

# Karl Fischer Titrator

Since 1972

**MOICO-A19** Coulometric Karl Fischer Titrator

**MOIVO-A19** Volumetric Karl Fischer Titrator



MOICO-A19

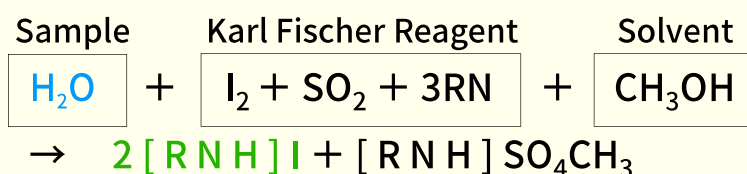


MOIVO-A19

## Principle of the Karl Fischer Moisture Determination Method

### Karl Fischer reaction

Water reacts with Iodine, Sulfur Dioxide, and Amine in a titration solvent containing Methanol and is titrated. Consequently, 1 mole (18g) of water (H<sub>2</sub>O) is titrated by 1 mole (252g) of iodine (I<sub>2</sub>).



The Karl Fischer analysis has two methods

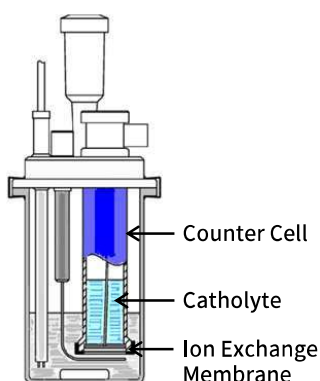
Coulometric titration, in which Iodine produced by electrolysis of the generating solution is used for titration, and Volumetric titration is based on the titration of the Karl Fischer reagent.

## Comparison of Coulometric and Volumetric Titration Methods

|                 | Coulometric titration  | Volumetric titration  |
|-----------------|--|---|
| Principle       | Iodine generated by electrolysis reacts with moisture, and the amount of moisture is calculated from the amount of electricity required to generate it.  | Calculate moisture content from the volume of Karl Fischer reagent consumed.  |
| Reagents        | Generating liquid (Counter electrode liquid)   | Karl Fischer reagent, Dehydrating solvent   |
| Characteristics | <ul style="list-style-type: none"> <li>- Accurately measures trace amounts of moisture.</li> <li>- Repeatable measurements with the same generated liquid.</li> <li>- Titer determination is not required.</li> </ul>  | <ul style="list-style-type: none"> <li>- Short measurement time for samples with high water content.</li> <li>- Wide range of application by selecting dehydrated solvent.</li> </ul> |
| Measuring range | 5μg~   | 0.1mg~  |
| Sample          | <ul style="list-style-type: none"> <li>- Liquids, gases, solids (including powders)</li> <li>- Organic and inorganic substances, Petrochemical products and Raw materials, Pharmaceuticals and pharmaceutical raw materials, etc. (For samples that do not dissolve in the generated liquid or dehydrated solvent, or for samples with disturbing reactions, a heating vaporization or evaporation method is required.)</li> </ul> |   |

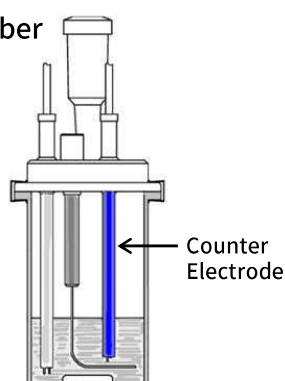
Coulometric titration methods have two types: "Two-Chamber Method" and "One-Chamber Method".

