**Option**

- Bent-type Sampler for Powder
  - MKV 12-04576

- Straight-type Sampler for Light Weight Powder
  - MKV 12-04574

- Eggplant-shaped Sampler for Powders phi18.5 1/10 Taper Glass
  - MKV 12-04454

- Spoon Type Sampler for Viscous Sample
  - MKV 12-04575

- Finger Shaped Sampler
  - MKV 12-04184

- Sampler for High Viscous Sample
  - MKV 12-03400

- Finger Shaped Sampler
  - ADP 12-04184

- Sampler for Viscous samples
  - MKV 12-05192

- Syringe inlet (with Septum)
  - MKV 12-00661-11

- Liquefied gas Sampler
  - MKV 12-05143

- Micro Sampling Unit (for Coulometric)
  - MKV 12-00696-10

- D-type Titration Vessel with Port Plug
  - MKV 12-03510

- N-type Titration Vessel with Port Plug
  - MKV 12-01585

- C-type Titration Vessel with Port Plug
  - MKV 12-02828

- Titration Cell with Drain Cock
  - MKC 20-04042-00

**Karl Fischer Moisture Titrator [Volumetric titration]**

**MKV-710 Series**

**Karl Fischer Moisture Titrator [Coulometric titration]**

**MKC-710 Series**

**Option: Additional Burette KF (10mL)**

Distributed by

KYOTO ELECTRONICS
MANUFACTURING CO., LTD.

Specifications and design subject to change for improvements without notice. Printed in Japan.
MKV/MKC-710M
Unique flexibility – up to 4 simultaneous titration of any type

Moisture measurement by Karl Fischer method has been adopted in the official analysis methods (ASTM and pharmacopeial standard) and is widely used to determine moisture content in various substances as the most reliable method. The MKV/MKC-710M as a flagship model comes with a largest titration user interface available in the market. The main control unit of this model, MCU-710M, provides with its 8.4 inch LED touch panel an unique user experience and can be the common basis for up to four full-fledged titrators of any type, be it AT-710B potentiometric titrators or additional MKV-710B Volumetric or MKC-710B Coulometric Karl Fischer moisture titrators.

Summary/Connection Example

Wireless Bluetooth® communication – increased workplace safety when measuring toxic samples

* Bluetooth® adapters are to be prepared locally.

Wireless communication offers substantial benefits in terms of safety and space requirements. Operation is easier and safer when toxic samples have to be measured as the main control unit can be located outside the hood.
**Feature**

No cabled connections required between main control unit and titrator

With Bluetooth® adapters, there is no need to connect the main control unit to the titrator with a cable. This offers substantial benefits in terms of safety as the main control unit can be located outside the hood when toxic samples have to be measured. The main control unit can be equipped with a battery and therefore be held in the hand. Additionally, it can be equipped with a monitor arm and therefore be located in the most suitable spot. (Arm mount: VESA standard 75mm x 75mm)

One screen for up to four titrators

One main control unit can operate up to four titrators of any type (Potentiometric and Karl Fischer moisture titrators). It is thus possible to set up a system capable of running potentiometric and Karl Fischer moisture titrations simultaneously without wasting valuable bench space for several separate displays.

Result output as PDF files

Paper saving and environmentally friendly – results no longer need to be printed. Measurement results are converted to PDF and can be stored in a USB flash drive.

User groups and permissions

Two different user levels let you easily define the operation permissions of each operator. An administrator (protected with password) has access to all functions whereas a normal operator can only perform burette operation, calibration, measurement, method number (sample file) change and reading of method.

Large color TFT-LCD with touch panel

The main control unit is equipped with a large color TFT-LCD. The touch panel enables easy key entry.

**MKV-710S**

New burette unit

The new burette unit has the switching valve mounted directly on top of the cylinder. Less dead space between the switching valve and the cylinder and inside of the cylinder left less residual titrant when replacing it.

Titrant information stored in burette unit

Relevant titrant information is stored in an IC chip in the burette unit. Mounting the burette unit from one titrator to another does not require re-entry of the titrant information. This prevents titration with incorrect titrant.

Automatic factor calibration (timer controlled)

By adding an optional additional burette filled with a Water-Methanol standard solution, factor determinations can automatically be performed at regular intervals.

**MKC-710S**

Fast measurements

Our proprietary technology achieves electrolytic speeds up to 2.6mg H₂O/min. This shortens the time required for pre-titrations and sample measurements considerably.

