W) x 250(D) x 180(H) mm, Approx. 9kg |

New

## ■Syringe Pump SP-C for calibration

It can be prepared calibration standard of different concentrations from one standard by automatic dilution.

| | |
|---|---|
| Syringe volume | 1ml |
| Power supply | 24VDC |
| Mass and weight | 110(W) x 340(D) x 275(H)mm, Approx. 4kg |
| Weight | Approx. 4kg |

New

# Plug-In Options

*Optional units can be integrated directly into the gas absorption unit, combining smart appearance, quick upgrade possibility and* ***easier maintenance***

## ■Combustion Monitor Model CM-500

CM-500 measures the oxygen concentration in combustion gases. Combustion conditions can be easily optimized by linking boat position and oxygen concentration.

## ■External Solution Selector Model ES-500

Six types of calibration curve solutions can be automatically switched and injected into the Ion Chromatograph.

# Applications

## ■Sample: Polyethylene

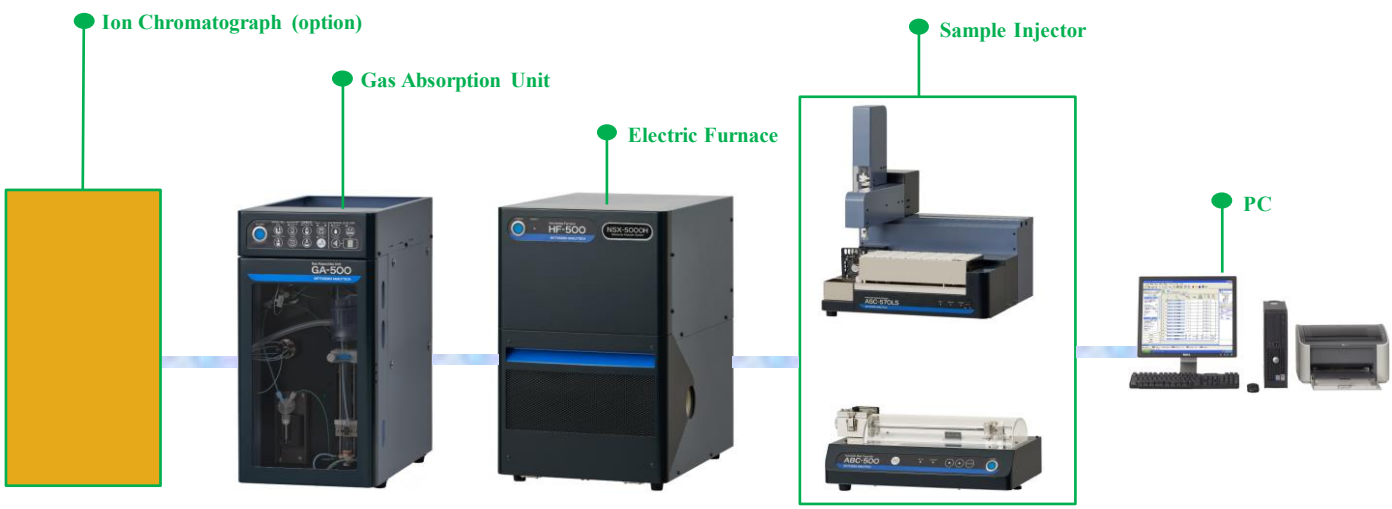
| Sample | Cl (ppm) | Br (ppm) | S (ppm) |
|---|---|---|---|
| 1 | 72 | 173 | 82 |
| 2 | 76 | 189 | 89 |
| 3 | 70 | 167 | 79 |
| Avg. | 73 | 177 | 83 |
| RSD(%) | 4.5 | 6.5 | 6.6 |

## ■Sample: Coal

| Sample | F(ppm) | Cl (ppm) | S (%) |
|---|---|---|---|
| 1 | 68 | 1138 | 1.43 |
| 2 | 70 | 1133 | 1.42 |
| 3 | 67 | 1086 | 1.40 |
| Avg. | 68 | 1138 | 1.42 |
| RSD(%) | 2.1 | 2.6 | 0.9 |

*Caution: Variations may occur due to sample composition, uniformity, weighing accuracy, etc.