Two-chamber



Applicable to various standards

One-chamber



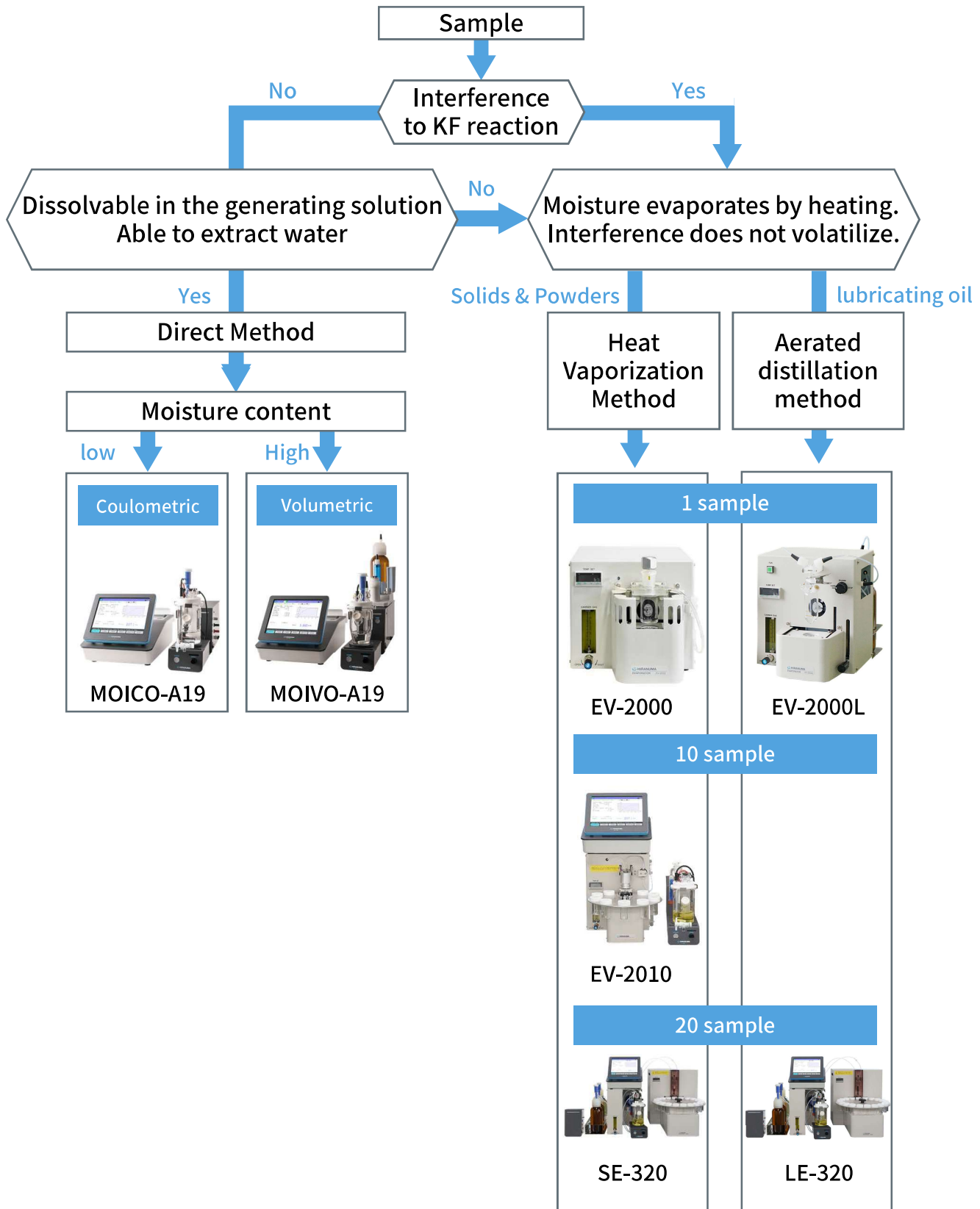
Easy maintenance with less reagent and waste liquid

Our unique technology enables the use of single-chamber electrolytic cell even with evaporators\*.

\*Except for small-capacity One-chamber electrolytic cells

## Select the measurement method to suit samples

Depending on the moisture content and condition of the sample, moisture content of various samples can be measured in combination with Evaporators. The following items should be used as a guide in selecting a device.



**MOICO-A19 Coulometric Karl Fischer Titrator**  
**MOIVO-A19 Volumetric Karl Fischer Titrator**

**Moisture measurement that is right for you.**

People who use the equipment varies. And the locations where they are installed vary as well.

We want to make it easier to see, easier to use, and easier to understand.

We wish the system could be flexible to suit each user.

We have incorporated such functions.

This is a moisture measurement device for you.

*problem*  
 “The screen is too small to read ...”



**Large LCD**



**MOICO-A19**



**MOIVO-A19**

*problem*  
 “I can’t get the right angle for me...”



**Monitor angle adjustment**



*problem*  
"I have nowhere to put it..."



**Space-saving design**

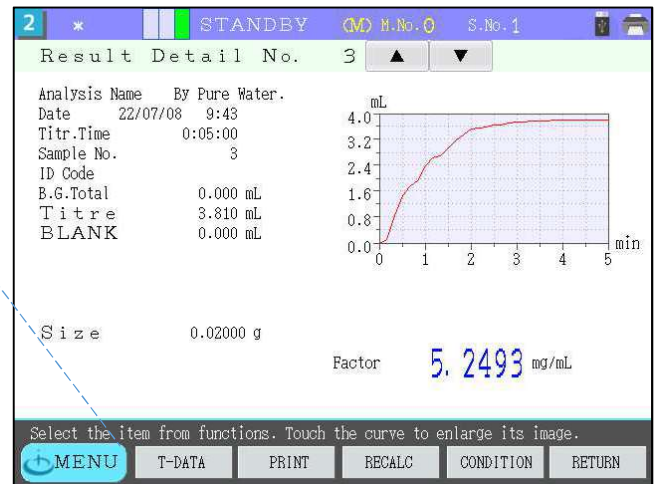
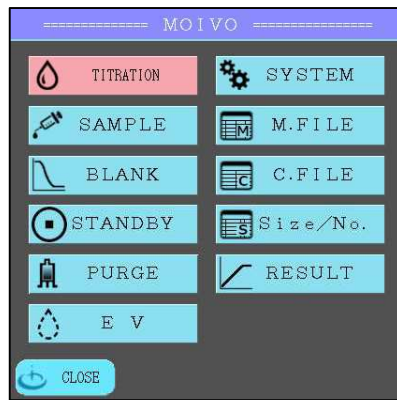
*problem*  
"I don't know if it's measuring or not ..."



**LED indication**

## Large Color LCD Touch Panel

A large 8.4" touch panel screen enables the user to input text easily. Selecting functions from the menu can be operated intuitively. The protective film can be replaced to protect it from scratches and wear over the long term.



## LCD Display Adjustable in 16 Positions

Each user can adjust the angle as he/she likes. The position can be locked so that it will not move when the screen is pressed.

