Karl Fischer Moisture Titrator
(for coulometric method)

MKC-610

Operation Manual

Please read this manual thoroughly in advance for the best performance of the equipment.

Ver.10
A/N 98-595-0481

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1. Introduction

1-1. Overview of the instrument

Your patronage of KEM product by purchasing the MKC-610 this time is highly valued since it offers you the ease of operation with precision results and minimum time length required in moisture measurement. This model determines water content in liquids or solids by Coulometric Karl Fischer method with the following advanced features:

[Features]

1) **Two (2) measuring units can be connected (simultaneous measurements in parallel)**
Connection of either Volumetric KF measuring unit or Coulometric KF measuring unit will allow for simultaneous measurements by two units. The selection of the measuring units depends on sample properties and/or measuring range. Connected measuring units allow you to measure on samples simultaneously.
Further, our AT-610 Automatic Potentiometric Titrator can also be connected with MKC-610.

2) **Operating panel is Touch-on type LCD**
You just touch on the display panel following the guiding messages to complete a series of measurements. The panel is covered with a protection film which is replaceable with a new one whenever you want a better view in the course of time.

3) **Operating unit and measuring unit can be separated**
The measuring unit can be detached depending on sample type when so necessary.

4) **A Large color LCD with two languages selective on display**
A large 8-inch color LCD provides easy view and operation with language selection of either English or Japanese on display.

5) **Real time display of titration curve**
You can monitor measurement in progress by watching its titration curve in real time.

6) **Data Storage on Compact Flash (CF) Card:**
Allow an operator to store Measuring conditions (Method Parameter) and Titration results on CF cards (option).

7) **Dispenser for Karl Fischer reagent is standard equipment**
The reagent dispenser as standard equipment eliminates troublesome replacements. The open air does not go into a titration cell at the time of reagent exchange. Therefore, the stability after reagent exchange is quick.

8) **Faster electrolysis with acceleration amplifier (1.3 times faster)**
KEM's hi-tech amplifier shortens electrolysis time length by 1.3 times faster than conventional units both in pre-titration and sample measurement.

9) **GLP/GMP conformed**
This model fully conforms to GLP/GMP requirements for those records of validation with standard substance, of check date and reagent replacement date as well as advance notice prompting periodic reagent replacement on display.

1-2. About the manual

Please keep this manual near your system so that you can easily access to the necessary information you are looking for while operating or preparing for measurement.

The below three boxed messages show the basis symbols of warning, caution and note that you will see in this manual from time to time:

1. Where there exists a danger of physical injury or even possible death:

> **Warning!**
> **There exists the danger of physical injury or even possible death if the instruction is disregarded.**

2. Where there exists a danger of property damage:

> **Caution!**
> **There exists the danger of property damage if the instruction is ignored.**

3. When there exists a possibility of failure of instrument performance:

> **Note:**
> **There exists the possibility of failure of instrument performance. If ignored, warranty may not be covered.**

* If you should find any part in this manual not clear to understand or missing article, contact your local dealer or sales representative.

* Manufacturer will not be liable for any loss or damage directly or indirectly caused by use of the instrument or its consequences.

* This Manual is based on the apparatus of standard specification. For details of those of special specification, see its manual.

1-3. ⚠Safety symbols

Always observe these signs and instructions.

You must observe cautionary messages and warnings in order to protect yourself as well as prevent others from physical injury or property damages.

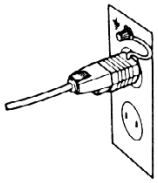
⚠ Warning This symbol means "Danger of severe injury or possible death".	This symbol means prohibition of an act.
⚠ Caution This symbol means "Danger of injury or property damage".	This symbol means mandatory.

⚠ WARNING!

You must ground earth wire of power cable.

Ground the green wire of adapter if power tap is 2-pin outlet.

3-pin plug has earth line to ground by itself when plugged in.



Danger of electric shock if not grounded to earth.

⚠ WARNING!

Use the same type and rating of fuse. Be sure to plug out power cord before replace the fuse.

Danger of fire if a wrong fuse is loaded.

⚠ WARNING!

Do not use volatile chemical or work in flammable gas.

Danger of explosion inside the instrument.

⚠ WARNING!

Wear safety glasses, gloves or protective mask if necessary,and well ventilate the room.

Danger of injury on your skin or in the eyes by splashing chemical.
Also your windpipe may get hurt if toxic gas is breathed in.

⚠ CAUTION!

Unplug the power cord when the unit can be troubled or exposed to a lightning.

Failure to observe this caution may result in a damage to the instrument.

⚠ CAUTION!

Do not operate in a way other than specified in the manual.

Danger of fire, electric shock or damage to the instrument.

⚠ CAUTION!

Do not open housing case or overhaul the unit for repair except by an authorized service person.

Danger of fire, shock or malfunctioning of the unit.

About place for installation

Avoid the use of this instrument under the environment described below.
(Failure can lead to the degradation of performance and reliability of the system.)

- Operation of devices with strong electric motors using common power source
- Near strong magnetic/electric field
- Use of power source with too variable load
- Location of strong vibration
- Exposure to direct sunlight
- Location with large temperature difference
- Exposure to corrosive gas
- Exposure to extreme heat (Operation temperature: 5 to 35°C (41 to 95°F))
- Exposure to high humidity (Over 85%RH)

About power source

- Power for this instrument is AC100-120/200-240V ±10%and 50/60Hz.
- Supply power direct from the outlet, and do not share power from a tap.
- Do not put any obstacle around power outlet just case of need for plugging out power cord to avoid the possible danger of the whole system in trouble.

About place for storage

- Store in a desiccant container the disassembled titration cell as they are after cleansed and dried, if it is not going to be operated for a long period of time. It is recommended to pack the main unit in the carton box in which the instrument was first delivered.
- Avoid the places for storage under inadequate ambient conditions such as extremely high/low temperature, high humidity or heavily dusty atmosphere.

About use

- Karl Fischer reagents are toxic chemicals. Therefore, please handle in a well ventilated room and be aware of its danger.
- When a reagent etc. is spilt to Main unit or the connectors of magnetic stirrer, there is a possibility of malfunction.
- When using the touch panel, just lightly touch it with a finger. Do not touch it with a sharp edge such as pen tip; otherwise the touch panel can be incapable of normal operations.

Other caution

- Do not use such a solvent as alcohol, acetone, thinner or the like for cleaning this instrument. Doing so may adversely affect the instrument, e.g. deformation, discoloration or cracks. When cleaning this instrument, wipe it with a soft cloth or tissue paper, after applying detergent diluted with water to the soft cloth or tissue paper and adequately wringing out excess water in order not to allow water drops to fall.
- In draining waste liquid, dispose waste liquid before the drain pot is filled up with it; failure to follow this caution can be the cause of the gushing of waste liquid from the rubber globe.

Environmental condition

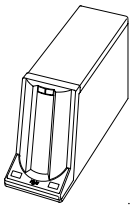
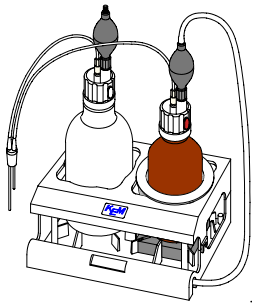
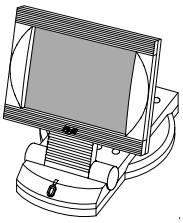
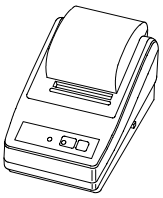
- This instrument is designed for the indoor use under the environmental conditions specified in the Section 1.4 of CE marking (LVD, 73/23/EEC, EN61010-1) and the use of the Category II of Overvoltage and the Pollution Level 2.

2. Preparations for measurement

2-1. Supplied parts

Check the supplied parts referring to the following parts list for MKC-610, Manual solvent change unit and MCU-610. If you should find any missing or broken parts including the main unit, accessories or manual, contact your sales representative or local dealer.

— Karl Fischer Moisture Titrator MKC-610 —

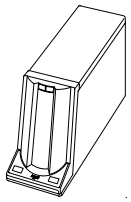
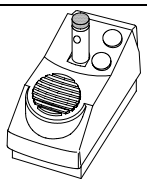
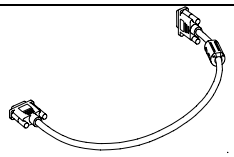
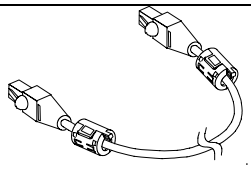
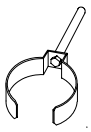
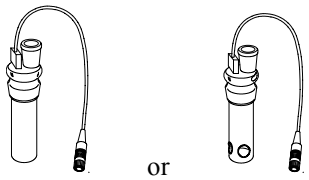
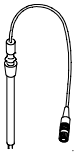
Part name	Part code	Qty	Sketch
Coulometric KF measuring unit *1	MKC-610	1 unit	
Manual solvent change unit *2	—	1 unit	
Touch-on panel main control unit *3	MCU-610	1 unit	
Impact dot printer (option) (AC 100V) (AC 120V) (AC 230V)	 IDP-100-10 -11 -12	1 unit	

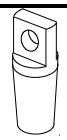
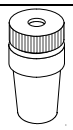
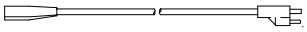
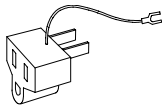
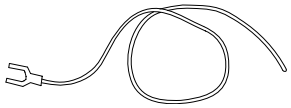
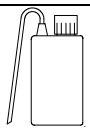
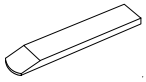
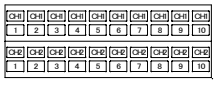
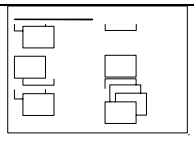
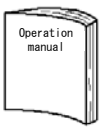
Note:

The details of components for above 1, 2 and 3 are shown on the following pages.

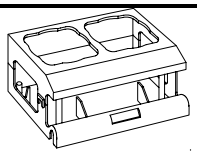
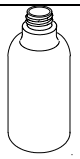
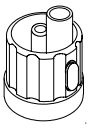
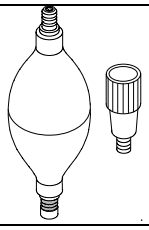
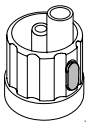
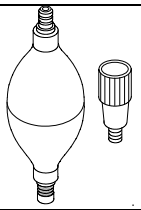
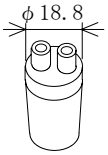
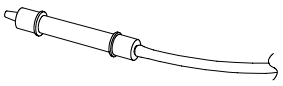
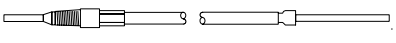
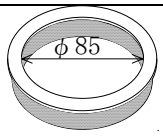
Above 3 is not attatched for MKC-610-D/2ND and MKC-610-N/2ND.

