

OPTION



Bent-type Sampler for Powder
12-04576



"C" Bent-type Sampler for Powders
phi18.5 1/10 Taper Glass
12-04454



Sampler for Light Weight Powder
12-04452



Finger Shaped Sampler
12-04184



Straight-type Sampler for Light Weight Powder
12-04574



Eggplant-shaped Sampler for Powders
phi18.5 1/10 Taper
12-04453



Spoon Type Sampler for Viscous Sample
12-04575



Sampler for High Viscous Sample
12-02400



Sampler for viscous samples
12-05192



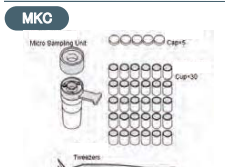
Syringe Inlet (with Septum)
12-00661-11



Liquefied Gas Sampler
12-05143



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



D-type Titration Vessel with Port Plug
12-03510



N-type Titration Vessel with Port Plug
12-01585



C-type Titration Vessel with Port Plug
12-02828



Titration Cell with Drain Cock
20-04042-00



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Karl Fischer Moisture Titrator [Volumetric titration]

MKV-710 SERIES

Karl Fischer Moisture Titrator [Coulometric titration]

MKC-710 SERIES



MKV-710M
Option: Additional Burette KF (10mL)

MKC-710M

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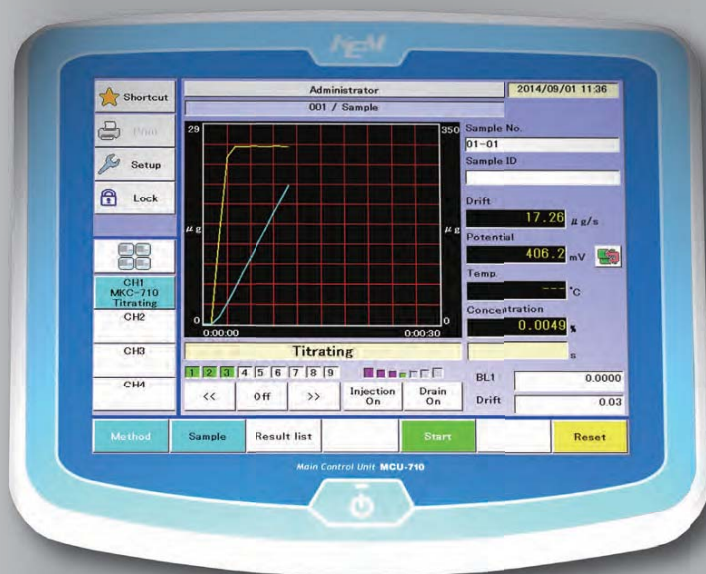
SUMMARY / CONNECTION EXAMPLE

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.



Main Control Unit
MCU-710M



Karl Fischer Moisture Titrator
[Volumetric titration]

MKV-710B

MKV-710M / MKV-710S



Karl Fischer Moisture Titrator
[Coulometric titration]

MKC-710B

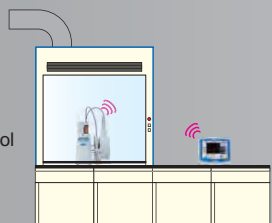
MKC-710M / MKC-710S

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.



MKV-710M + MKC-710B + AT-710B

FEATURE

no cabled connections required between main control unit and titrator

MKV-710M MKV-710M

For safe operation

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 75 mm x 75 mm)

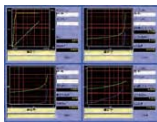


One screen for up to four titrators

MKV-710M MKV-710M

patented patent no. 2138712

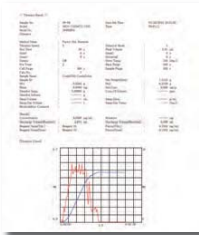
One main control unit can operate up to four titrators of any type (potentiometric and Karl Fischer moisture titrators). It is thus possible to set up a system capable of running potentiometric and Karl Fischer moisture titrations simultaneously without wasting valuable bench space for several separate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



result output as PDF files

MKV-710M MKV-710S MKV-710B MKC-710M MKC-710S MKC-710B

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

MKV-710M MKV-710S MKC-710M MKC-710S

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

MKV-710M MKV-710S MKC-710M MKC-710S

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

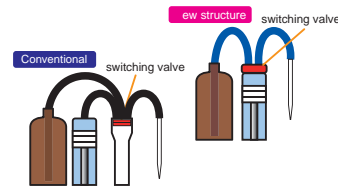


MKV-710 [Volumetric titration]

new burette unit

MKV-710M MKV-710S MKV-710B

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 it inside of the cylinder left less residual titrant when replacing it.



Titrant information stored in burette unit

MKV-710M MKV-710S

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.



no need to adjust settings for different types of solvent and samples

MKV-710M MKV-710S MKV-710B

Our proprietary technology (endpoint detection by compensating liquid resistance, patented no. 18 338) makes it unnecessary to change the detection electrode sensitivity and the endpoint voltage depending on the nature of each solvent and sample. This feature reliably prevents over titration and ensures highly accurate measurements.



patented patent no. 18 338

Automatic factor calibration (timer controlled)

MKV-710M MKV-710S

By adding an optional additional burette filled with a Water-Methanol standard solution, factor determinations are a matter of one single click. Thanks to a built-in timer function, factor determinations of the Karl Fischer reagent can automatically be performed at regular intervals.



MKC-710 [Coulometric titration]

Fast measurements

MKC-710M MKC-710S MKC-710B

Our proprietary technology achieves electrolytic speeds up to 2.5 mg $\text{H}_2\text{O}/\text{min}$. This shortens the time required for pre-titrations and sample measurements considerably.



replaceable diaphragm

MKC-710M MKC-710S MKC-710B

Easy maintenance when measuring samples which tend to contaminate the diaphragm as e.g. oils: Thanks to a unique mechanism, the ceramic diaphragm of the optional titration cell unit (12-03 3 -01) can be replaced.