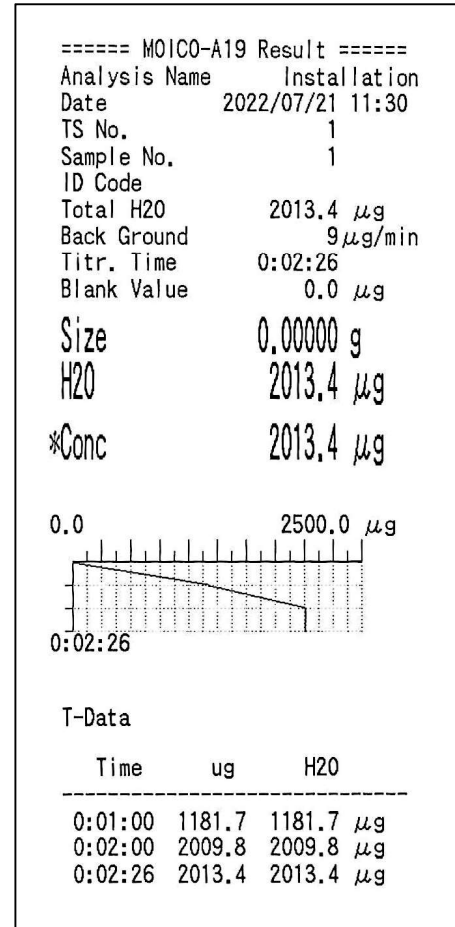


## Built-in Thermal Printer

Equipped with a built-in thermal printer with a paper roll 58-mm wide, which can be set up simply by inserting the paper roll and closing the cover.

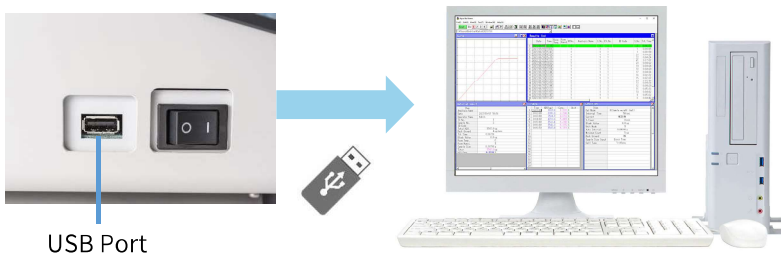


## Example of measurement result printout



## USB / LAN Port

Approximately 9,900 results can be stored on a USB memory stick. With optional software, the user can view the data on a PC or use a recalculation function. With a LAN connection, the user can also view the data on a Web browser.



## User Authentication Settings

User restrictions enable the security improvement as well as the prevention of inadvertent changes to, for example, measurement conditions.



## KF Titrator Main Drive

### Status Indicator with 3 LED Colors

Colored lights allow the user to confirm the status of operation from a distance. The user will also be alerted to unexpected problems right away.



Ready

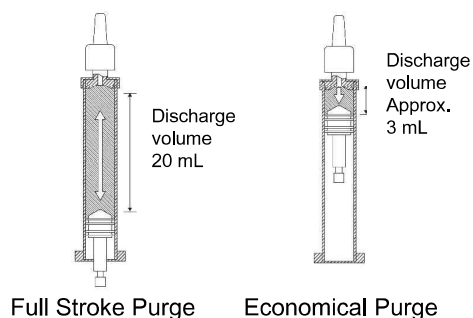
Titration in progress

Error

### Economical Purge Function

Volumetric

Discharging/charging at the top end of the syringe is repeated. Reagents can be replaced automatically, which greatly reduces waste fluid. The number of economical purge cycles can be set from 1 to 99.



Full Stroke Purge

Economical Purge

### Easy Replacement of Buret Head

Volumetric

Simply sliding toward the user, Buret Head can be removed together with the reagent bottle just with one hand.



### Reagent return function

Volumetric

No waste of expensive Karl Fischer reagents.



## Stirrer

### Forty Rotation Speeds Can Be Set

Rotation can be adjusted manually in fine increments shown by LED bars—it is easy to see and understand. (Four increments per each bar)



HIRANUMA K-3000A

HIRANUMA K-3000A

HIRANUMA K-3000A

### Two-color LED display of operating status

The operating status can be checked from a distant location.