**MKV-710S**

Replaceable diaphragm

Easy maintenance when measuring samples which tend to contaminate the diaphragm as eg. oils: Thanks to a unique mechanism, the ceramic diaphragm of the optional titration cell unit (12-03635-01) can be replaced.
### Flagship model

**Unique flexibility - up to 4 simultaneous titrations of any type**

**Karl Fischer Moisture Titrator [Volumetric titration]**

#### MKV-710 M

- **Automatic Solvent Change Unit**
- **Measuring method** Karl Fischer Volumetric titration
- **Measuring range**
  1. Water content: 0.1 to 500 mg H₂O (depends on KF reagent factor)
  2. Concentration: 1 ppm to 100% H₂O

- **Burette precision**
  - Volume: ± 0.005 mL
  - Weight: ± 0.005 mL

- **Endpoint detection**
  - By potentiometric level detected with a twin platinum electrode

- **Titration form**
  - Normal titration / Back titration (Option: additional burette required)

- **Required solvent**
  - 30 to 100 mL (in S-type titration vessel)

- **Key operation**
  - Touch panel

- **Displays**
  - 1) 8.4-inch color LCD 800 × 600 dots
  - 3) Simultaneous 4-channel display

- **Data storage**
  - 500 samples

- **GLP conformance**
  - Registration of operator / User group administration
  - Titrant: Reminder of factor measurement data / Alarm to indicate remaining reagent / Reminder of piston check results / Reminder of scheduled check date / Record of conduction time

- **External I/O**
  - RS-232C port × 4
  - USB port × 1

- **Power source**
  - AC 100 to 240V ± 10% 50/60 Hz

- **Dimensions**
  - Touch panel controller: 225 (W) × 190 (D) × 42 (H) mm
  - Karl Fischer reagent bottle: 280 × 300 × 300 mm

#### MKV-710 S

- **Simple titration**

#### MKV-710 B

### Midrange model

#### Karl Fischer Moisture Titrator [Volumetric titration]

### Entry model

#### Karl Fischer Moisture Titrator [Volumetric titration]

### Volumetric titration method

In moisture measurements by Karl Fischer titration method, water reacts with iodine and sulfur dioxide in the presence of a base and alcohol.

\[
2H_2O + I_2 + SO_2 + CH_3OH + 3RN \rightarrow [RNH]SO_4CH_3 + 2[RNH]I
\]

In moisture measurements by volumetric titration method, solvent is put in the titration cell and titrated with Karl Fischer reagent to achieve dehydrated state. Then the sample is added. The water content is then determined by adding Karl Fischer reagent whose factor (mg H₂O/mL) is pre-determined with a water-Methanol standard solution.

During titration, the speed and amount of Karl Fischer reagent addition is controlled based on the measured electric polarization potential of the detection electrode.
Flagship model

Unique flexibility - up to 4 simultaneous titrations of any type

Karl Fischer Moisture Titrator [Coulometric titration] MKC-710 M

Midrange model

Easy operation by touch panel

Karl Fischer Moisture Titrator [Coulometric titration] MKC-710 S

Entry model

Simple titration

Karl Fischer Moisture Titrator [Coulometric titration] MKC-710 B

### Specification

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<td><strong>Type</strong></td>
<td>Karl Fischer Moisture Titrator</td>
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<td><strong>Model</strong></td>
<td>MKC-710M</td>
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<tr>
<td><strong>Product configuration</strong></td>
<td>MKC-710M/MKC-710EXP-150-Manual Solvent Change Unit</td>
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<tr>
<td><strong>Making method</strong></td>
<td>Karl Fischer Coulometric titration</td>
</tr>
<tr>
<td><strong>Measuring range</strong></td>
<td>Water content / bromine index: 1ug to 300mg (depends on reagent)</td>
</tr>
<tr>
<td><strong>Measurement cell</strong></td>
<td>3-Component (3) Equipment</td>
</tr>
<tr>
<td><strong>Precision</strong></td>
<td>Relative standard deviation: less than 0.3% (n=10)</td>
</tr>
<tr>
<td><strong>Display resolution</strong></td>
<td>8-hg</td>
</tr>
<tr>
<td><strong>Control method</strong></td>
<td>Constant current pulse time control</td>
</tr>
<tr>
<td><strong>Endpoint detection</strong></td>
<td>Alternate current polarization method with a twin platinum electrode</td>
</tr>
<tr>
<td><strong>IF method</strong></td>
<td>Selective drift stability or limit measurement time</td>
</tr>
<tr>
<td><strong>Required solvent</strong></td>
<td>Anolyte 100mL (max 150mL)</td>
</tr>
<tr>
<td><strong>Method</strong></td>
<td>Karl Fischer Moisture Titrator [Coulometric titration]</td>
</tr>
<tr>
<td><strong>Key operation</strong></td>
<td>Touch panel</td>
</tr>
<tr>
<td><strong>Displays</strong></td>
<td>1) 8.4-inch color LCD 800 × 600 dots</td>
</tr>
<tr>
<td><strong>Calculation</strong></td>
<td>Concentration of water content, statistics data processing (mean, SD and RSD) and automatic averaging of blank value</td>
</tr>
<tr>
<td><strong>External I/O</strong></td>
<td>RS-232C port × 4, RS-232C port × 2</td>
</tr>
<tr>
<td><strong>LAN</strong></td>
<td>1) For Dot matrix printer, Electronic balance, Data Capture Software (SOFT-CAP), Evaporator, Multiple sample changer (SOFT-CAP)</td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td>Touch panel controller: 225(W) × 190(D) × 42(H) mm</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>Touch panel controller: Approx. 1.5kg</td>
</tr>
<tr>
<td><strong>Conformity standard</strong></td>
<td>CE marking</td>
</tr>
</tbody>
</table>

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### Coulometric titration method

In moisture measurements by Karl Fischer titration method, water reacts with iodine and sulfur dioxide in the presence of a base and alcohol.