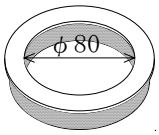
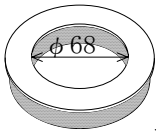
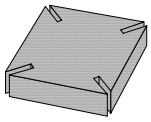
— Components of MKC-610 —

Part name	Part code	Qty	Sketch
Main unit	—	1 unit	
Magnetic stirrer	98-433-0111	1 unit	
Stirrer cable	98-428-0031	1 pce	
Connecting cable	32-001-1400-48	1 pce	
Titration cell holder	98-433-3496	1 pce	
Titration cell(transparency)	20-040-4100-48	1 pce	
Stirrer rotor (35mm)	(98-500-3362)	1 pce	
Inner burette 2-component burette (For MKC-610-DT,MKC-610-D/2ND) 1-component burette (For MKC-610-NT,MKC-610-N/2ND)	98-433-0006 98-103-0002	1 pce	
Twin platinum electrode / KF	98-103-M713	1 pce	
Desiccant tube A	98-433-3116	1 pce	

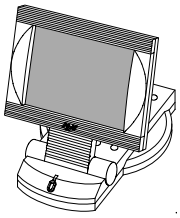
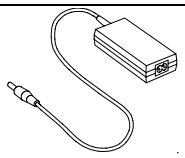
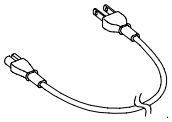
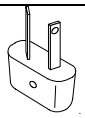
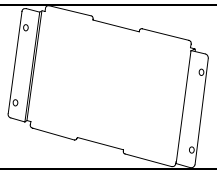
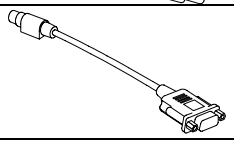
Part name	Part code	Qty	Sketch
Port plug (19/25)	98-550-0073	1 pce	
Syringe inlet (with septum)	98-433-3407	1 pce	
KF grease (5g)	98-433-3138	1 pce	
Power cord with earth wire (AC 100/110/120V area) (AC 220/230/240V area) (for UK) (for China)	 98-320-3198 98-320-3461 98-320-4199 64-000-1800-48	1 pce	
Adapter for power connector (AC 100/110V)	98-320-3199	1 pce	
Ground wire (AC 100/110V)	98-433-3331	1 pce	
Septum (10pcs/set)	98-523-3161S	1 set	
Washing bottle	98-500-3134	1 pce	
Funnel	98-500-3159	1 pce	
Anode adjuster	98-075-3411	1 pce	
Seal	(98-594-0010)	1 pce	
Quick reference	69-000-2301-48	1 copy	
Operation manual	98-595-0481	1 copy	

— Manual solvent change unit (*2) —

Part name	Part code	Qty	Sketch
Bottle holder	98-560-0017	1 pce	
Polyethylene bottle (1L)	69-000-2800-48	1 pce	
Reagent bottle cap (with plug)	98-430-0052	1 pce	
Rubber globe for drain	98-433-0105	1 pce	
Reagent bottle cap	98-430-0058	1 pce	
Rubber globe	98-433-0069	1 set	
Plug for titration flask	98-550-0076	1 pce	
Desiccant tube	(98-444-6542)	1 pce	
Injection tube	98-433-0120	1 pce	
Drain tube	98-433-0121	1 pce	
Bottle holder 1	(98-569-0001)	1 pce	

Part name	Part code	Qty	Sketch
Bottle holder 2	(98-569-0002)	1 pce	
Bottle holder 3	(98-569-0003)	1 pce	
Bottle stand	(98-569-0004)	1 pce	

— Component of MCU-610 (*3) —

Part name	Part code	Qty	Sketch
Main control unit	—	1 unit	
AC adapter	98-403-0052	1 pce	
Power cable (AC 100 /110/120 V area) (AC 220/230/240 V area) (for UK) (for China)	 98-429-0035 98-429-0034 98-429-0036 64-000-3500-48	1 pce	
Adapter (for China)	64-000-3600-48	1 pce	
Protection film	(98-560-0093)	2 pcs	
Connecting cable (Mini DIN-D Sub)	98-428-0032	1 pce	

Note:

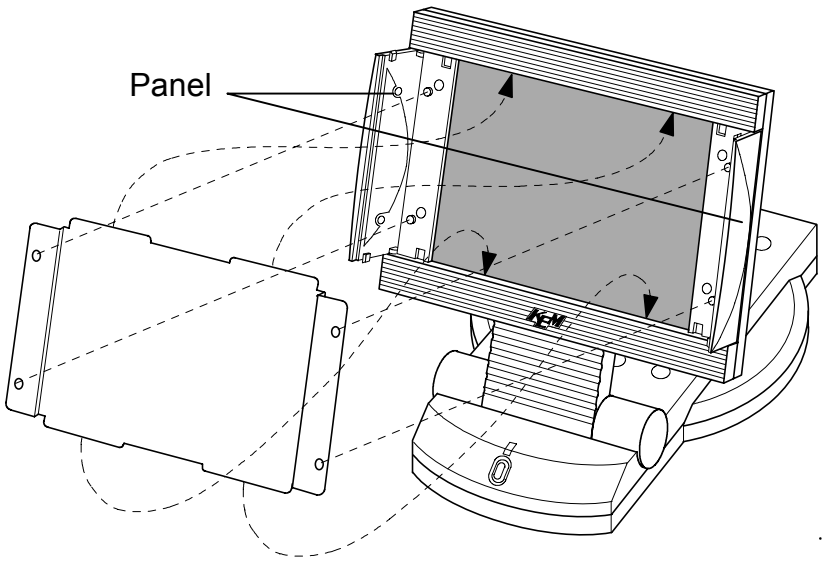
Parts with parenthesized part code have unique order units or packing forms different from others. Therefore, please refer to the section "7-1. Part list" when ordering these parts.

2-2. Installation and start-up

2-2-1. Protection film

Attach the protection film on the display panel of Main control unit (MCU-610):

1) Make sure the power of Main control unit is turned off.
2) Open the control panel.
3) Attach the supplied film as follows: Insert the film into the vertical gap, and match the film holes and raised portions on panel.
4) Close the panel.

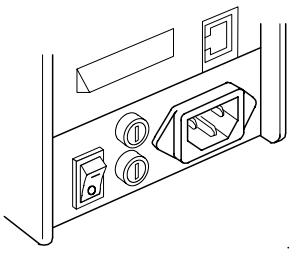


Note:

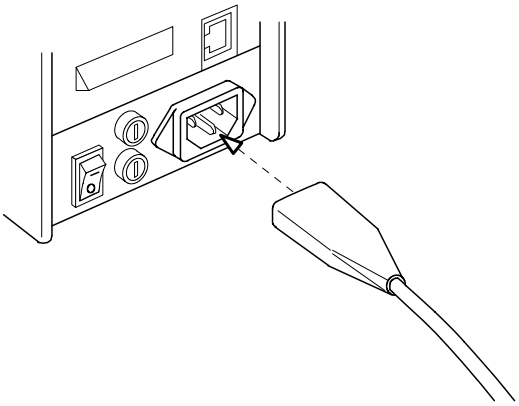
When using the optional glazed protection film (P/N: 20-024-5400-48), apply the protection film to the surface of the touch panel.

2-2-2. Power cable

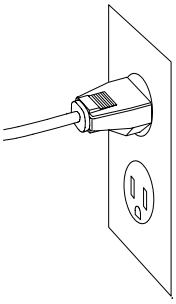
1) Make sure the power switch is in Off position.



2) Plug in the supplied power cable on the back of unit.

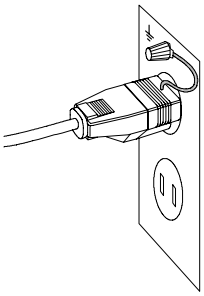


3) Connect the power cable to the power outlet.



< 3-pin plug >

The 3 pins plug has an earth terminal and grounds to the earth by itself.



< 2-pin plug >

Attach an adapter for power connector to the plug and ground the green wire to the earth terminal.

⚠ Warning!

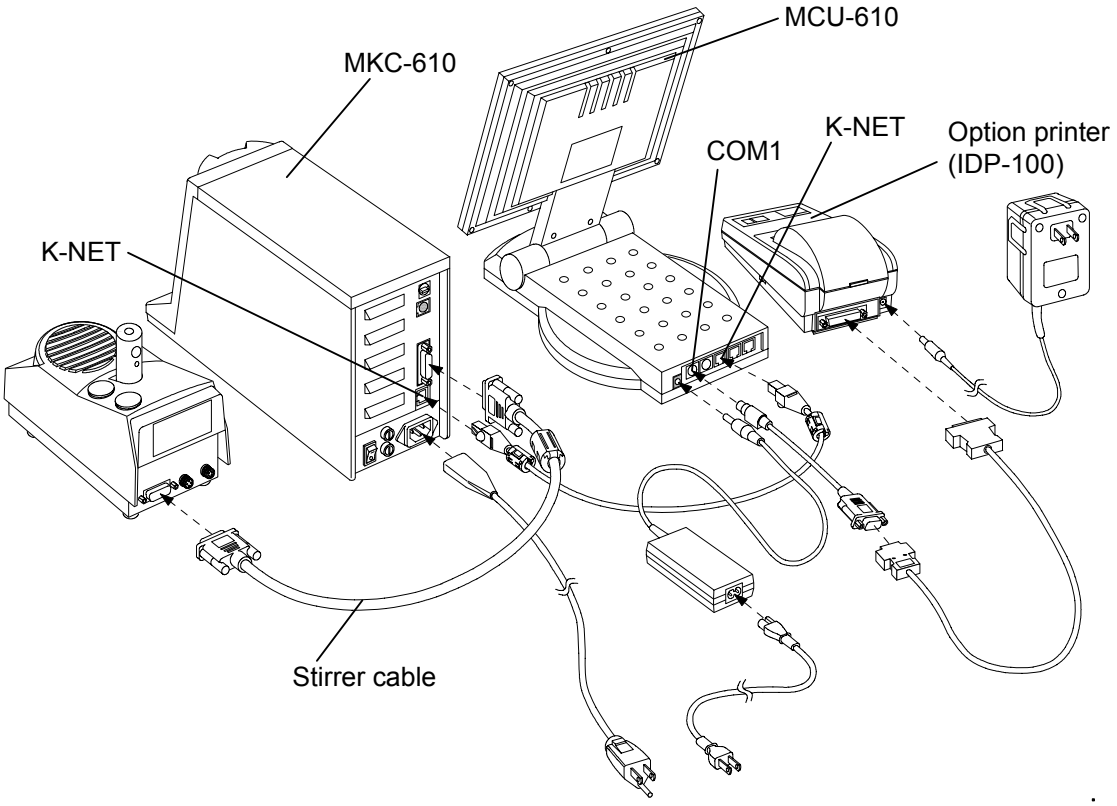
The earth wire must be grounded. If not, there exists a danger of electric shock.