Ready

Titration in progress

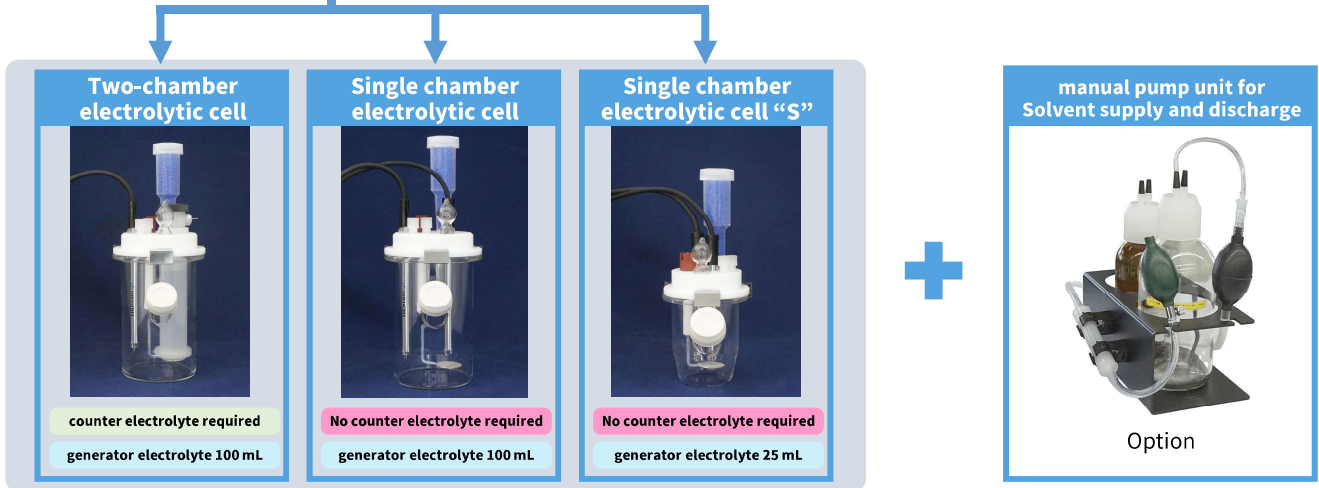
Coulometric



### Advantages of Single chamber electrolytic cell

- No Counter electrolyte and Diaphragm are required. Low waste and running costs.
- The simple structure of the electrolytic cell makes maintenance easy.
- Blanking is rapid (about 1/2 shortened) in Single chamber electrolytic cell "S".
- Our unique technology enables the use of Evaporator even in Single chamber electrolytic cells. (except for Single chamber electrolytic cell "S")

※ Some samples cannot be measured.  
 ※ Use in the Dry-Rooms is deprecated. Due to low Background moisture content It may take some time to recover from a state below endpoint potential after measurement is completed.



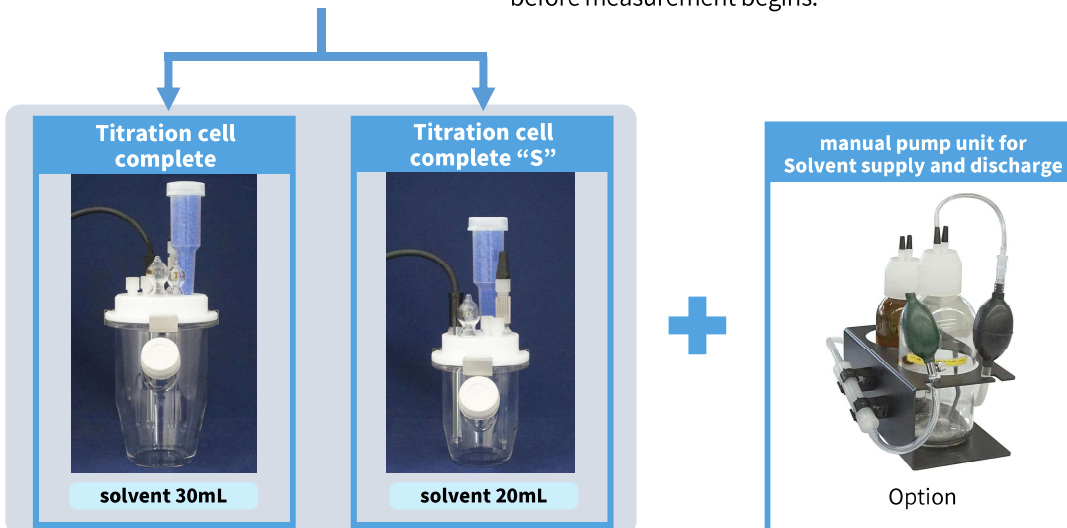
These images are examples without drain valve.  
 Also available with drain valve.  
 (except for Single chamber electrolytic cell "S")

Volumetric



### Advantages of Small-volume titration cell

- Usage of titration solvent is 2/3 of the conventional amount.
- Fewer reagents lead to lower effluent and running costs.
- The small surface area and volume in the cell allows for faster blank removal before measurement begins.



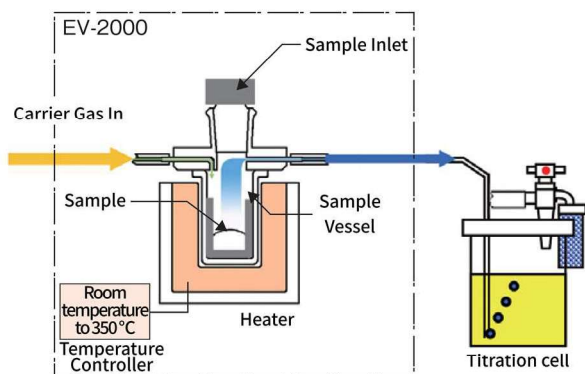
These images are examples without drain valve. Also available with drain valve.  
 (except for Titration cell complete "S")

## EV-2000 Solid Evaporator

Simple measurement of moisture in solid and powdered samples.



Example of configuration with MOICO-A19



### Examples of Uses

various resin pellets, medicines (powdered and solid), various inorganic powders and granules, copy machine toner, etc.

\*Samples such as sodium bicarbonate that produce water by decomposition by heating, or samples that release substances that react with Karl Fischer reagents cannot be measured.

#### Standard Specifications

|                       |  |
|-----------------------|--|
| Temperature control   | Optional settings, automatic temperature adjustment  |
| Temperature range     | From room temperature to 350 °C  |
| Carrier gas           | N <sub>2</sub> gas (or dry air from an optional dry air pump)<br>Flow rate : 0.1 to 1.0 L / min (depending on setting) |
| Carrier gas Desiccant | Molecular Sieves 100 g   |
| Heater                | Band heater  |
| Sample amount         | About 10 mL or less  |
| Power supply          | AC 100 - 240 V 50/60 Hz About 150 VA<br>A power cable is not included in this product. (*1)                            |
| Dimensions / Weight   | 220(W) x 430(D) x 200(H) mm / Approx. 8 kg   |

\*1: The power inlet of this product complies with IEC60320 C14.  
Please prepare a power cable that can be connected to this power inlet.