Option: Additional Burette KF (10mL)



Option: Additional Burette KF (10mL)



Standard: MS-710V Magnetic Stirrer / Automatic Solvent Change Unit

Flagship model

Unique flexibility - up to 4 simultaneous titrations of any type

Karl Fischer Moisture Titrator [Volumetric titration]

MKV-710M

Midrange model

Easy operation by touch panel

Karl Fischer Moisture Titrator [Volumetric titration]

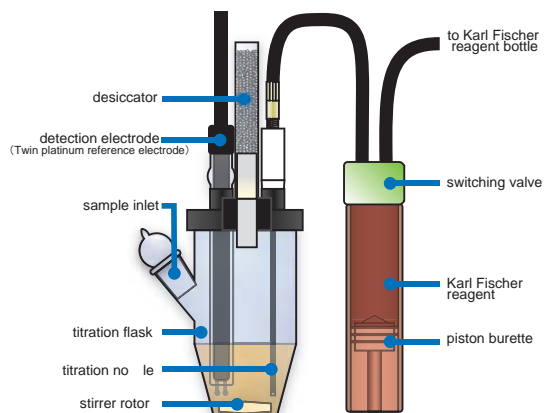
MKV-710S

Entry model

Simple titration

Karl Fischer Moisture Titrator [Volumetric titration]

MKV-710B



—VOLUMETRIC TITRATION METHOD—

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



n 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 H_2O /mL) is pre-determined with a water standard as eg. a Water-Methanol standard solution.

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

MKV-710 [Volumetric titration]

Specification	Contents			
Type	Karl Fischer Moisture Titrator			
Model	MKV-710M	MKV-710S	MKV-710B	
Product configuration	MCU-710M+MKV-710+IDP-100+ Automatic Solvent Change Unit	MCU-710S+MKV-710+IDP-100+ Automatic Solvent Change Unit	MKV-710+IDP-100+Automatic Solvent Change Unit	
Measuring method	Karl Fischer Volumetric titration			
Measuring range	1) Water content : 0.1 to 500mgH ₂ O (depends on KF reagent factor) 2) Concentration : 1ppm to 100%HzO			
Burette precision	Volume : 10mL burette Discharge precision : 10mL ±0.015mL Repeatability : ±0.005mL			
Endpoint detection	By polarized potential level detected with a twin platinum electrode			
EP sense method	Detection of potential level maintained during preset end time End time range : 1 to 99s			
Titration form	Normal titration / Back titration (Option additional burette required)			
Required solvent	30 to 100mL (in S-type titration vessel)			
Method	120	20		
Key operation	Touch panel	Sheet key		
Displays	1) 8.4-inch color LCD 800 × 600 dots 2) English / Japanese / Mandarin Chinese / Korean / Russian / Spanish / German / French 3) Simultaneous 4-channel display (Can also display Automatic Potentiometric Titrator simultaneously)		1) Black and white LED-backlit LCD 2) English / Japanese / Mandarin Chinese / Korean / Russian / Spanish 3) 1-channel display	
Calculation	Concentration of water content, statistics data processing (mean, SD and RSD) and automatic averaging of blank value and factor value			
Data storage	500 samples	100 samples		
GLP conformance	Registration of operator / User group administration Titrant: Reminder of factor measurement date / Alarm to indicate remaining reagent / Reminder of piston replacement date / Reminder of reagent replacement date / History of factor measurement. Check performance: Reminder of scheduled check date / Record of check results Management of conduction time : Display of operating time		Registration of operator / Record of check results / Record of factor measurement / Management of conduction time	
External I/O	RS-232C port × 4 for Dot matrix printer, Electronic balance, Data Capture Software (SOFT-CAP), Evaporator USB × 1 for USB flash drive, Thermal printer, A4 printer, Keyboard, Barcode reader, Foot switch, USB HUB SS-BUS × 1 : for APB LAN × 1 : for Personal computer (PC)		RS-232C port × 2 for Dot matrix printer, Electronic balance, Data Capture Software (SOFT-CAP) USB × 1 for USB flash drive, Thermal printer, Keyboard, Barcode reader, Foot switch, USB HUB, Android device	
Extensibility	Measuring instrument : Automatic Potentiometric Titrator (AT-710), Karl Fischer Moisture Titrator (MKV-710/MKC-710); Three of these instruments can be added. Automatic piston burette : Can control max 2 burette drives (including two built-in burette drives) Evaporator ADP-611			
Ambient condition	1) Temperature : 5 to 35°C 2) Humidity : 85%RH or below (no condensation)			
Power source	AC100 - 240V ±10% 50/60 Hz			
Power consumption	Main unit : Approx. 30W Printer : Approx. 7W	Main unit : Approx. 20W Printer : Approx. 7W		
Dimensions	Touch panel controller : 225(W) × 190(D) × 42(H) mm Titration unit : 141(W) × 292(D) × 367(H) mm (not incl. tubing) Stirrer : 107(W) × 206(D) × 322(H) mm (not incl. Solvent Change unit) Solvent Change Unit : 240(W) × 140(D) × 400(H) mm (not incl. tubing) Printer : 106(W) × 180(D) × 88(H) mm			
Weight	Touch panel controller : Approx. 1.5kg Titration unit : Approx. 4.0kg Stirrer : Approx. 2.0kg Solvent Change Unit : Approx. 0.6kg Printer : Approx. 0.4kg			
Conformity standard	CE marking EMC : EN61326-1 LVD : EN61010-1 RE Directive Burette unit EBU FCC Part15 SubpartC FCC ID: 2ABSVEBU01			

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

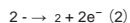
Standard: MS-710C Magnetic Stirrer/
Manual Solvent Change Unit

—COULOMETRIC TITRATION METHOD—

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



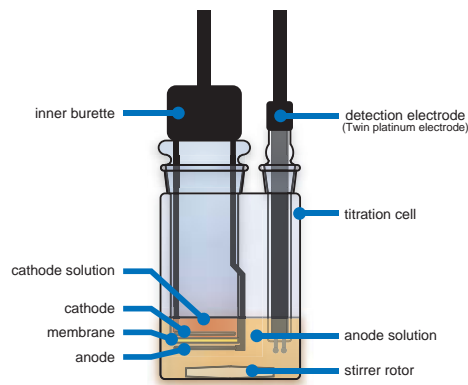
n moisture measurements by coulometric titration method, iodine is generated through electrolysis of an anode solution containing iodide ions.