2-2-3. Connecting cables

Connect the cables as shown below.

Connect MCU-610 and MKC-610 with connecting cable via K-NET port on the back.

Connect MCU-610 and Printer with the cable via COM1 or COM2 port on the back of MCU-610 and the printer port.



Note:

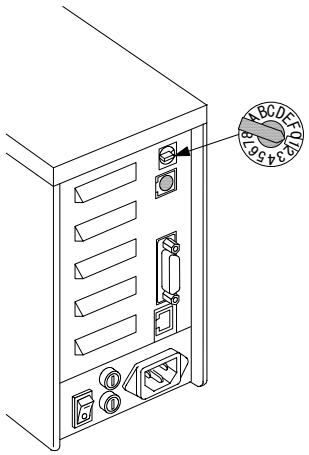
Turn on the power only after all of the cables are connected. Work on the stirrer cable only when the main power switch is off in order to avoid malfunction of the main unit.

⚠ Warning!

Use an AC adapter appropriate to the power line voltage. Make sure of the rating of the AC adapter before plug it in to avoid malfunction of the unit or breakout of a fire.

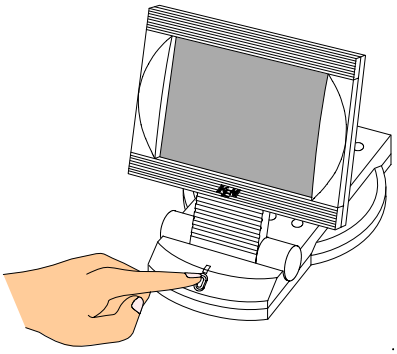
2-2-4. Set up the address for measuring unit

Set MCU No. switch on the back of measuring unit to “1” position.

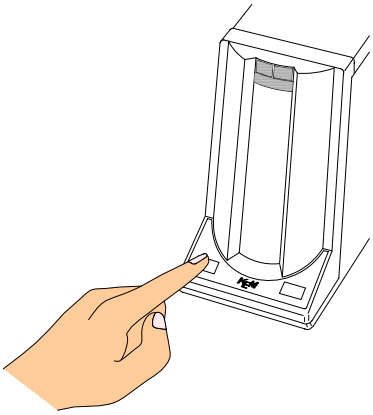


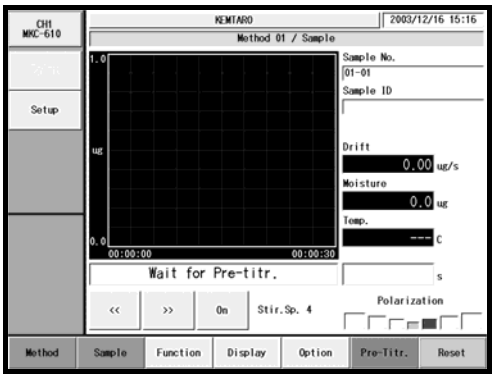
2-2-5. Start-up

1) Make sure the power of measuring unit is off, and then turn on the power of Main control unit. The screen will show the initial display when first power is turned on after the unit is delivered and unpacked.



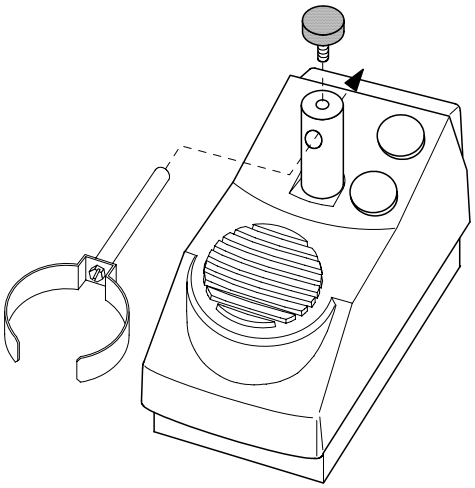
2) Turn on the power of measuring unit by turning on “Power” switch on the back of unit, and then, press [Power] button in front. The screen of Main control unit will show the below display, which will first appear from the next time on.

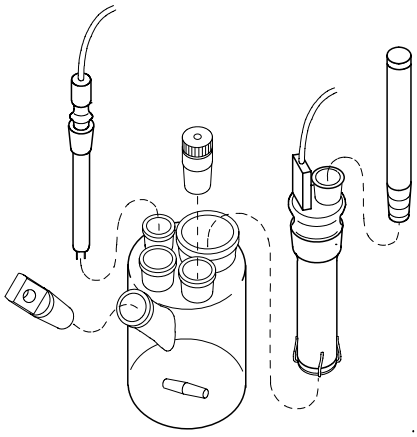




2-2-6. Assembly of the titration cell

1) Fix the cell holder to the magnetic stirrer.
2) Put a stirrer rotor into the cell, and install the inner burette, the electrode, desiccant tube A, the port plug and syringe inlet.



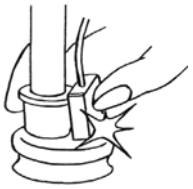


Note:

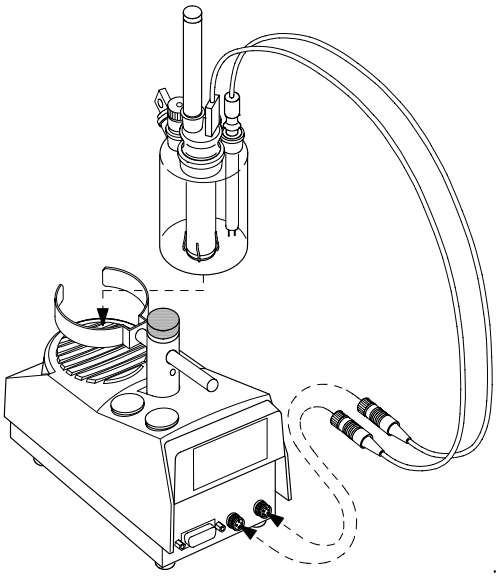
Make sure to apply KF grease around glass sliding area.

⚠ Warning!

When handling the inner burette, do not hold the housing (black resin area) and sliding area of desiccant tube in order to avoid breakage.

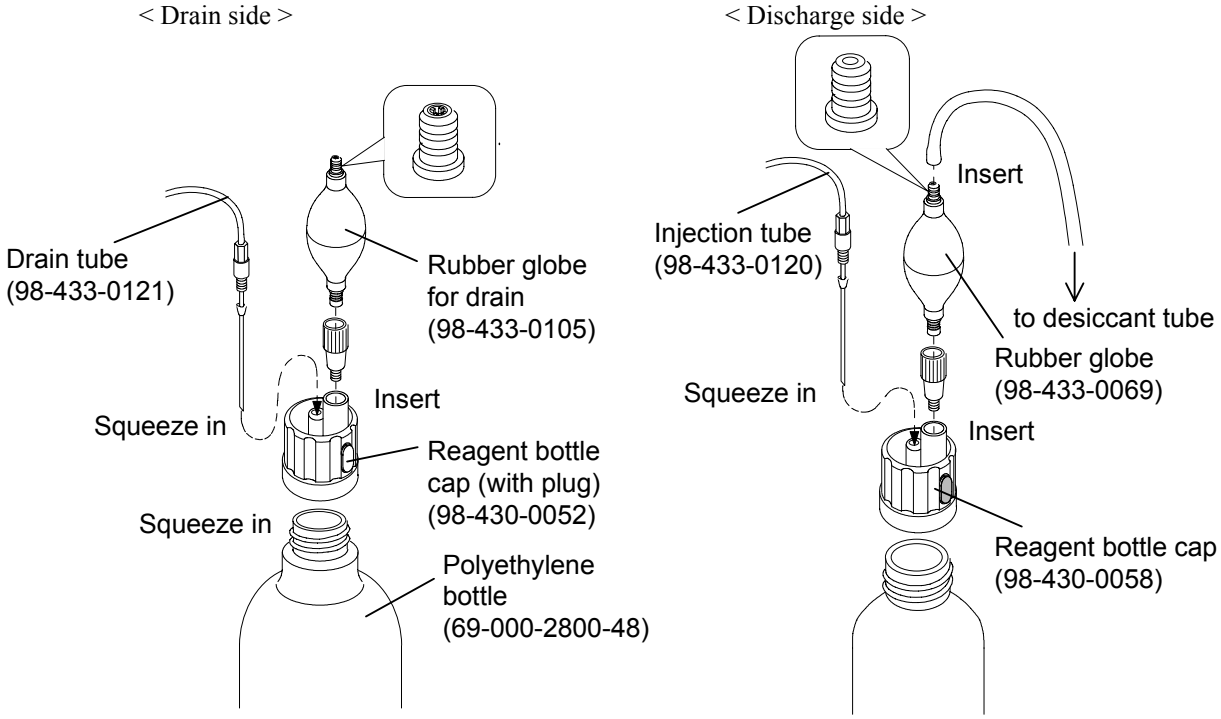


3) Place the titration cell onto the titration holder, and plug in the cable from the inner burette and the electrode. Tighten the plug screws firmly.



2-2-7. Installation of KF reagent dispenser

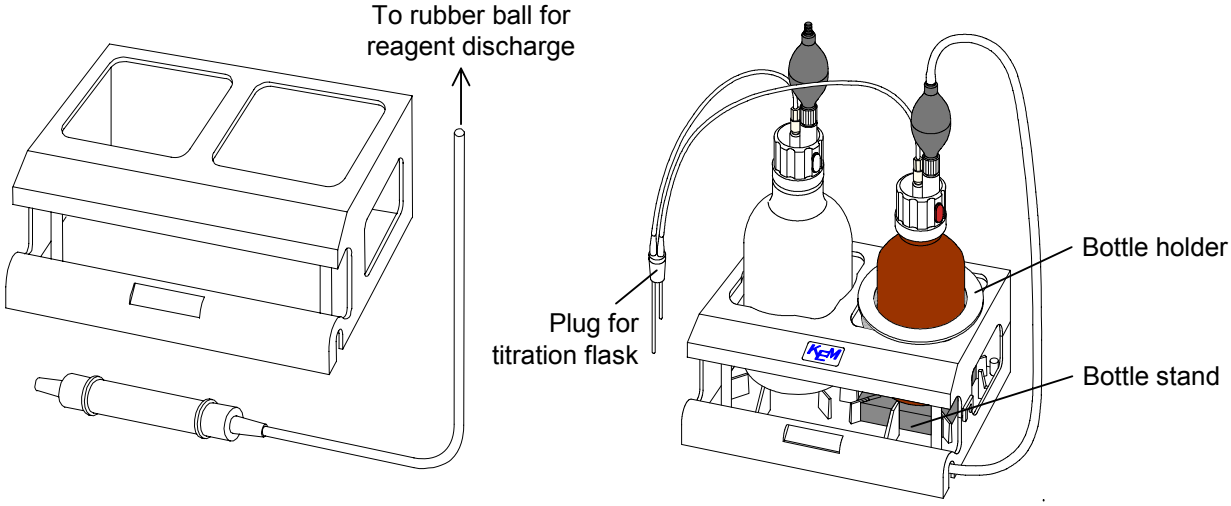
1) Insert the rubber globe onto the reagent bottle cap.
2) Connect the drain tube to the reagent bottle cap (with rubber stopper), and the injection tube to the reagent bottle cap.
3) Fix the cap (with plug) to the polyethylene bottle.
4) Fix the desiccant tube to the rubber globe.
5) Connect the reagent bottle to a commercially sold KF reagent bottle filled with anolyte.