Solvents are not included.

### Advantages of "sample vessel = vaporization chamber"

- 1) Direct heating of sample vessel → good heating response
- 2) Smaller vaporization chamber volume → shorter blanking time
- 3) Direct cooling by fan → Short cooling time
- 4) Easily removable vaporization chamber → Easy to clean and maintain



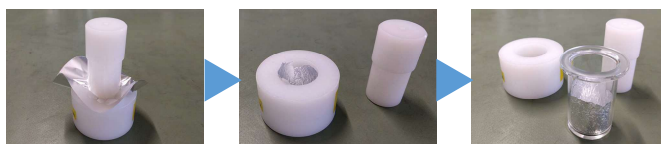
### For moisture vaporizer control "EV File"

The control of the moisture vaporizer can be set with a Karl Fischer Titrator.  
Three-step temperature increase is possible to find the appropriate heating temperature for your sample.



### Aluminum foil die-cut is included as standard

Aluminum foil can be used to prevent specimens from sticking to the vaporization chamber after heating.  
A die is provided for easy molding and mounting to match the vaporization chamber.



## EV-2000L Oil Evaporator

Samples which include substances which interfere with the Karl Fischer reaction such as lubricating oil and are difficult to measure the moisture of via direct methods can be measured in a short time using the azeotropic distillation method.

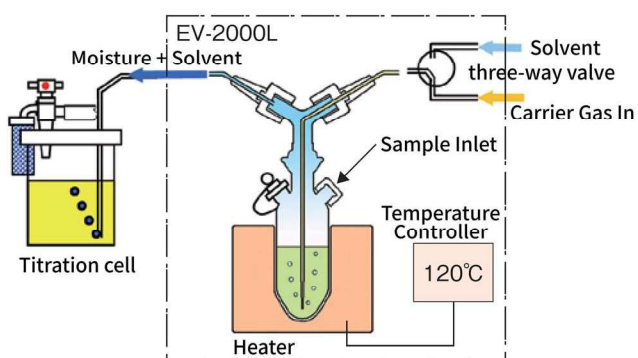


### Examples of Uses

Lubricating oils, mercaptans with relatively high boiling points (approximately 150 °C or higher\*),  
 Samples containing ketones, inks containing dyes, etc.

\*Measurement may not be possible depending on the concentration of interferences in the sample.

Example of configuration with MOICO-A19



| Standard Specifications      |  |
|------------------------------|--|
| Moisture Vaporization Method | Azeotropic Distillation Method (distillation while ventilating carrier gas)  |
| Temperature control          | Optional settings, automatic temperature adjustment  |
| Temperature range            | From room temperature to 200 °C  |
| Carrier gas                  | N <sub>2</sub> gas (or dry air from an optional dry air pump)<br>Flow rate : 30 to 300 mL / min (depending on setting) |
| Carrier gas Desiccant        | Molecular Sieves 100 g   |
| Heater                       | Band heater  |
| Sample amount                | About 10 mL or less  |
| Distillation Solvent         | Toluene, Xylene, n-Octane, etc.<br>(volume used in each measurement: 5-10mL)   |
| Power supply                 | AC 100 - 240 V 50/60 Hz About 150 VA<br>A power cable is not included in this product. (*1)                            |
| Dimensions / Weight          | 220(W) x 370(D) x 265(H) mm / Approx. 7 kg   |

\*1: The power inlet of this product complies with IEC60320 C14.  
 Please prepare a power cable that can be connected to this power inlet.

Solvents are not included.

### Options

- Dry Air Pump (For EV-2000/2000L/2010)

Dry air can be used as the carrier gas.

\*N<sub>2</sub> gas is recommended for pyrolysis samples.



- Evaporation chamber (For EV-2000L)

|                                       |   |  |
|---------------------------------------|---|--|
| Evaporation chamber A<br>No.E323310-A | For the grease sample                               |  |
| Evaporation chamber C<br>No.E323312-A | For the liquid sample<br>(Included in the EV-2000L) |  |

## Automated Solid Evaporator



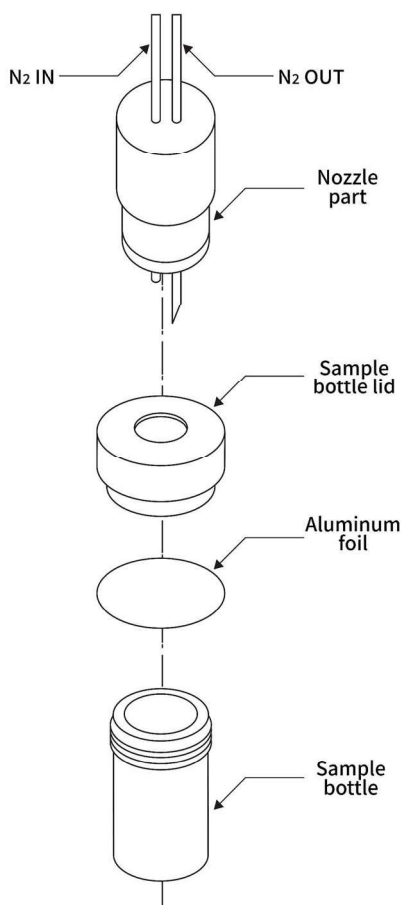
Example of configuration with MOICO-A19 and EV-2010