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 Faraday's law. The formula (1) shows that 2 reacts with zO 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.



MKC-710 [Coulometric titration]

Specification	Contents		
Type	Karl Fischer Moisture Titrator		
Model	MKC-710M	MKC-710S	MKC-710B
Product configuration	MCU-710M+MKC-710-IDP-100+Manual Solvent Change Unit	MCU-710S+MKC-710-IDP-100+Manual Solvent Change Unit	MKC-710-IDP-100+Manual Solvent Change Unit
Measuring method	Karl Fischer Coulometric titration		
Measuring range	Water content / Bromine index : 1µg to 300mg (depends on reagent)		
Measurement cell	2-Component or 1-Component		
Precision	Relative standard deviation : less than 0.3% (n=10) *Per KEM standard measurement conditions and standard liquids		
Display resolution	0.1µg		
Control method	Constant current pulse time control		
Endpoint detection	Alternate current polarization method with a twin platinum electrode		
EP sense method	Selective drift stability or limit measurement time		
Required solvent	Anolyte 100mL (max 150mL) Catholyte 5mL		
Method	120	20	
Key operation	Touch panel	Sheet key	
Displays	1) 8.4-inch color LCD 800 × 600 dots		1) Black and white LED-backlit LCD
	2) English / Japanese / Mandarin Chinese / Korean / Russian / Spanish / German / French		2) English / Japanese / Mandarin Chinese / Korean / Russian / Spanish
	3) Simultaneous 4-channel display (Can also display Automatic Potentiometric Titrator simultaneously)	3) 1-channel display	3) 1-channel display
Calculation	Concentration of water content, statistics data processing (mean, SD and RSD) and automatic averaging of blank value		
Data storage	500 samples	100 samples	
GLP conformance	Registration of operator / User group administration Check performance with standard substance: Reminder of scheduled check date / Record of check results Reagent life control: Reminder of expiration / Reminder of reagent replacement date Management of conduction time : Display of operating time		Registration of operator / Check performance with standard substance / Reagent life control / Management of conduction time
External I/O	RS-232C port × 4 for Dot matrix printer, Electronic balance, Data Capture Software (SOFT-CAP), Evaporator, Multiple sample changer		RS-232C port × 2 for Dot matrix printer, Electronic balance, Data Capture Software (SOFT-CAP)
	USB × 1 for USB flash drive, Thermal printer, A4 printer, Keyboard, Barcode reader, Foot switch, USB HUB		USB × 1 for USB flash drive, Thermal printer, Keyboard, Barcode reader, Foot switch, USB HUB, Android device
	LAN × 1 : for Personal computer (PC)		
Extensibility	Measuring instrument : Automatic Potentiometric Titrator (AT-710), Karl Fischer Moisture Titrator (MKV-710/MKC-710); Three of these instruments can be added.		
	Evaporator : ADP-611 Multiple sample changer : CHK-501		
Ambient condition	1) Temperature : 5 to 35°C 2) Humidity : 85%RH or below (no condensation)		
Power source	AC100 - 240V ±10% 50/60 Hz		
Power consumption	Main unit	: Approx. 30W	Main unit : Approx. 20W
	Printer	: Approx. 7W	Printer: : Approx. 7W
Dimensions	Touch panel controller	: 225(W) × 190(D) × 42(H) mm	
	Titration unit	: 141(W) × 292(D) × 244(H) mm	
	Stirrer	: 107(W) × 206(D) × 340(H) mm (not incl. Solvent Change unit)	
	Solvent Change Unit	: 240(W) × 140(D) × 405(H) mm (not incl. tubing)	
	Printer	: 106(W) × 180(D) × 88(H) mm	
Weight	Touch panel controller	: Approx. 1.5kg	
	Titration unit	: Approx. 3.0kg	
	Stirrer	: Approx. 2.0kg	
	Solvent Change Unit	: Approx. 0.6kg	
	Printer	: Approx. 0.4kg	
Conformity standard	CE marking EMC : EN61326-1 LVD: EN61010-1		

Evaporator AD - 11



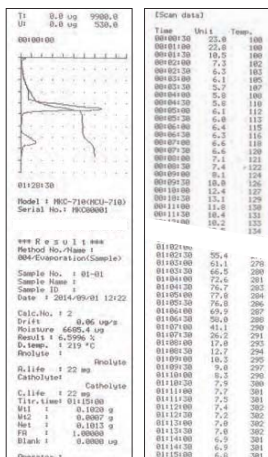
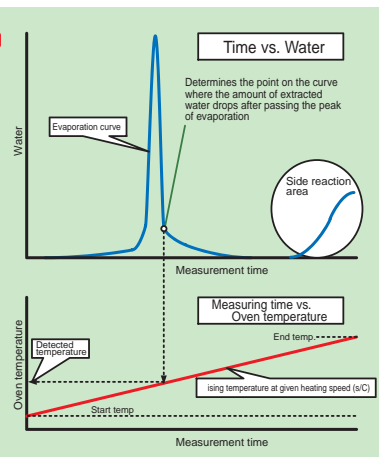
Model	Evaporator ADP-811	
Heating method	Electrically conductive clear heater glass	
Heating temperature range	50°C~300°C	
Temperature control	Setting range: 50°C~300°C (Minimum setting: 1°C) Temperature sensor: K-thermocouple (Precision: ±2°C / Setting temperature: At higher than 100°C)	
Temperature/ Flow display	LED digital 3 digits	
Heated tube	Pyrex glass tube: φ30 (O.D)mm x 335 (L)mm	
Sample boat	Pyrex glass: 65 (L) x 25 (W) x 15 (H)mm Capacity 16mL	
Carrier gas	Nitrogen gas: Not included as a standard accessory Air: Air Pump Unit (option)	
Gas dryer	Zeolite container (100g) x 2pcs	
Gas flow	100~300mL/min	
External control input/ output	Communication with Karl Fischer Moisture Titrator : RS232C Mini DIN 8pin	
Dimensions	370 (W) x 195 (D) x 217 (H)mm	
Power source	AC 100~120V 50/60Hz	AC 220~240V 50/60Hz (Pre-adjusted before shipment from the factory)
Power consumption	Approx. 300W	
Weight	Approx. 5kg	Approx. 7kg
Option	Stand	

※ When nitrogen gas is in use, regulator (Ad unstable to 0k a) is required.