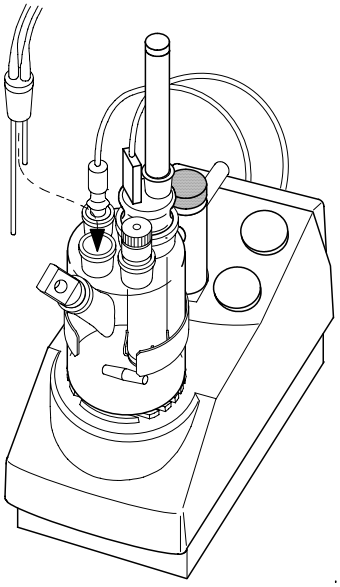
Note:

If loosely squeezed it in, pressurized air may leak and it may cause malfunction of dispensing KF reagent. There are two kinds of rubber globes, one for drain and the other for discharge of reagent. Both of them are indicated by the joint on top of each.

6) Install the desiccant tube onto the reagent bottle holder.
7) Place the reagent bottle in the bottle holder. If the outside diameter of reagent bottle does not match the holder, use the bottle holder and bottle stand as shown below.
8) Connect the tube for drain and injection to the Plug for titration flask as shown below respectively.

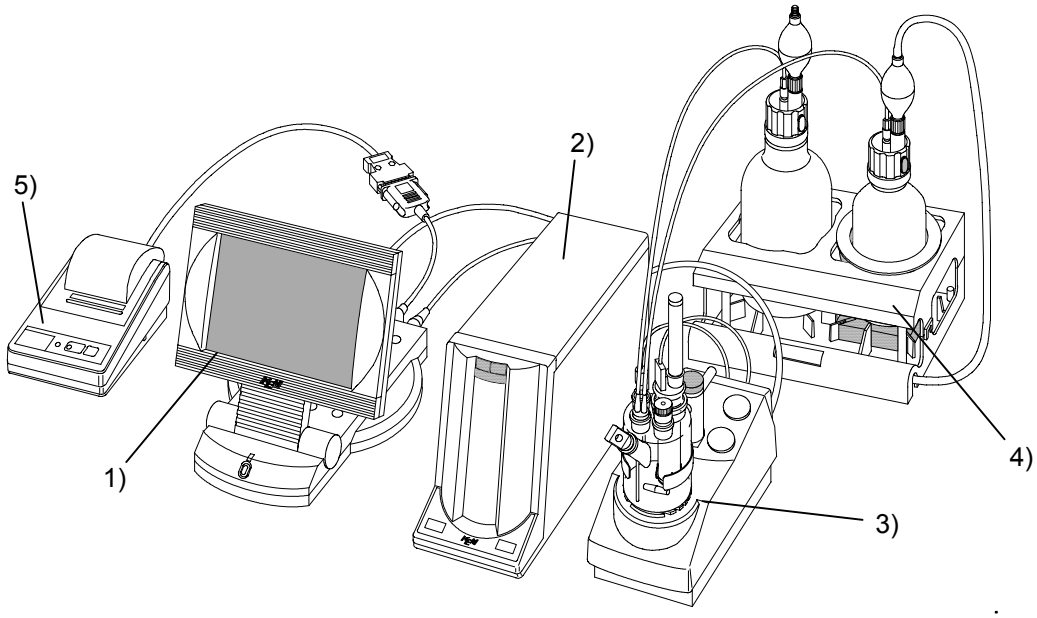


9) Insert the Plug for titration flask carefully into the titration cell. At this point, apply a small amount of KF grease on slide contact area.



2-3. Parts configuration and each function

2-3-1. Karl Fischer moisture titrator



1) Main control unit (MCU-610)
   Operating unit for Karl Fischer titration.

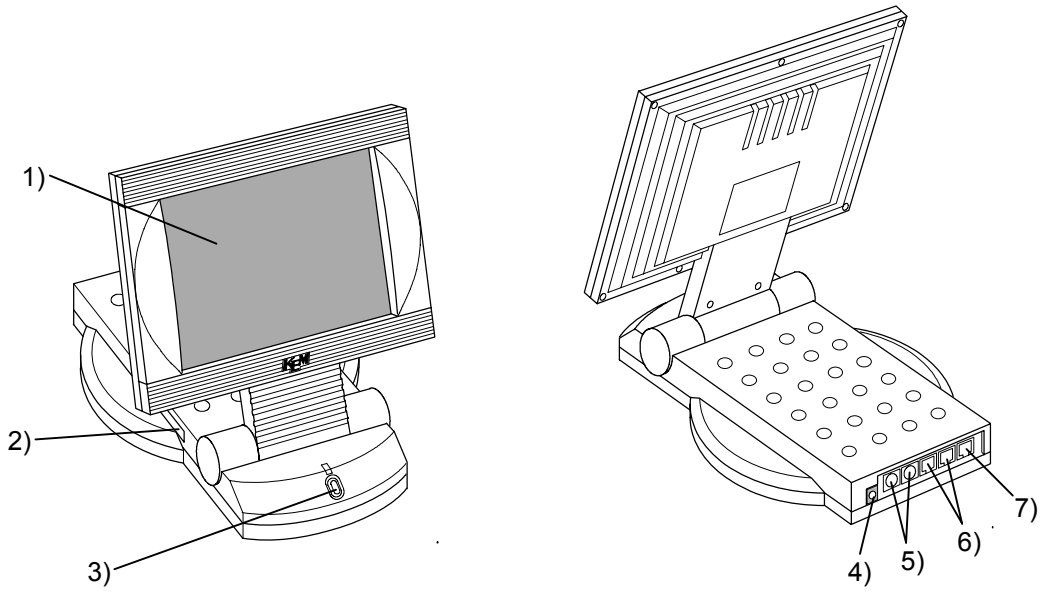
2) Measuring unit (MKC-610)
   Control unit for Karl Fischer titration.

3) Stirrer
   Measuring unit for Karl Fischer titration with a magnetic stirrer.

4) Manual solvent change unit
   KF reagent is supplied and drained here.

5) Impact dot printer (IDP-100)
   Print out measurement results and parameters.

2-3-2. Main control unit (MCU-610)



1) Touch-on panel display
   This panel displays operating buttons and measurement results as well as configured parameters. With these buttons on screen, you can maneuver the sequence for measurement by just touching on the necessary buttons on display.

2) Card slot
   Insert the CF card (option).

3) Power switch
   This switch turns on or off the power of Main control unit. It should be noted the power must be turned on again at least 10 seconds interval.

4) ~ LINE
   Connector for power cord.

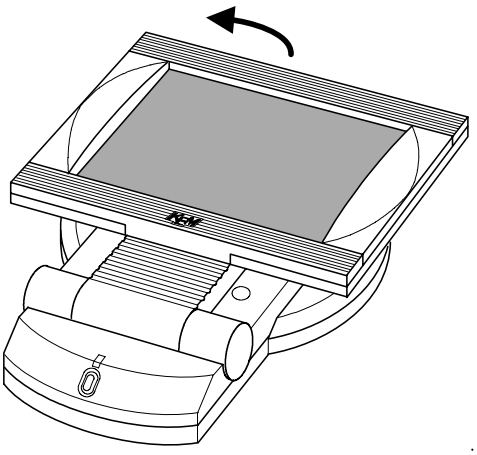
5) COM1 and COM2 port
   These ports are for connections to Printer, Balance or Personal computer. The printer prints out measurement results as well as selected parameters. When an electronic balance is connected, the sample weight is automatically input for measurement. Personal computer is connected to this port for data acquisition using the optional software.

6) K-NET connector
   Connecting port for measuring unit.

7) PC connector
   This connector is not used in this system.

< Adjust the Touchpanel >

Lift the Touchpanel slowly as shown below until you hear it click and stop. Then tilt and sit it to the point where you can see the monitor well. When lifting it up too much, once lift it to the upright position according to the instructions in < How to tilt the Touchpanel of MCU-610 >, followed by folding the panel. Then tilt it again to adjust the angle.

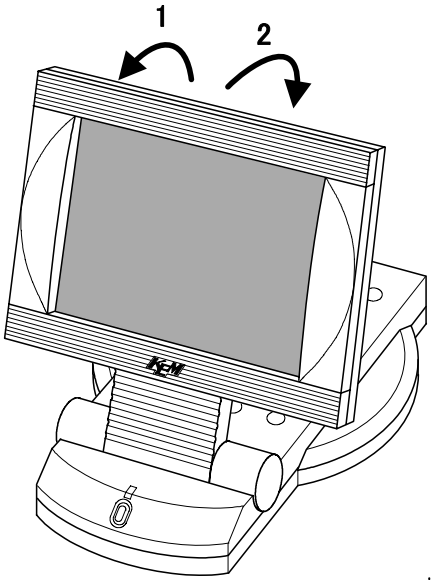


⚠ Caution:

Do not force the Touchpanel when tilting it.
Failure may break the joint for tilting the Touchpanel.

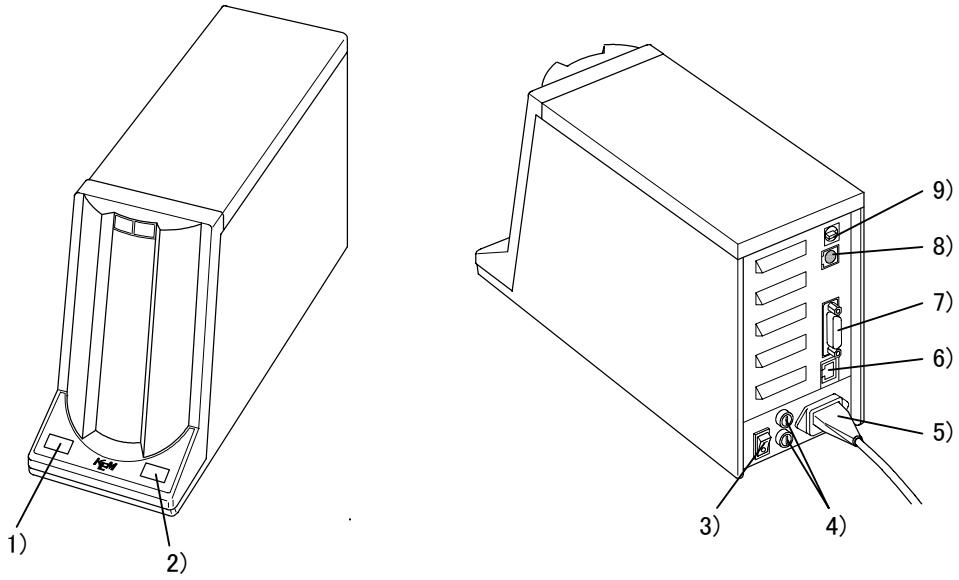
< How to tilt the Touchpanel of MCU-610 >

Once lift the Touchpanel to the upright position as shown below.
Then tilt the panel backward.