Example of configuration with MOICO-A19 and SE-320

- 1) Multiple samples can be measured automatically for efficient moisture measurement.
- 2) The sample heating temperature can be set arbitrarily from room temperature to 300°C. There are 50 measurement condition files, and optimal temperature settings can be registered for each sample.
- 3) Up to 3 steps of temperature increase can be set for each sample.
- 4) Easy-to-handle sample bottles are used. The container is straight from the bottom to the mouth, making it easy to take out the dissolved sample.
- 5) Automatic reagent exchange function is standard. (SE-320)  
The reagent replacement can be set by the number of measurements to automatically drain and replace the generator electrolyte.

Solvents are not included.

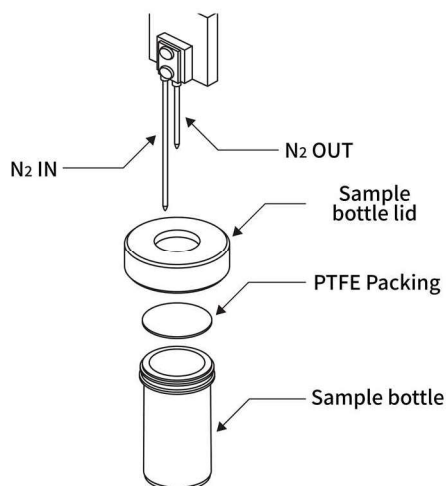


Configuration of nozzle and sample bottle

## Automated Oil Evaporator



Example of configuration with MOICO-A19 and LE-320



Configuration of nozzle and sample bottle

- 1) Multiple samples can be measured automatically for efficient moisture measurement.
- 2) The sample heating temperature can be set arbitrarily from room temperature to 200°C. There are 50 measurement condition files, and optimal temperature settings can be registered for each sample.
- 3) Up to 3 steps of temperature increase can be set for each sample.
- 4) Easy-to-handle sample bottles are used. Since PTFE is used for the packing, there is no blank from the packing.
- 5) Automatic reagent exchange function is standard. The reagent replacement can be set by the number of measurements to automatically drain and replace the generator electrolyte.

Solvents are not included.

### Standard Specifications

|                              | EV-2010  | SE-320  | LE-320                                    |
|------------------------------|--|---|---|
| Moisture Vaporization Method | Ventilation heating vaporization method  |   | Azeotropic Distillation Method            |
| Sample Container             | Hard glass bottle, aluminum foil packing, PTFE lid   |   | Hard glass bottle, PTFE packing, PTFE lid |
| Number of sample containers  | 10 samples   | 20 samples  |   |
| Sample amount (Volume)       | About 10 mL or less  |   | About 3 mL or less                        |
| Toluene Dispensing Volume    | —  |   | About 5 mL (per measurement)              |
| Carrier gas                  | N <sub>2</sub> gas (or dry air from an optional dry air pump)<br>Flow rate : 30 to 300 mL / min (depending on setting) | N <sub>2</sub> gas<br>Flow rate : 30 to 300 mL / min (depending on setting)     |   |
| reagent exchange             | —  | Automatic exchange by setting the number of measurements                        |   |
| Carrier gas Desiccant        | Molecular Sieves   |   |   |
| Heater/Temperature Control   | Band heater, PID control method  |   |   |
| Temperature range            | From room temperature to 300 °C,<br>Up to 3 levels can be set  |   | From room temperature to 200 °C           |
| End position setting         | Set stop-pin to end position   | When the stop pin is set to the end position or no container is detected        |   |
| Post-measurement procedures  | End buzzer   |   |   |
| Power supply                 | AC 100 - 240 V 50/60 Hz About 150 VA<br>A power cable is not included in this product. (*1)                            |   |   |
| Dimensions                   | 260W x 600D x 280H (mm)  | Sample changer : 350W x 510D x 390H (mm)<br>Valve BOX : 275W x 440D x 280H (mm) |   |
| Weight                       | Approx. 11 kg  | Sample changer : Approx. 19 kg<br>Valve BOX : Approx. 9 kg                      |   |

\*1: The power inlet of this product complies with IEC60320 C14.  
Please prepare a power cable that can be connected to this power inlet.