Scan mode

spanno alert no. 42470 3

The scan mode automatically determines the optimum evaporator temperature. It is used when the vaporizing temperature of a sample is unknown or if the sample tends to thermal decomposition. In the scan mode, the temperature in the heating furnace is increased at a constant rate and the evaporated moisture curve is analyzed. The optimum evaporator temperature is determined based on the decay observed in the evaporated moisture curve.



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 optimal evaporation temperature based on the relation between released water and heating temperature. The heating tube is easy to be cleaned thanks to its simple



Multiple Sample Changer C K- 01



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. (O -CE)

Model	Multiple Sample Changer C K- 01	
Number of vials	24 vials	
Vial	20mL vial	
Heating temperature	Setting range : room temp.~300°C Minimum setting : 1°C Control precision: 3°C Measurement with Thermocouple (At setting temperature higher than 100°C)	
Heating tube	Higher than 100°C with self-control	
Heating method	Electric oven heating over outside surface and bottom Special heater made of integrated mica with 0W capacity	
Vial detection	Optical beam sensor	
Auto power off	Power is shut off automatically after measurement is over.	
re-treatment	Programmable automatic purge of system lines	
Sample transfer system	Revolve turntable with vials and transfer a vial from turntable to heater oven.	
Carrier gas	Flow range : 100~300mL/min Other : Dehydration with silica gel and zeolite	
Display	20 digits x 2 lines LCD with back light	
Alarm	Transfer mechanism malfunctions, temperature control failure, carrier gas suspension, operation error etc.	
Ambient condition	Temperature : 1 ~ 3 °C humidity : 0 ~ 8	
Power source	AC 100-120V/ 220-240V 10 0/ 0	
Power consumption	Approx. 100W	

※ When nitrogen gas is in use, regulator (Ad unstable to 0k a) is required.

Evaporator for Oil Samples AD - 13



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. (O -CE)

Model	Evaporator for Oil Sample AD - 13	
Heating oven	room temp.~200°C Temperature indicator controller D control late heater Cartridge type structure	
as flow	100~300mL/min	
Carrier gas	Nitrogen gas/ Supply pressure below 0k a	
Power source	AC 100-120V/ 200-240V 10 0/ 0	
Power consumption	Approx. 400W	
Dimensions	320 (W) x 210 (D) x 330 (H)mm	
Weight	Approx. 3kg	

※ When nitrogen gas is in use, regulator (Ad unstable to 0k a) is required.
• Complies to JIS K 227 Crude oil and petroleum products- Determination of water content
• Equipped with specially designed drain-out system for easy drainage of base oil.
• Equipped with fuse to prevent excessive temperature rise.

eat Extractor for Sugar Samples AD -344



The ideal solution sugary samples: This mantle heater for volumetric Karl Fischer titration cells ensures the complete extraction of the moisture content of samples like chocolates, caramels and other samples containing sugars. (O -CE)

Model	eat Extractor for Sugar Samples AD -344	
Heating method	Mantle heater	
Heating temperature range	room temp.~ 0°C	
Thermo sensor	Thermistor	
Temperature control	3°C (At setting temperature higher than 40°C) O / OFF control	

Evaporator for Ores AD - 12



Powerful furnace - short warm-up time: This evaporator attains a temperature of 1000 C in 30 minutes and reaches

stable measuring conditions in another 30 minutes. An overheat protection mechanism for this evaporator is available. (O -CE)

Model	Evaporator for Ores AD - 12	
Electric furnace	High temperature furnace 0~1000°C Temperature indicator controller D control Temperature setting precision: Set value 10°C (At room temperature 2 °C/ At setting temperature higher than 300°C) Low temperature furnace 0~130°C Temperature indicator controller D control	
as flow	100~300mL/min	
Carrier gas	Nitrogen gas/ Supply pressure below 0k a	
Power source	AC 100-120V/ 200-240V 10 0/ 0	
Power consumption	Approx. 00W	
Dimensions	110 (W) x 340 (D) x 334 (H)mm	
Weight	Approx. 30kg	

※ When nitrogen gas is in use, regulator (Ad unstable to 0k a) is required.

Evaporator for High Temperature AD - 12S



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. (O -CE)

Model	Evaporator for High Temperature AD - 12S	
Electric furnace	0~1000°C Temperature indicator controller D control Temperature setting precision: Set value 10°C (At room temperature 2 °C/ At setting temperature higher than 300°C)	
as flow	100~300mL/min	
Carrier gas	Nitrogen gas/ Supply pressure below 0k a	
Power source	AC 100-120V/ 200-240V 10 0/ 0	
Power consumption	Approx. 00W	
Dimensions	83 (W) x 340 (D) x 334 (H)mm	
Weight	Approx. 30kg	

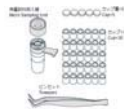
※ When nitrogen gas is in use, regulator (Ad unstable to 0k a) is required.