2-3-3. Measuring unit (MKC-610)

< Main unit >



1) [Power] button
It turns on or off the power. The power is turned off when pressed for more than 5 seconds. This button works only when the power switch on the rear panel of measuring unit is in On position.

2) [Reset] button
On-going measurement can be aborted with this button, and the unit sets in standby mode.

3) Power switch on rear
This switch turns on or off the measuring unit. This is the main switch for measuring unit, and [Power] switch in front works only when this switch is in On position.

4) Fuse box
Power fuse rated for T3.15A/T250V is housed here.

5) Power connector
Connecting port for power cable.

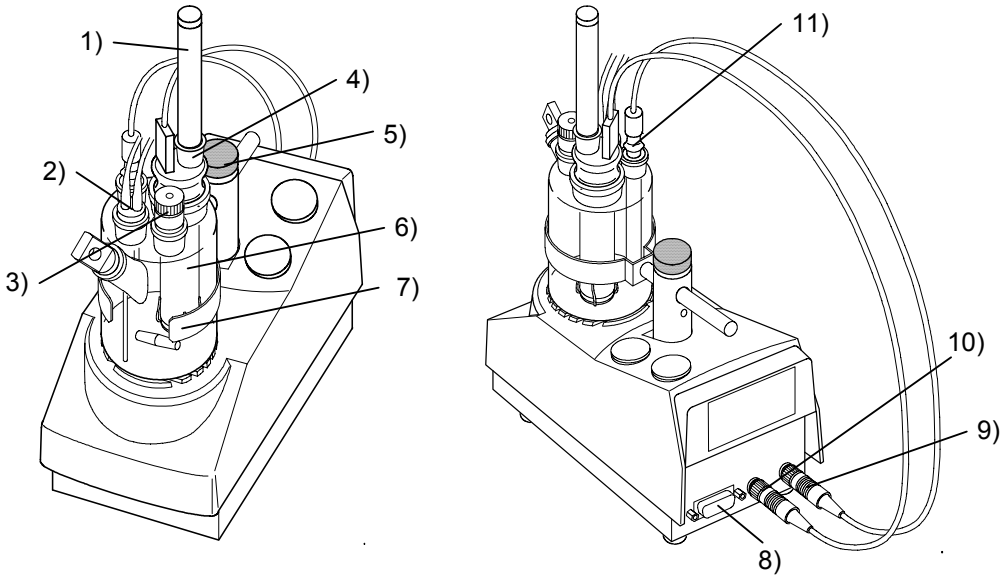
6) K-NET connector
Connecting port for communication with Main control unit.

7) Stirrer port
Magnetic stirrer is connected to this port.

8) RS-232C port
The optional oven ADP-611 or multiple sample changer CHK-501 is connected here.

9) MCU No. switch
The main unit group number (MCU No.) connected to measuring unit is selected here.

< Stirrer >



1) Desiccant tube
   The gas fume from titration cell is exhausted through this tube.

2) Plug for titration flask
   Dispensing tubes for KF reagent are inserted here.

3) Syringe inlet
   This is the sample inlet.

4) Inner burette
   The anode and cathode liquid reacts here for electrolysis.

5) Cell holder screw
   The titration cell is fixed here.

6) Titration cell
   The iodine generated in electrolysis and water in sample reacts here.

7) Titration cell holder
   This is the lid for titration cell.

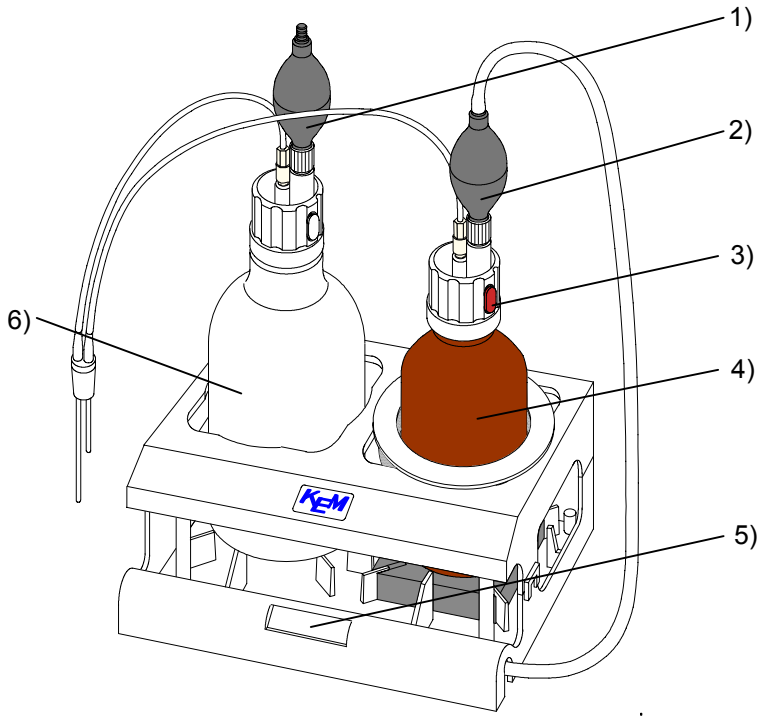
8) Stirrer port
   The connecting cable to the stirrer is plugged in here.

9) Detection electrode connector
   The twin platinum electrode is connected here.

10) Inner burette connector
    The inner burette for electrolysis electrode is connected here.

11) Twin platinum electrode/KF
    This electrode detects the potential level of the anolyte inside the titration cell.

< Solvent change unit >



1) Rubber globe (for drain)
This globe pumps to drain the solvent.

2) Rubber globe
This globe pumps to discharge the solvent.

3) Seal
This works as a valve to control dispensing reagent.

4) Reagent bottle for solvent
Use a commercially sold solvent bottle.

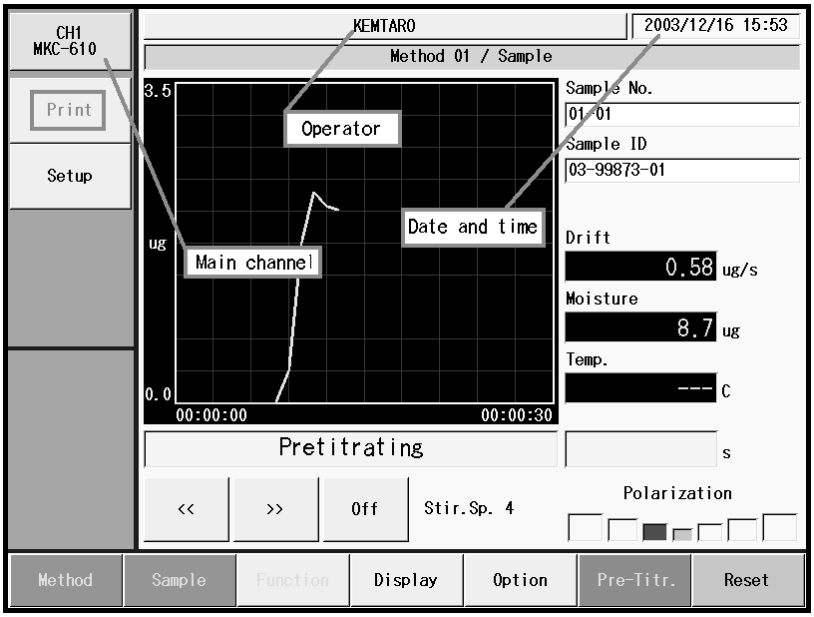
5) Desiccant tube
Absorbs moisture of solvent.

6) Waste bottle
This bottle keeps the used liquid after measurement.

2-4. Displays and operating buttons

2-4-1. Description of system area and operating buttons

Here major buttons are arranged on display for configuration of the system in general.



[Main channel]

Main channel system is shown here.

[Print] button

This button is for printing the parameters shown on main channel area.

[Setup] button

Setup functions are selected as follows:

- Regist operator
- International
- Interface
- LCD Backlight
- Beep

[Operator] button

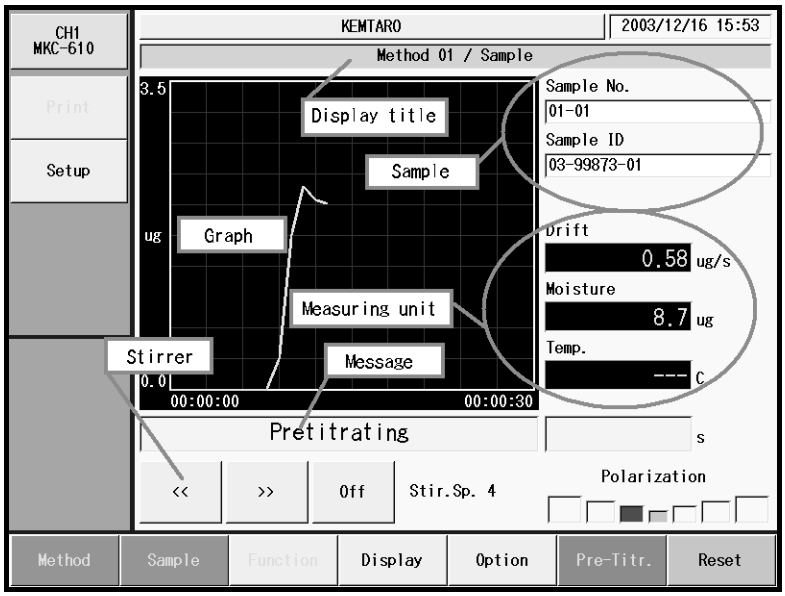
Operators name or code is changed here with the button showing currently active operator in charge.

[Date and time]

The built-in clock shows the present time and date here.

2-4-2. Main channel display area and operating buttons

The potential level of measuring unit and drift level connected to main channel are shown here.



[Display title]

The title of currently displayed screen is shown here. It shows currently significant Method number and its name.

[Message]

This shows the status of measuring unit connected to main channel.