## MOICO-A19 Coulometric Karl Fischer Titrator

| ITEM  | SPECIFICATIONS  |
|---|---|
| Titration method                              | Coulometric Karl Fischer Titration  |
| Electrolysis control method                   | Constant-current electrolysis, intermittent electrolysis near the end point   |
| End-point detection method                    | AC polarization potentiometric detection method   |
| Measuring range                               | 5 µgH <sub>2</sub> O – 300 mgH <sub>2</sub> O   |
| Displayed resolution                          | 0.1 µg  |
| Background correction                         | Automatic correction (selectable ON/OFF)  |
| Display                                       | 8.4 inch color LCD touch panel  |
| Display unit                                  | µgH <sub>2</sub> O, ppm, %  |
| Accuracy                                      | Within CV of 0.3 %<br>(1 g of 1 mgH <sub>2</sub> O/mL water-in-methanol measured 10 times)  |
| Required measurement time                     | FAST : 1.8 mgH <sub>2</sub> O/min (30 µgH <sub>2</sub> O/sec)<br>MEDIUM : 1.2 mgH <sub>2</sub> O/min (20 µgH <sub>2</sub> O/sec)<br>SLOW : 0.6 mgH <sub>2</sub> O/min (10 µgH <sub>2</sub> O/sec)   |
| Electrolysis diaphragm                        | Ion exchange membrane (Only Two-chamber electrolytic cell)  |
| Electrolytic cell capacity                    | Two-chamber electrolytic cell : 150 mL (min.usage: approx. 100 mL)<br>Single chamber electrolytic cell : 150 mL (min.usage: approx. 100 mL)<br>Single chamber electrolytic cell "S" : 75 mL (min.usage: approx. 25 mL)  |
| Memory data capacity (Each titration station) | Built-in memory: 100 data points<br>USB flash memory: (≥256 MB) Maximum capacity approx. 9,900 data points  |
| Settings input method                         | Key touch input (English guide displayed)   |
| Conditions file                               | 51 files  |
| Sample files                                  | 99 files  |
| Calculation function                          | Concentration calculation, Recalculation, Statistics calculations   |
| GLP-compliant function                        | 1) Electrode control<br>- Total electrolysis volumes, replacement dates, and replacement alarms of generating solution<br>- Total electrolysis volumes, replacement dates, and replacement alarms of counter electrode solution<br>- Ion exchange membrane replacement date<br>- Indicator electrode replacement date<br>2) Measurement accuracy test<br>3) User control system |
| Printer                                       | Built-in thermal printer (Paper roll width: 58 mm)  |
| External input/output                         | RS-232C: 1 port (For balance or computer connection), LAN: 1 port, USB flash memory stick: 1 port   |
| Power supply                                  | AC100-240 V±10 % 50/60 Hz 60 VA (MC-3000) 50 VA (TQ-3000)<br>A power cable is not included in this product. (*1)  |
| Dimensions / weight                           | 235(W) × 400(D) × 250(H) mm / Approx. 6.5 kg (MC-3000)<br>110(W) × 250(D) × 160(H) mm / Approx. 3.5 kg (TQ-3000)<br>100(W) × 165(D) × 175(H) mm / Approx. 1.5 kg (K-3000A)  |

\*1: The power inlet of this product complies with IEC60320 C14. Please prepare a power cable that can be connected to this power inlet.

Solvents are not included.

## K-3000A Stirrer

| ITEM            | SPECIFICATIONS                         |
|-----------------|--|
| Stirring system | Magnetic stirrer                       |
| Power supply    | DC12 V (supplied by titration station) |



## Operating Requirements for Equipment

- Temperature: 5 to 35 °C
- Humidity: 85 % or less, with no condensation
- Atmosphere: No presence of acid, alkali, organic solvent gas, or rare gas
- Other: No inordinately high amount of dust or particles.  
No equipment nearby that generates strong lines of magnetic force.

## MOIVO-A19 Volumetric Karl Fischer Titrator

| ITEM                        | SPECIFICATIONS  |
|-----------------------------|---|
| Titration method            | Volumetric Karl Fischer Titration   |
| Electrolysis control method | Continuous dispensing; intermittent dispensing only around the end point  |
| End-point detection method  | AC polarization current detection method/AC polarization potential difference detection method  |
| Measuring range             | 0.1 mgH <sub>2</sub> O – 500 mgH <sub>2</sub> O (10 ppm – 100 %)  |
| Background correction       | Automatic correction (selectable ON/OFF)  |
| Display                     | 8.4 inch color LCD touch panel  |
| Display units               | mL (min.display:0.001 mL), mgH <sub>2</sub> O, %, ppm   |
| Buret accuracy              | Relative accuracy: $\pm 0.1\%$ or less (with full capacity discharge from 20-mL syringe at factory settings (new))<br>Repeat accuracy: 0.01 mL or less (with full capacity discharge from 20-mL syringe, n=6 standard deviation)  |
| Liquid contact tube         | $\phi 2 \times \phi 3$ , PTFE tube  |
| Valve change-over           | Automatic switching by ceramic lapping  |
| Min. dispensing volume      | 0.005 mL, 0.01 mL, 0.02 mL or 0.05 mL can be set.   |
| Titration cell capacity     | Standard : 150 mL (min.usage: approx. 30 mL)<br>Small : 75 mL (min.usage: approx. 20 mL)  |
| Memory data capacity        | Built-in memory: 100 data points<br>USB flash memory: ( $\geq 256$ MB) Maximum capacity approx. 9,900 data points   |
| Settings input method       | Key touch input (English guide displayed)   |
| Conditions file             | 51 files  |
| Sample files                | 99 files  |
| Calculation function        | Concentration calculation, Titer standardization calculation, Back titration calculation, Recalculation, Statistics calculations  |
| GLP-compliant function      | 1) Reagent Management<br>- Reagent remaining volume, replacement dates, and replacement alarms of reagent<br>- Total discharge volume, and operation start date of buret head<br>- Indicator electrode replacement date<br>2) Measurement accuracy test<br>3) Buret reliability check<br>4) User control system |
| Printer                     | Built-in thermal printer (Paper roll width: 58 mm)  |
| External input/output       | RS-232C: 1 port (For balance or computer connection), LAN: 1 port, USB flash memory stick: 1 port   |
| Power supply                | AC100-240 V $\pm 10\%$ 50/60 Hz 60 VA (MC-3000) 70 VA (TQV-3000)<br>A power cable is not included in this product. (*1)   |
| Dimensions / weight         | 235(W) $\times$ 400(D) $\times$ 250(H) mm / Approx. 6.5 kg (MC-3000)<br>120(W) $\times$ 340(D) $\times$ 500(H) mm / Approx. 7.0 kg (TQV-3000 and H-3000)<br>100(W) $\times$ 165(D) $\times$ 175(H) mm / Approx. 1.5 kg (K-3000A)  |