OPTIONS

Part Number	Name	Remarks
12-03265	SOFT-CAP Data Acquisition Software	Displays data on a PC display, enabling loading of the measurement results into a spreadsheet such as Excel® or saving of the data in CSV format.
12-04184	Finger Shaped Sampler	Suitable for load in solid samples and powder samples.
12-04576	Bent-type Sampler for Powder	Connected to the titration cells, enables half-rotation of the sampler to drop samples.
12-04575	Spoon Type Sampler for Viscous Sample	Suitable for load in viscous samples. Enables to inject samples with the spoon.
12-04452	Sampler for Light Weight Powder	Suitable for small- quantity of powder samples. Connected to the titration cells, the sampler enables to half-rotate the sampler to drop samples.
12-04574	Straight-type Sampler for Light Weight Powder	Suitable for small- quantity of powder samples. Vibrates to drop samples.
12-02400	Sampler for High Viscous Sample	Suitable for high-viscosity solid samples. Injected into the titration cell, the sampler presses out the samples.
12-05067	Micro Sampling Unit (phi14 1/10 Taper)	Suitable for the trace powder samples of especially high hygroscopicity. The sample is loaded with its special container in the titration cell.



Finger Shaped Sampler

Bent-type Sampler
for PowderSpoon Type Sampler
for Viscous SampleSampler
for Light Weight PowderStraight-type Sampler
for Light Weight PowderSampler
for High Viscous SampleMicro Sampling Unit
(phi14 1/10 Taper)

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Hybrid Karl Fischer Moisture Titrator

MKH-710



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MANUFACTURING CO.,LTD.

FEATURES

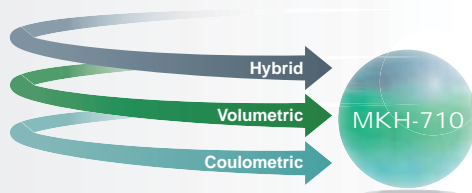
Measuring moisture contents of solid and liquid samples by using the Karl Fischer reaction.

Hybrid Karl Fischer Moisture Titrator has world's first original features with convenient functionality, and high-speed, high-accuracy measurement using our "Hybrid Titration Method". With our "Electrolytic Factor Measurement System", factor measurement is possible without using pure water. This is a breakthrough product that innovates the Karl Fischer moisture titration instruments. This product complies with official methods of analysis specified by the ASTM, JIS (Japanese Industrial Standards), and as published in the European Pharmacopoeia and the United States Pharmacopoeia.



Single instrument and a single titration cell allow utilization of Volumetric/Coulometric/Hybrid Titration Methods.

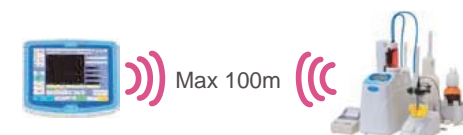
Just one instrument with one titration cell is needed to perform volumetric, coulometric, and hybrid measurements. With high operability for the volumetric method, the requisite sealability for the coulometric method has also been realized. Integrated functionality greatly contributes to a compact installation and low maintenance requirements.



No cabled connections required between main control unit and titrator

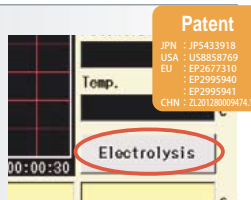
For safe operation

With Bluetooth® adapters, there is no need to connect main control unit to titrator with 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)



No need to inject pure water Fully automatic factor measurement

Our unique "Electrolytic Factor Measurement System" carries out factor measurement automatically. Just the press of a button enables factor measurement, which alleviates the need for the tedious weighing or measuring of pure water.



*Some reagents are not applicable.

Automatic sample injection

Hybrid titration method automatically switches the measurement methods of volumetric and coulometric according to the water content of the sample. You can accurately and seamlessly measure samples without concern for the sample moisture content, as the instrument is capable of measuring trace or much larger quantities.



Patent
JPN : JP5433918
USA : US8858769
EU : EP2677310
EP2995940
EP2995941
CHN : ZL20128009474.1

*Some reagents are not applicable.

Reduced running-costs

- ◆ Hybrid Titration Method Compared to the coulometric titration method, running cost is almost halved.
- ◆ Electrolytic Factor Measurement Compared to conventional factor measurement, running cost is reduced by up to 60%.



*Under our specified conditions

One screen for up to four titrators

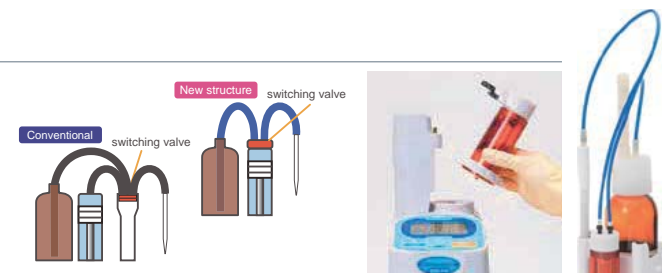
One main control unit can operate up to four titrators of any type (Potentiometric and Karl Fischer moisture titrators). It is thus possible to set up a system capable of running potentiometric and Karl Fischer moisture titrations simultaneously without wasting valuable bench space for several separate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



Wireless 4ch Multi Connection

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 it inside of the cylinder left less residual titrant when replacing it.



FEATURES

Titration cell stopper can be easily removed

The titration cell stopper can be removed from the titration cell for easy cleaning. Even when the electrode is stuck at the stopper, you can still easily remove it by hand.



Diaphragm can be replaced

The new mechanism of electrolysis electrode (inner burette) allows diaphragm replacement. When the diaphragm is contaminated by the oil samples, it can be easily replaced for cleaner measurement.



Large capacity titration cell

The titration cell has approximately twice the capacity (40mL ~ 150mL) of our conventional volumetric titration cell. The frequency of injection/drain of dehydrated solvent can be reduced.



Large sample inlet

The titration cell is equipped with the large sample inlet of $\phi 34$ on its top side. You can now easily and correctly load samples of powder or other substances when performing volumetric titration.



Easy injection/drain of dehydrated solvent

The stirrer unit is equipped with a pump for injecting/draining dehydrated solvent. Once you set the operating time of the pump with the internal timer, the optimum quantity of the solvent is automatically injected.



Karl Fischer reagent 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 Karl Fischer reagent information. This prevents titration with incorrect titrant.