- Pre-titrating
- Wait for stable drift : This status means drift level is below. 10.0ug/s.
- Drift stable : This status means drift stable(ug/min) changes within preset level, that is, the drift stable can be assumed stable at normal preset level of 0.1ug/min. Therefore, accurate moisture amount can be measured and determined.
- Titrating, etc.

[Stirrer]

This button controls stirrer speed of the stirrer connected to the measuring unit.

- [〈〈] : Speed slows down by one step
- [〉〉] : Speed goes up by one step
- [On], [Off] : Turns on or off the stirrer

[Graph]

The graphic curve is plotted in real time during titration. This setting is made on graph setup on Function.

[Sample]

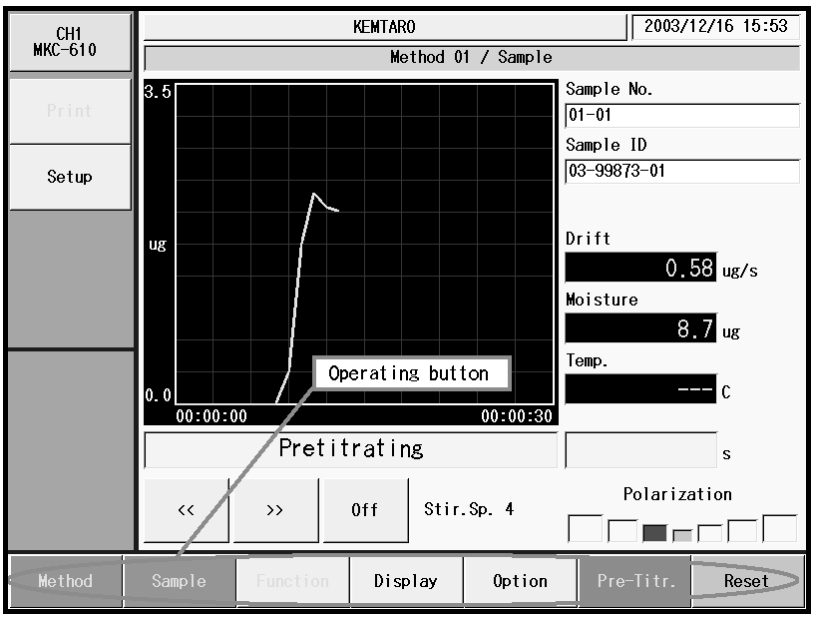
Sample number and its ID preset on sample setup are shown here.

[Measuring unit]

This box shows the drift level, potential and water content relayed from the measuring unit.

2-4-3. Main channel operating buttons

Here arranged are the buttons for operating the measuring unit connected to main channel.



[Method] button

This button changes the Method.

[Sample] button

Sample is configured here with this button.

[Function] button

Function provides the following settings:

- Reagent information
- Method edit
- Results list
- Sample mode
- Blank list
- GLP management
- Auto statistics
- Decimal edit
- Graph setting
- Other settings
- System information
- Memory clear
- Operation of CF card

[Display] button

The information on measuring unit of main channel area is switched here.

[Option] button

The optional peripheral is controlled here like oven purge of the evaporator.

[Pretitr.] button or [Start] button

This button first works for pre-titration and then, switches to [Start] button. When t(stir)-Wait time before start- is set up, pressing [Start] button again after starting titration will lead to skipping the execution of “Wait time before start”.

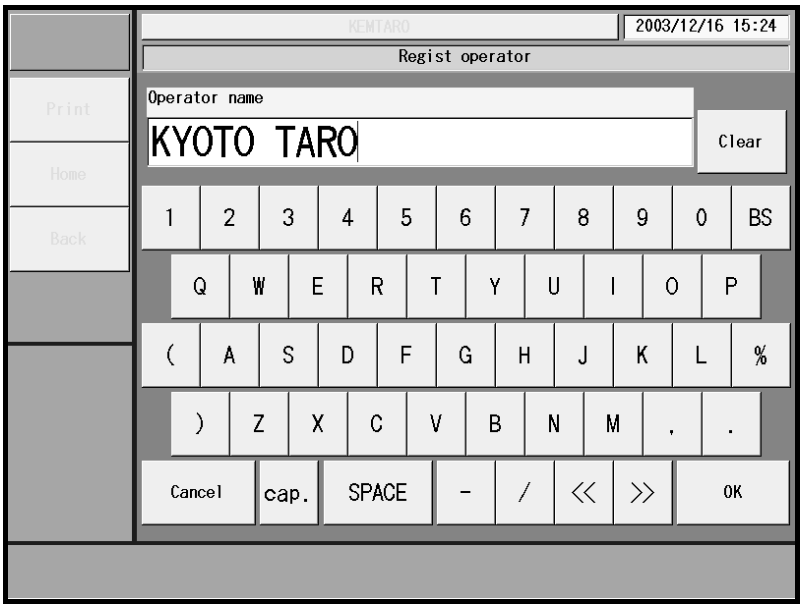
[Reset] button

This button stops pre-titration or aborts measurement underway.

2-4-4. Description of how to input characters and numbers

The operators name or reagent name are selected and entered here.

(Example: Regist operator)



[1] ~ [0] button

These are numeric buttons

[A] ~ [Z] or [a] ~ [z] button

Capital or small letters are selected here. [CAP.] stands for capital letter and [cap.] for small.

[( ], [,], [ )], [,], [%] button

These are symbols.

[BS] button

This button erases the preceding one character.

[Cancel] button

The entered characters can be canceled with this button.

[cap.] or [CAP.] button

This button switches capital letter or small and [–], [/] or [+], [*] button.

[Space] button

Space is inserted with this button.

[–], [/] or [+], [*] button

These symbols can be selected with [cap.] or [CAP.] button

[〈〈], [〉〉] button

This button moves the cursor position o display.

[OK] button

This button confirms the input that you have entered on key board display.

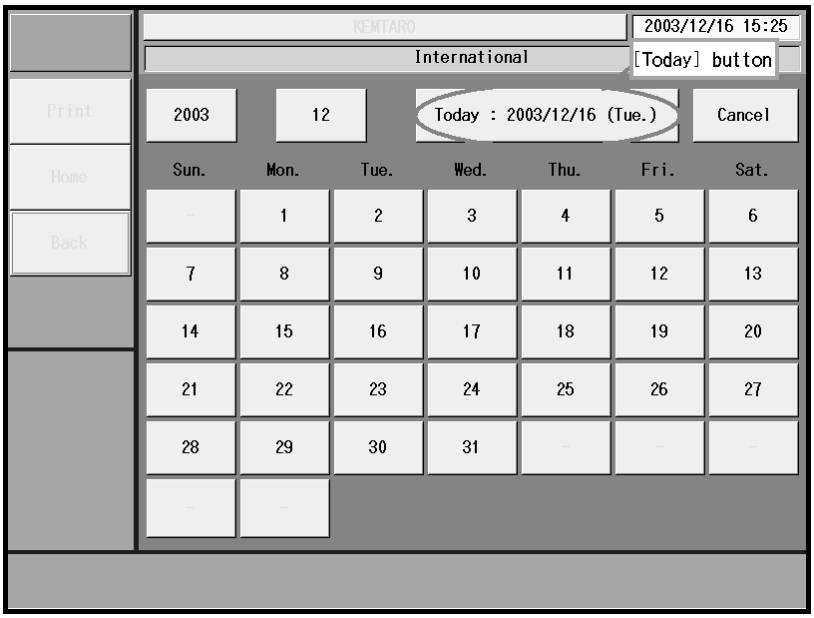
[Clear] button

This button clears key entries. When pressed again, the display returns to the screen before cleared.

2-4-5. Description of date entry

The below display appears for date entry.

(Example: setup of international)



[Today] button

This button updates the date to the present day as of today.

Year button

Display where you enter the year.

- 2001 ~ 2099 year

Month button

Display where you enter the month

- 1 (January) ~ 12 (December)

[1] ~ [31] button

This button enters the day of the month. This date will be displayed as calendar by inputting a year and a month.

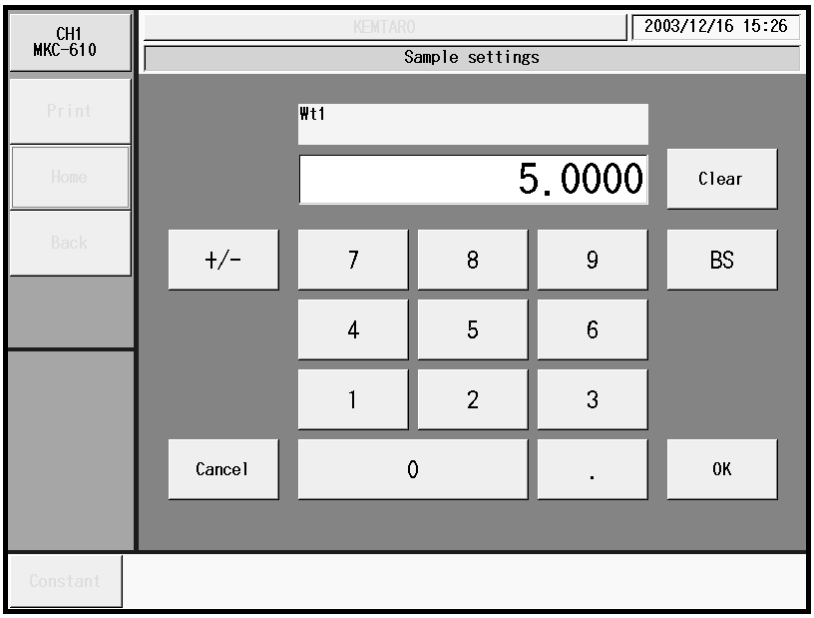
[Cancel] button

This button cancels already entered configuration.

2-4-6. Description of numeric entry

The below display appears for numeric entry.

(Example: Display of sample size (Wt1))



[1] ~ [0] button

This button enters numerals.

[.] button

This button enters decimal point, only significant when so necessary.

[OK] button

This button confirms the input that you have entered on key board display.

[BS] button

This button erases preceding one character.

[Clear] button

This button clears all of the entered configurations. When pressed again, it returns to the previous display before cleared.

[Cancel] button

This button cancels the entry.

[+/–] button

This button switches plus and minus, only significant when minus can be entered.

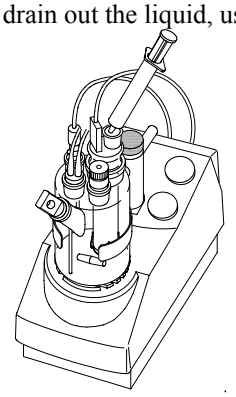
3. Basic procedure

3-1. Basic steps before titration

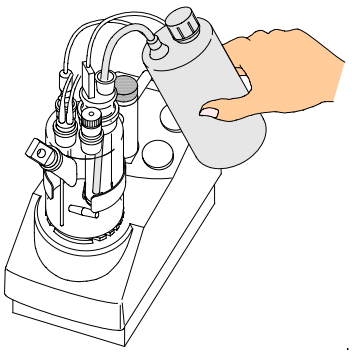
3-1-1. Filling reagent and draining

< Catholyte >

Inject 5mL catholyte into the inner burette using a syringe. (The lower line outside the cell shows approx.5mL.)
To drain out the liquid, use the supplied washing bottle for draining.