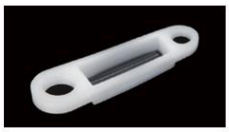
# System Configuration



# Official Testing Methods

| No. | Description | Target Halogen |
|---|---|---|
| ASTM D5987 | Standard Test Method for Total Fluorine in Coal and Coke by Pyrohydrolytic Extraction and Ion Selective Electrode or Ion Chromatograph Methods | F |
| ASTM D7359 | ASTM D7359 is the standard Test Method for Total Fluorine, Chlorine and Sulfur in Aromatic Hydrocarbons and Their Mixtures by Oxidative Pyrohydrolytic Combustion followed by Ion Chromatography Detection (Combustion Ion Chromatography-CIC) | F, Cl, S |
| ASTM D8150 | Standard Test Method for Determination of Organic Chloride Content in Crude Oil by Distillation Followed by Detection Using Combustion Ion Chromatography | Cl |
| ASTM D8247 | Standard Test Method for Determination of Total Fluorine and Total Chlorine in Coal by Oxidative Pyrohydrolytic Combustion Followed by Ion Chromatography Detection | F, CL |
| UOP 991 | Trace Chloride, Fluoride, and Bromide in Liquid Organics by Combustion Ion Chromatography (CIC) | F, Cl, Br |
| ISO 19242 | Determination of total sulfur content by ion chromatography | S |
| IEC 62321-3-2 | Determination of certain substances in electrotechnical products - Part 3-2: Screening - Fluorine, bromine and chlorine in polymer and electronics by combustion-ion chromatography (C-IC) | Br |
| DIN 38409-59 | Determination of adsorbable organically bound fluorine, chlorine, bromine and iodine (AOF, AOCl, AOBr, AOI) using combustion and subsequent ion chromatographic measurement | F |
| ASTM WK68866 | New Test Method for Determination of Adsorbable Organic Fluorine in Waters and Waste Waters by Adsorption on Activated Carbon followed by Combustion Ion Chromatography | F |
| EPA 1621 Draft Method | Screening Method for the Determination of Adsorbable Organic Fluorine (AOF) in Aqueous Matrices by Combustion Ion Chromatography (CIC) | F |

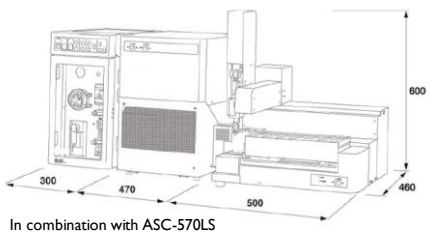
# Sample Boats

| Material | Ceramics | Porcelain | Sintered quartz | Quartz | Nickel (inner boat) |
|---|---|---|---|---|---|
| Appearance |  |  |  |  |  |

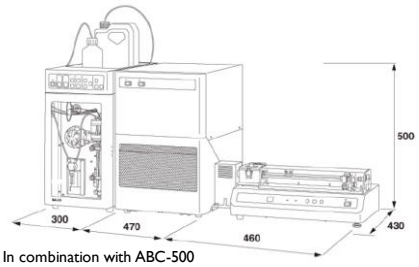
# Standard Specifications

| | |
|---|---|
| Sample introduction | Automated boat control |
| Sample | Solid, Liquid |
| Amount | 1 – 150 mg (solid), 5 – 100 µL (liquid) |
| Sample Pyrolysis | High purity quartz tube (ceramic option) |
| Electric furnace | Max. 1,100 °C, Openable electric furnace, 2 heating zones (Temperature individually controlled) |
| Injection to IC | Loop 100µl (5, 20, 50, 200, 500, 1000 µL option) |
| Tubing material | Fluoro-resin (low blank), PEEK |
| Signal output | Contact signal to start Ion Chromatograph |
| Gas | Argon (purity 99.98 % or higher, 0.3 ± 0.1 MPa) |
| | Oxygen (purity 99.7 % or higher, 0.3 ± 0.1 MPa) |
| Power supply | AC100-240VAC, 50/60 Hz |

## Outline view and footprint




In combination with ASC-570LS




In combination with ABC-500

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