Supporting proper reagent replacement

Reagent replacement or filling and cleaning of the burette can be performed according to the navigation function of Karl Fischer reagent replacement system. You can fill and drain out the solution without errors thanks to the guidance of key operation and work.



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.



No need to adjust settings for different types of solvent and samples

Volumetric Titration Method

Our proprietary technology (endpoint detection by compensating liquid resistance, Japanese Patent No.1896338) makes it unnecessary to change the detection electrode sensitivity or endpoint voltage depending on the nature of each solvent and sample. This feature reliably prevents over titration and ensures highly accurate measurements.

Patent No.1896338



Automatic factor measurement (Timer function added)

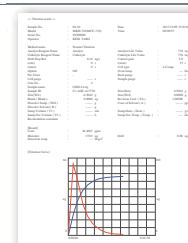
Volumetric Titration Method

Optionally available burette unit and water-methanol standard solution enable automatic operation flow, from the pre-titration to the factor measurement just by pressing a button. The automatic factor measurement can be preset to start; you can start measuring samples whenever you like.



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.



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.

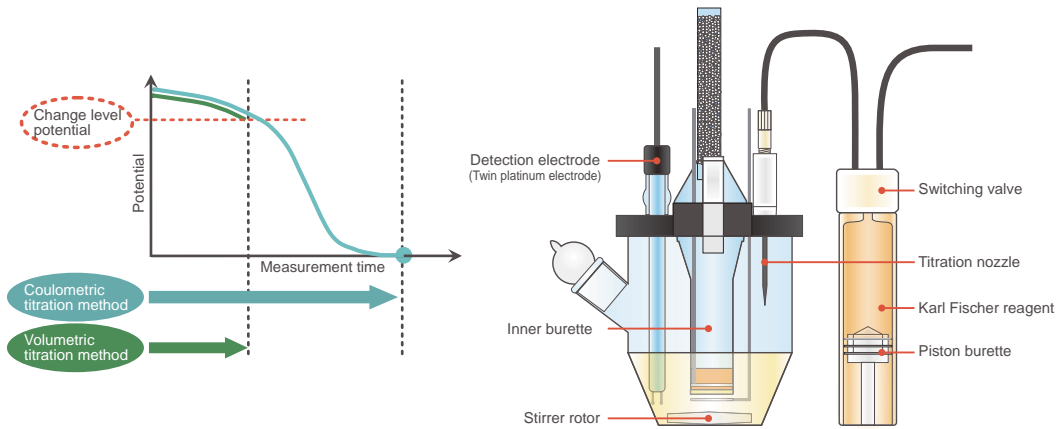


MEASUREMENT PRINCIPLE

Hybrid Titration Method

There are two Karl Fischer titration methods: volumetric titration method and coulometric titration method. Both have advantages and disadvantages. The volumetric titration method is suitable for measurement of high-moisture samples (1% or more), but not for low-moisture samples (ppm order). Meanwhile, the coulometric titration method is suitable for measurement of low-moisture samples (ppm order), but not for high-moisture samples (1% or more). This is because measurement time is rather long and if the sample quantity is reduced in order to shorten the measurement time, errors from weighing would affect the measurement results.

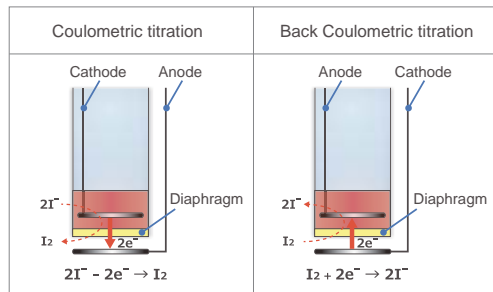
The hybrid titration method highlights the advantages and covers address the disadvantages of both methods. The hybrid titration method runs both volumetric and coulometric titration methods in parallel. Once water content goes below a certain level, measurement will be performed using the coulometric titration method. The method automatically switches from the parallel running of volumetric and coulometric titration methods to the coulometric titration method only. The system runs the coulometric titration method when a sample includes only water content lower than the certain level.



Electrolysis Factor Measurement

In Karl Fischer volumetric titration method, pure water or water standard is used for factor measurement of Karl Fischer reagents. In electrolysis factor measurement, factor measurement of Karl Fischer reagents is carried out by the electrolysis without using pure water or water standard.

The coulometric titration method measures water content by the electrolysis (coulometric titration) to generate iodine from iodide ions within the analyte. In electrolysis factor measurement, factor measurement of Karl Fischer reagents is carried out based on the electric quantity used in the electrolysis (back coulometric titration) to generate iodide ions from iodine within the analyte.



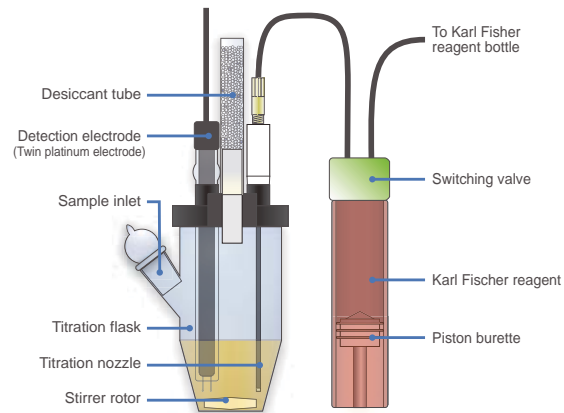
Volumetric Titration Method

In the Karl Fischer reaction, water reacts with iodine and sulfur dioxide quantitatively in the presence of base and alcohol.



After dehydrated solvent is put in the titration cell and the dehydrated state is achieved by titration using Karl Fischer reagent, the sample is added into the titration cell. Water content is determined by using Karl Fischer reagent of which the factor (mgH₂O/mL) is pre-determined with the water-methanol standard etc.

Titration proceeds by controlling the titration speed while detecting the polarization of the electric potential of the detection electrode.