< To fill the reagent >

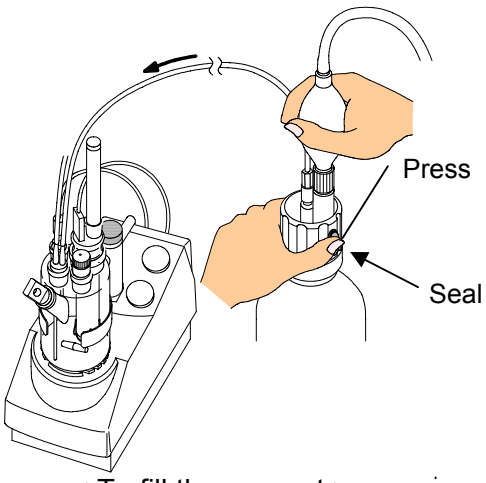


< Drain out >

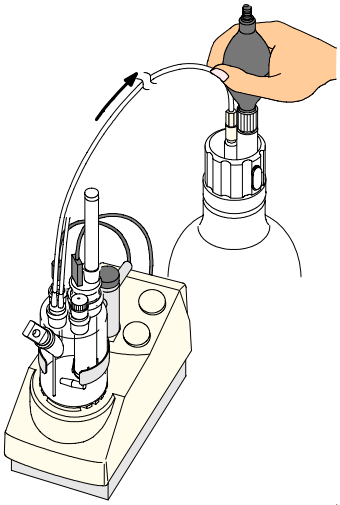
Note:
When one component cell is used for inner burette, catholyte is not needed.

< Anolyte >

To fill the reagent, pump the rubber globe with fingers while holding the seal of reagent bottle cap. Fill the titration cell with 100mL reagent for two component cell, and fill the titration cell with 150mL reagent for one component cell. (The lower line outside the titration cell indicates approx.100mL line for anolyte, and the middle point between upper and lower line marked outside the titration cell indicates approx.150mL line for anolyte.) To stop filling, detach your finger which is holding the seal.
To drain it out, pump the rubber globe of drain bottle a few times. The used reagent in the cell transfers to the waste bottle.



< To fill the reagent >

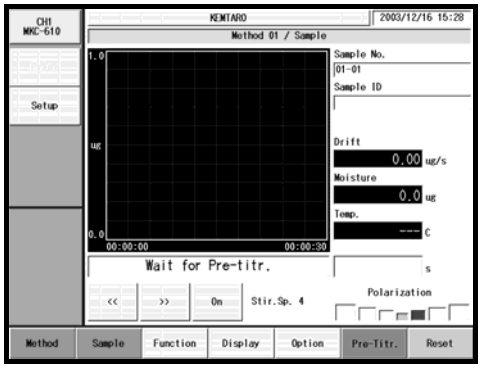


< Drain out >

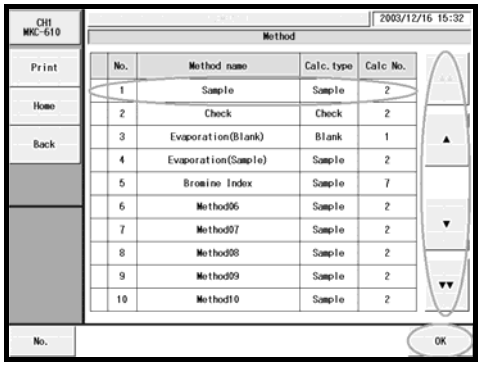
Note:

When reagents for Ketones are used, residue of alcohols in the titration cell may lead to the failure of successful measurements. In this event, rinse the inside of the titration cell and replace the Anolyte.

3-1-2. Selection of Method (measurement parameters and conditions)

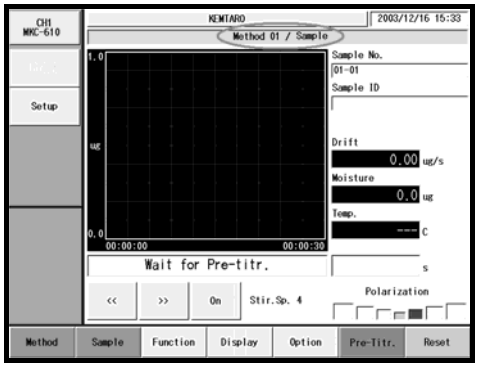


1) Press [Reset] button.
2) Make sure the message “Wait for Pre-titr.” appears.
3) Press [Method] button.



4) When “Method” dialog box appears select your desired Method for measurement with [▲][▼], [▲▲][▼▼] buttons. You can choose a Method directly with numeric buttons.

5) Press [OK] button.



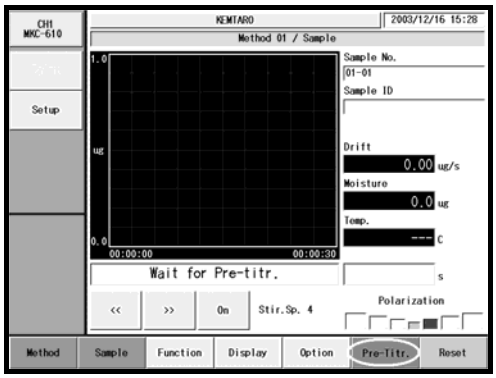
The Method display changes to Main display (standby mode), where currently active Method is shown on the screen.

Note:

Method cannot be changed during pre-titration or measurement in progress.
To change Method, press [Reset] button to set in “Wait for Pre-titr.” mode.

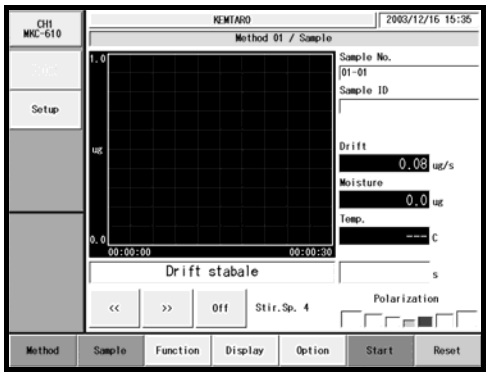
For Method configuration, refer to “3-7. About Method”.

3-1-3. Measurement procedure

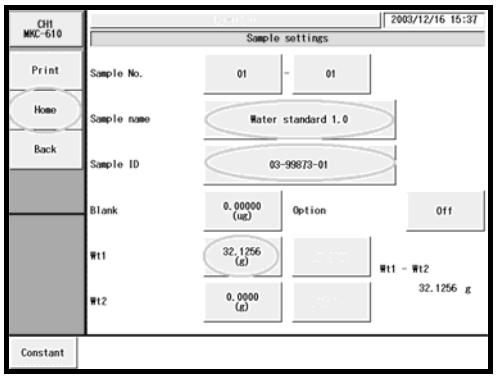


1) Press [Pretitr.] button. The Karl Fischer reagent absorbs ambient moisture depending on how it is preserved and its shelf life. Therefore, its moisture must be extracted by pre-titration before sample measurement is preformed.

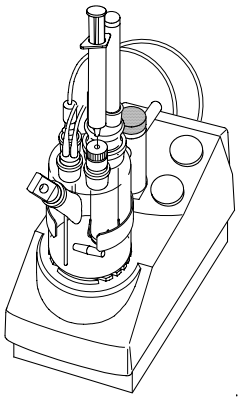
   When the titration cell is dehydrated, the display shows “Drift stable”, and the button changes from “Pre-Titr.” to “Start”.



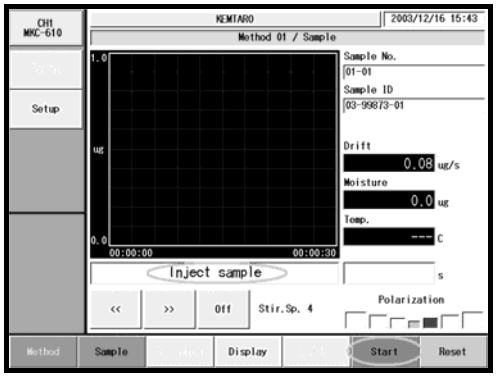
2) Make sure the display shows “Drift stable” status.
3) Use a syringe to take a sample, and weigh it using an electronic balance.
4) Press [Sample] button to show “Sample settings” dialog box.
5) Press Wt1 button of the weighed sample. Enter the weight of 3) with numerals. Also, enter the sample name and its ID.



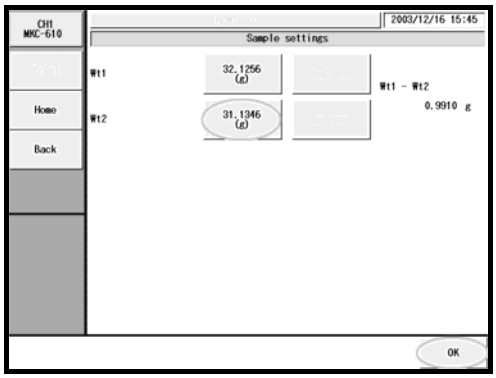
6) Press [Home] button to return the screen back to Main display.
7) Press [Start] button. The message “Inject sample” and “Please press [Start] button”.



8) Inject the sample into the titration cell.
9) Weigh the syringe on the balance after the sample is injected.

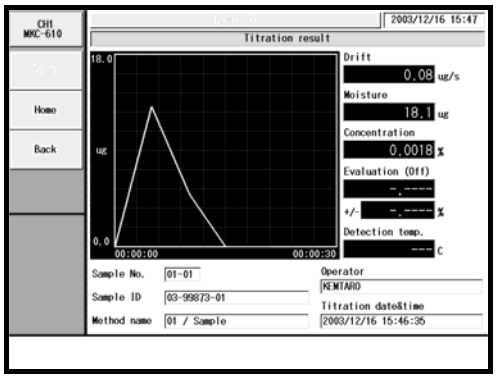


10) Press [Start] button once more. Titration starts and its curve in graphic form will appear. Press [Reset] button to abort the titration in progress halfway.



11) When the titration is over, the display changes to prompt Wt2 of tare weight. Enter the weight of 9) and press [OK] button.

If it is set to Off for "After entry" for sample mode on [Function], it will be calculated with currently stored Wt2 weight.