H₂O + I₂ + SO₂ + CH₃OH → [RNH]SO₄CH₃ + 2[RNH]I

(1)

In moisture measurements by coulometric titration method, iodine is generated through electrolysis of an anode solution containing iodide ions. The generated iodine is proportional to the electric quantity according to the principle as described above and converted to water content.

H₂O → I₂ + 2e⁻ + 2H⁺

(2)

The generated iodine (according to formula 2) is consumed by the water according to formula (1). The detection electrode serves to detect the amount of free iodine and to control the speed of electrolysis.

The generated iodine is proportional to the electric quantity according to the Anfaday’s law. The formula (1) shows that I₂ reacts with H₂O in the proportion of one to one. The electric quantity required for the generation of the iodine based on the principle as described above is measured and converted to water content.
Together with Karl Fischer moisture titrator, this evaporator allows to measure the moisture content in powders or solid samples that cause side reactions and therefore cannot be titrated directly.

The samples are heated and the vaporized moisture is carried into the titration cell by a carrier gas. The sample boat moves in a closed tube driven by a magnet. This makes it possible to perform reliable measurements of trace moisture eliminating the risk of contamination from atmospheric moisture.

A patented scan mode automatically determines the optimum evaporation temperature based on the relation between released water and heating temperature. The heating tube is easy to be cleaned thanks to its simple construction.

Model | Evaporator ADP-611
---|---
**Heating method** | Mantel heater
**Sample type** | Powders or solid samples
**Sample capacity** | 0.1 ug to 45 mg
**Sample size** | 24 vials
**Sample size** | 50 mL vial
**Heating temperature** | Room temp.
**Sample transfer system** | Revolve turntable with vials and transfer a vial from turntable to heater oven.
**Carry gas** | Flow range: 100 to 300 mL/min
**Power source** | AC 100-120V/ 220-240V±10% 50/60Hz
**Dimensions** | 1150 (W) x 340 (D) x 334 (H)mm
**Weight** | Approx. 30kg

When nitrogen gas is in use, regulator (Adjustable to 50kPa) is required.

### Multiple Sample Changer CHK-501

Multiple sample evaporator for Coulometric Karl Fischer Moisture Titrators, suitable for the continuous measurement of up to 24 samples. The heating temperature can be set for each sample individually, different kinds of sample can thus be measured automatically one after the other. An auto power off function after measurement ensures safe operation.

**Model** | Multiple Sample Changer CHK-501
---|---
**Number of vials** | 24 vials
**Heating temperature** | Setting range: Room temp. to 300°C
**Carrier gas** | Flow range: 100 to 300 mL/min
**Power source** | AC 100-120V/ 220-240V±10% 50/60Hz
**Power consumption** | Approx. 800W
**Dimensions** | 320 (W) x 210 (D) x 330 (H)mm
**Weight** | Approx. 6kg

When nitrogen gas is in use, regulator (Adjustable to 50kPa) is required.

This unit evaporates moisture of samples dissolved in a heated base oil. This unit is primarily used for moisture measurements in lubricant oil, grease, tar products, paints and other viscous liquids.

**Model** | Evaporator for Oil Sample ADP-513
---|---
**Heating method** | Electric furnace
**Sample type** | Powders or solid samples
**Sample size** | 24 vials
**Sample capacity** | 0.1 ug to 45 mg
**Heating temperature** | Setting range: Room temp. to 300°C
**Carrier gas** | Flow range: 100 to 300 mL/min
**Power source** | AC 100-120V/ 220-240V±10% 50/60Hz
**Power consumption** | Approx. 600W
**Dimensions** | 835 (W) x 340 (D) x 334 (H)mm
**Weight** | Approx. 30kg

When nitrogen gas is in use, regulator (Adjustable to 50kPa) is required.

This unit is suitable for the determination of adhesive moisture or combined moisture of iron ores, manganese ores, clay or inorganic compounds according to the ISO standard.

The sample is heated in the electric furnace and the evaporated moisture is carried into the titration cell by nitrogen gas.

**Model** | Evaporator for High Temperature ADP-512S
---|---
**Heating method** | Electric furnace
**Heating temperature** | Setting range: 80°C to 130°C
**Sample amount** | 25 g to 400 g
**Sample size** | 24 vials
**Sample capacity** | 0.1 ug to 45 mg
**Heating temperature** | Setting range: Room temp. to 300°C
**Carrier gas** | Flow range: 100 to 300 mL/min
**Power source** | AC 100-120V/ 220-240V±10% 50/60Hz
**Power consumption** | Approx. 400W
**Dimensions** | 1150 (W) x 340 (D) x 334 (H)mm
**Weight** | Approx. 6kg

When nitrogen gas is in use, regulator (Adjustable to 50kPa) is required.