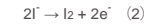


Coulometric Titration Method

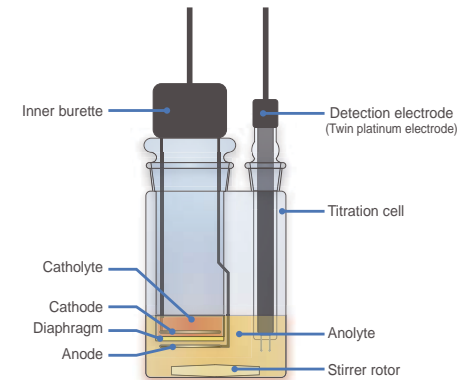
In the Karl Fischer reaction, water reacts with iodine and sulfur dioxide quantitatively in the presence of a base and alcohol.



In the coulometric titration method, iodine is generated by the electrolysis of the analyte containing iodide ions.



Once the generated iodine is consumed according to equation (1), the detection electrode detects the consumption of iodine and iodine is generated again by electrolysis according to equation (2). The generated iodine is proportional to the electric quantity according to the Faraday's law. The equation (1) shows that I₂ reacts with H₂O in the proportion of one to one. The electric quantity required for the electrolysis based on the principle as described above is converted into water content.



SPECIFICATIONS

Specification		Contents	
Name		Hybrid Karl Fischer Moisture Titrator	
Model		MKH-710M	
Coulometric Titration	Measurement method		Karl Fischer Coulometric Titration
	Measurement range	Water content	1µg to 300mgH ₂ O
		Bromine index	8µg to 300mgBr
	Precision	RSD	Less than 0.3% (n=10) (For measurements of 1mgH ₂ O)
		Display resolution	0.1µg
	Control method		Constant current pulse time control
	Endpoint detection		Alternate current polarization method with a twin platinum electrode
	EP sense method		Selective drift stability or Limit measurement time
	Titration form		Normal titration/Back titration
	Titration cell		Two component cell
Required reagent	Anolyte	100mL	
	Catholyte	5mL	
Volumetric Titration	Measurement method		Karl Fischer Volumetric Titration
	Measurement range	Water content	100µg to 500mgH ₂ O (Depend on Karl Fischer reagent factor)
		Concentration	1ppm to 100%H ₂ O
	Burette precision	Volume	10mL
		Resolution	1/20,000
		Discharge precision	±0.015mL
		Repeatability	±0.005mL
	Endpoint detection		By polarized potential level detected with a twin platinum electrode
	EP sense method		Detection of potential level maintained during End preset time End time range: 1 to 99 seconds
	Titration form		Normal titration Back titration (Add the optional additional burette unit)
Required solvent		40 to 150mL	
Hybrid Titration	Measurement method		Karl Fischer Volumetric Titration Karl Fischer Coulometric Titration
	Measurement range	Water content	1µg to 500mgH ₂ O
		Precision	RSD
	Display resolution		0.1µg
		Control method	
	Endpoint detection		Alternate current polarization method with a twin platinum electrode
	EP sense method		Selective drift stability or Limit measurement time
	Titration format		Normal titration
	Required reagent	Anolyte	100mL
		Catholyte	5mL

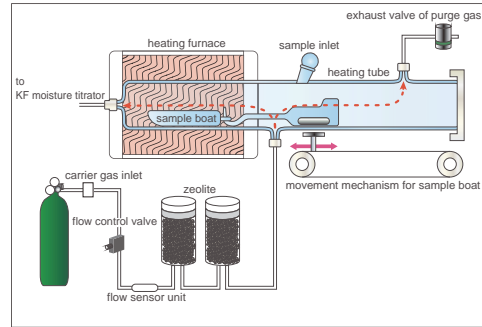
Specification		Contents	
Factor Measurement of Reagent by Electrolysis	Measurement method		Factor measurement of reagent by electrolysis
	Measuring range	Karl Fischer reagent	Reagent factor 1 to 5 (With the provisions of dose volume)
	Precision	RSD	Less than 1.0% (n=3) (Dose volume 0.5mL, Reagent factor 3mg/mL)
	Control method		Constant potential control
	Endpoint detection		Alternate current polarization method with a twin platinum electrode
	EP sense method		Drift stability
	Required reagent	Anolyte	100mL
		Catholyte	5mL
	Number of Method	Coulometric/Volumetric/ Hybrid/Electrolysis	Up to 120
	Data storage	On-board memory	500 datas
External memory		USB flash drive	
GLP conformance		Registration of operator/User group administration Titrant : Reminder of factor measurement date/Alarm to indicate remaining reagent / Reminder of piston replacement date/Reminder of reagent replacement date/ History of factor measurement/Reminder of scheduled check date Check performance : Reminder of scheduled check date/Record of check results Management of conduction time : Display of operating time	
External I/O (Measurement unit)	RS-232C	2ch COM1 : Dot matrix printer COM2 : Multiple sample changer/Evaporator	
	USB	1ch (MCU-710) (USB cable for wired connection, Bluetooth adapter for wireless connection)	
	SS-BUS	1ch (for APB)	
External I/O (Main Control Unit)	RS-232C	2ch (for Dot matrix printer (Only for COM1), Electric balance, PC)	
	USB	1ch (USB flash drive, Thermal printer, A4 printer, Keyboard, Barcode reader, Foot switch, Bluetooth adapter, USB HUB, Measuring unit (MKH-710/2nd, AT-710, MKV-710, MKC-710)	
	LAN	1ch (PC)	
Extensibility	Measuring unit	Automatic Potentiometric Titrator(AT-710), Karl Fischer Moisture Titrator (MKH-710, MKV-710, MKC-710); Three of these instruments can be added.	
	Automatic piston burette	Up to 2 control burettes (including 2 built-in units)	
Display function	Main control unit	8.4inch color liquid crystal display 800 x 600 resolution	
	Display (Measurement unit)	White LED-backlight LCD	
	Supported languages	Four languages: English, Japanese, Chinese, Korean	
Ambient conditions	Temperature	5 to 35°C	
	Humidity	Up to 85%RH or below (no condensation)	
Power supply		AC100 to 240V ± 10% 50Hz/60Hz	
Power consumption	Main unit	Approx. 50W	
	Printer	Approx. 7W	
Dimensions/ Weight (Excluding tube)	MKH-710	141 (W) × 292 (D) × 377 (H)mm / Approx. 4kg	
	MCU-710	225 (W) × 190 (D) × 42 (H)mm / Approx. 2kg	
	Stirrer/Cell	107 (W) × 206 (D) × 322 (H)mm / Approx. 2kg	
	Solvent change unit	240 (W) × 140 (D) × 400 (H)mm / Approx. 0.6kg	
	Printer	106 (W) × 180 (D) × 88 (H)mm / Approx. 0.4kg	
Conformity standards		CE marking (EMC: EN 61326-1 LVD: EN 61010-1 RE Directive RoHS (II) Directive compliant) Burette unit EBU FCC Part 15 Subpart C FCC ID: 2ABSVBU 01	