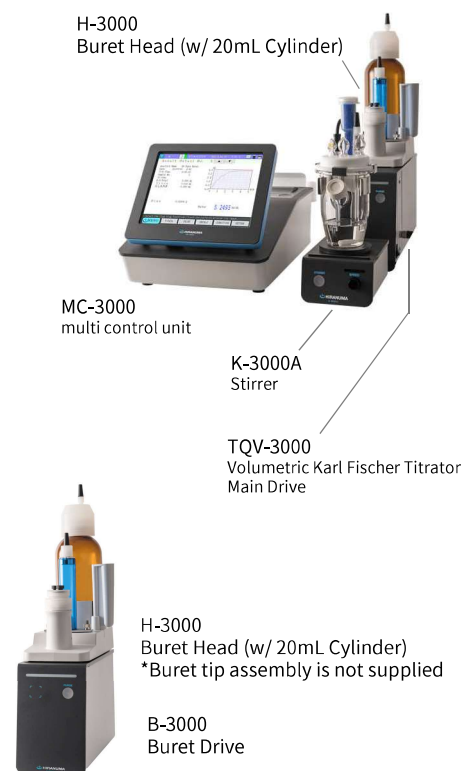
\*1: The power inlet of this product complies with IEC60320 C14. Please prepare a power cable that can be connected to this power inlet.

Solvents are not included.

## B-3000 Buret / H-3000 Buret Head

| ITEM                   | SPECIFICATIONS   |
|------------------------|--|
| Buret capacity         | 20 mL transparent syringe (also 10 mL)   |
| Wetted part material   | PTFE, hard glass, ceramic  |
| Connecting tubes       | $\phi 2 \times \phi 3$ PTFE tube   |
| Min. dispensing volume | 0.005 mL, 0.01 mL, 0.02 mL or 0.05 mL can be set.  |
| Buret accuracy         | Relative accuracy: $\pm 0.1\%$ or less (with full capacity discharge from 20-mL syringe at factory settings (new))<br>Repeat accuracy: 0.01 mL or less (with full capacity discharge from 20-mL syringe, n=6 standard deviation) |
| Buret attachment       | Up to one B-3000 burets can be attached simultaneously   |
| Power supply           | AC100-240 V $\pm 10\%$ 50/60 Hz 50 VA<br>A power cable is not included in this product. (*1)   |
| Dimensions / weight    | 120(W) $\times$ 250(D) $\times$ 500(H) mm / Approx. 4.0 kg   |

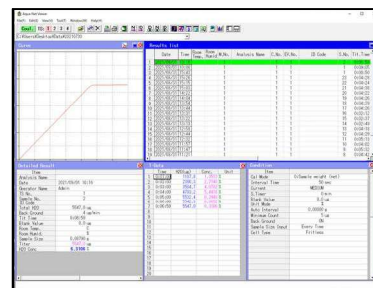
\*1: The power inlet of this product complies with IEC60320 C14.  
Please prepare a power cable that can be connected to this power inlet.



## PC software "Aqua-Net Viewer"

The results of measurements can be viewed, analyzed, and managed on a PC. A USB memory device must be connected to the PC.

- (1) Easy to manage measurement results.  
All result information can be displayed on a single PC screen.  
(List display, titration curve, measurement result, measurement condition, T data)
- (2) Reanalysis of results using the original data is possible.  
Recalculation and statistical calculation are available.



Titration curves and data can be copied and pasted to other application software (Word, Excel, etc.).

- Operating Environment;  
OS: Microsoft Windows 10 must be running properly.  
Memory: 4GB or more / CD-ROM drive must be installed. / USB: One port must be available.

### ■ Operating Requirements for Equipment

- Temperature: 5 to 35 °C
- Humidity: 85 % or less, with no condensation.
- Atmosphere: No presence of acid, alkali, organic solvent gas, or rare gas
- Other: No inordinately high amount of dust or particles.  
No equipment nearby that generates strong lines of magnetic force.

Note: "MICROSOFT", "Word", "EXCEL" and "WINDOWS" are registered trademarks or trademarks of Microsoft Corporation of the United States.

Note: The color of the actual product may differ from what you see here due to printing-related issues.

Note: The appearance, specifications, and accessories may be changed without prior notice for the purpose of making improvements.

**Caution regarding safety:** Be sure to read the instructions before use, and use the equipment as intended.

#### Sales

 **Hitachi High-Tech Science Corporation**

[www.hitachi-hightech.com/global/hhs/](http://www.hitachi-hightech.com/global/hhs/)

#### Head Office

Toranomon Hills Business Tower,  
1-17-1 Toranomon, Minato-ku, Tokyo 105-6409, Japan

#### Manufacturer

**HIRANUMA Co., Ltd.**

[www.hiranuma.com/english/index.html](http://www.hiranuma.com/english/index.html)

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