OPTIONS

Evaporator ADP-611



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 optimal evaporation temperature based on the relation between released water and heating temperature. The heating tube is easy to be cleaned thanks to its simple structure.



Model	Evaporator ADP-611	
Heating method	Electrically conductive clear heater glass	
Heating temperature range	50 to 300°C	
Temperature control	Setting range: 50 to 300°C (Minimum setting: 1°C) Temperature sensor: K-thermocouple (Precision: ±2°C/Setting temperature: At higher than 100°C)	
Temperature/ Flow display	LED digital 3 digits	
Heated tube	Pyrex glass tube: φ30 (O.D)mm x 335 (L)mm	
Sample boat	Pyrex glass: 68 (L) x 25 (W) x 15 (H)mm Capacity 16mL	
Carrier gas	Nitrogen gas: Not included as a standard accessory Air: Air Pump Unit (option)	
Gas dryer	Zeolite container (100g) x 2pcs	
Gas flow	100 to 300mL/min	
External control input/ output	Communication with Karl Fischer Moisture Titrator : RS232C Mini DIN 8pin	
Dimensions	370 (W) x 195 (D) x 217 (H)mm	
Power source	AC100 to 120V, 50/60Hz	AC220 to 240V, 50/60Hz (Pre-adjusted before shipment from the factory)
Power consumption	Approx. 300W	
Weight	Approx. 5kg	Approx. 7kg
Option	Stand	

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

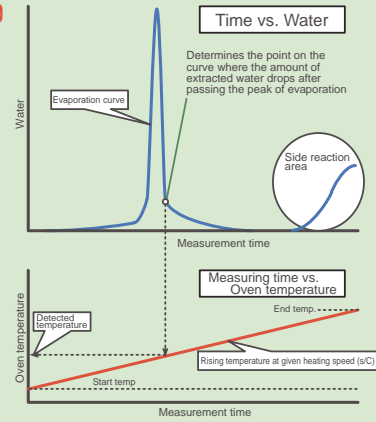
Printing example



Scan mode

Japanese Patent no. 4247093

The scan mode automatically determines the optimum evaporator temperature. It is used when the vaporizing temperature of a sample is unknown or if the sample tends to thermal decomposition. In the scan mode, the temperature in the heating furnace is increased at a constant rate and the evaporated moisture curve is analyzed. The optimum evaporator temperature is determined based on the decay observed in the evaporated moisture curve.



Model	Name	Remarks
CHK-501	Multiple Sample Changer	Multi-sample evaporator for the coulometric titration method. Since heating temperature can be set for each sample, different kinds of samples can be set at the same time (24 samples). Connection tube (for Multiple Sample Changer) (12-05065) is required. (NON-CE)
ADP-513	Evaporator for Oil Sample	This unit heats and evaporates lubricant oil, grease, tar products, paints, and other viscous liquids. Evaporated moisture is measured using a Karl Fischer moisture titrator. (NON-CE)
ADP-512	Evaporator for Ores	This unit heats and evaporates combined water content and adherent water in iron ore, manganese ore, clay and other inorganic compounds. Evaporated moisture is measured using a Karl Fischer moisture titrator. Compliant with "JIS M 8211 iron ores - Method for determination of combined water content" (NON-CE)
ADP-512S	Evaporator for High Temperature	This unit heats and evaporates ore, metal powder, ceramics, and other solid or powder samples. Evaporated moisture is measured using a Karl Fischer moisture titrator. (Maximum heating temperature: 1000°C.) (NON-CE)
ADP-344	Heat Extractor for Sugar Sample	This unit heats the titration cell and extracts water content from chocolate, caramel, and other sugar samples using the volumetric titration method. The titration cell unit (12-02811) and the cell holder (for volumetric method) (12-05066) are required. (NON-CE)

Model	Name	Remarks
MKV-710B	Karl Fischer Moisture Titrator	Volumetric titration method Karl Fischer moisture measurement unit for expansion. Connected to main control unit MCU-710M*. Up to 4 moisture measurements can be performed at the same time.
MKC-710B	Karl Fischer Moisture Titrator	Coulometric titration method Karl Fischer moisture measurement unit for expansion which is suitable for measurement of trace water content. Connected to main control unit MCU-710M*. Up to 4 moisture measurements can be performed at the same time.
AT-710B	Automatic Potentiometric Titrator	A unit to add automatic potentiometric titrator. Various titrations such as acid-base titration, redox titration, and photometric titration can be performed by selecting electrodes and preamplifier. Connected to main control unit MCU-710M*. Up to 4 moisture measurements can be performed at the same time.
MKH-710/2nd	Hybrid Karl Fischer Moisture Titrator	Hybrid Karl Fischer moisture measurement unit for expansion. Connected to main control unit MCU-710M*. Up to 4 moisture measurements can be performed at the same time.
12-05640-13	Additional Burette MKH (10mL)	By adding to the main unit, it becomes possible to work with two burettes. Two burettes can be used without increasing space taken. Back-titration and automatic factor measurement with water-methanol becomes possible.

*Cannot connect MCU-710S



MKH-710M MKC-710B MKV-710B AT-710B
(Additional Burette)