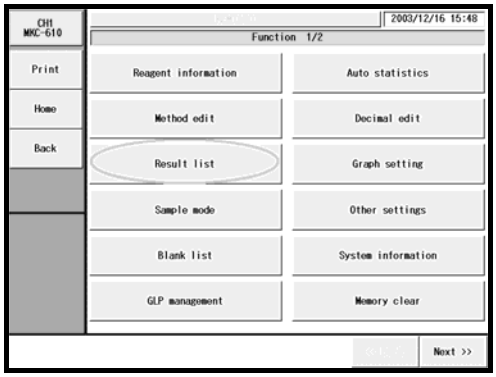
The titration results now appear on display.
When a printer is connected, the results will be printed out according to printing parameters preset in Method.

Note:

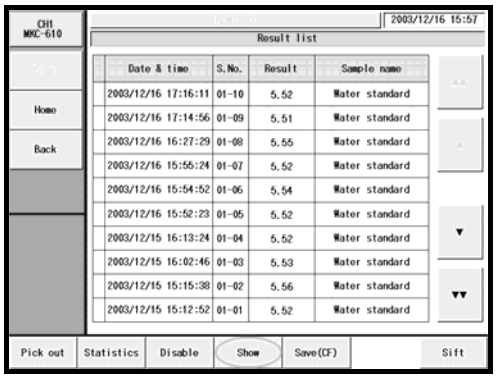
A sample must be discharged into the cell only after the screen has returned to Main screen after sample conditions are configured on sample setup dialog box first.
When [Start] button is pressed, the sample setup dialog box will appear if "Yes" is chosen on "Before entry". Otherwise, it should be noted titration will not start if the sample is discharged into the cell while the sample setup dialog box is on display.

3-2. Usage of titration data

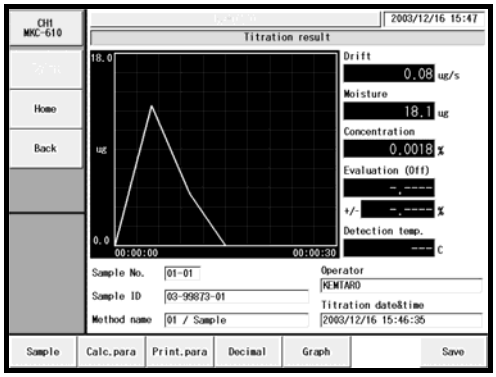
3-2-1. Re-calculate titration data



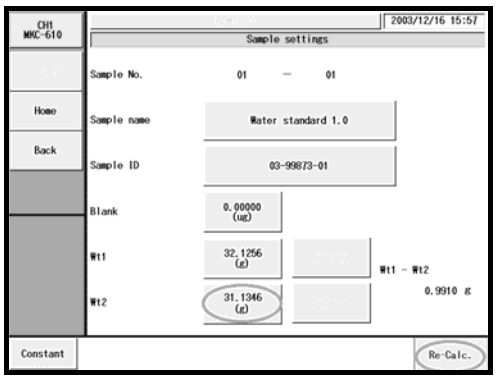
1) Press [Function] button on Main display.
2) Press [Results list] button.



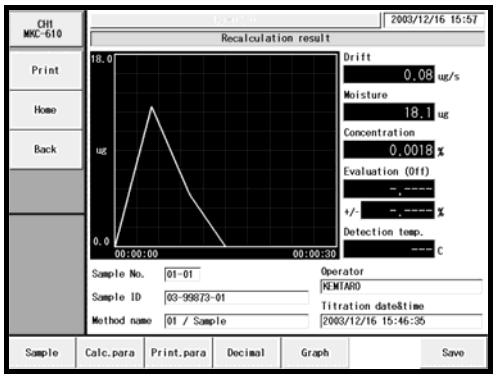
3) When "Results list" appears, point the cursor on the results data for recalculation.
   Use [▲][▼], [▲▲][▼▼] buttons to move the cursor or you can choose the desired data directly by pressing the data on list.
4) Press [Show] button.



5) The results of measurements will appear, and press the items for recalculation accordingly.
   Example: Press [Sample] button.

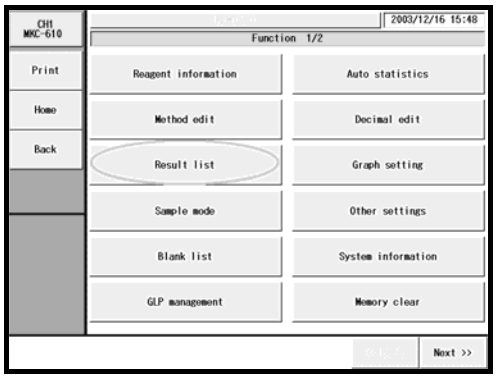


6) The screen display will turn "Sample settings" dialog box. Press Wt2 button of the weighed sample. Enter the weight.
7) Press [Re-Calc.] button.

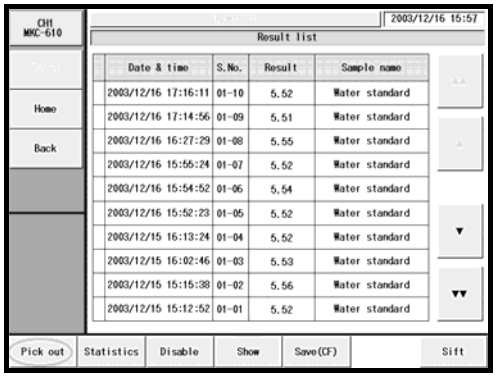


8) The screen display will turn “Recalculation result” dialog box. Then, press [Save] button.
9) The screen display will turn to the confirmation screen. Then, press [Yes] button.

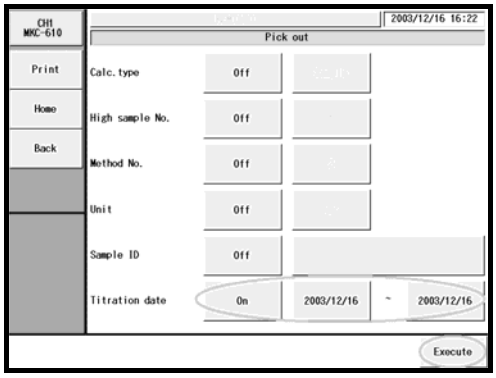
3-2-2. Batch processing of titration data



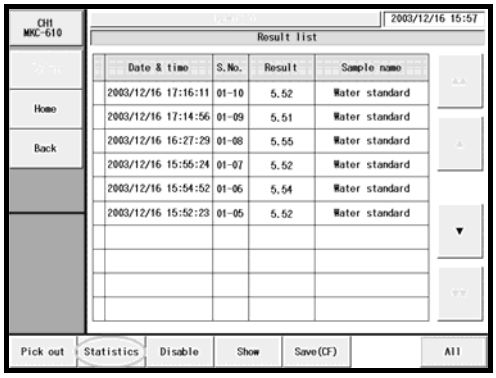
1) Press [Function] button on Main display.
2) Press [Results list] button.



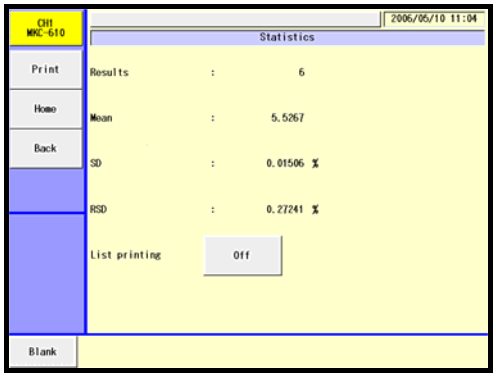
3) Press [Pick out] button. Here you sort out the data for batch calculation.



4) When [Pickout] display appears, configure parameters for selection of data, and press [Execute] button.
Example: Select titration date



5) Only those data thus selected appear on the results list, and then, execute batch processing by pressing [Statistics] button. If you want to view all of the results, press [All] button.



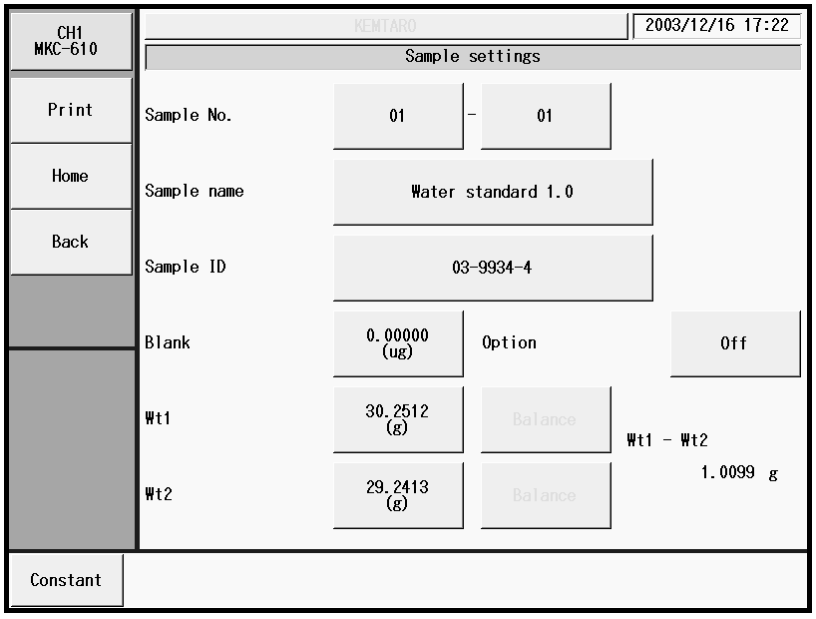
6) The screen on the left will appear. The batch calculated results will be printed out when [Print] button is pressed.
7) To return to Main display, press [Home] button.

Note:
For details of batch calculation, refer to "3-5-3-2. [Statistics]".

3-3. About Sample settings

Note:
If you use a multiple sample changer, refer to "3-3-1. Sample File Mode".

Here you set up parameters for the sample to be measured.
Press [Sample] on Main display to show the below screen. Select the buttons for the items you want to preset.



[Sample No.]

Here you select a number for the sample. The numbers consist of High order number and Low order number, and the samples when grouped are numbered with High order number. Lower number represents individual sample identification.

- 00 ~ 99

[Sample name]

Here each sample can be named with characters up to 20 letters.

[Sample ID]

The samples can be identified with ID or Lot number with up to 20 characters.

[Blank]

Here you enter the blank value. The blank value selected for the Blank No. in Method calculation parameter will be taken in automatically.

- 0.00000 ~ 99999.99999ug

[Option]

Here you choose On if you use an optional oven or a multiple sampler.

- Off : No options to be used.
- ADP- : Selected when measuring combined with the Drying oven. Such device will work to the Option parameter preset on Method.
- CHK- : Selected when measuring combined with the Multiple sample changer. Such device will work to the Option parameter preset on Method.

[Wt1]

Here you enter the total weight of tare and sample.

- 0.00000000 ~ 99999.99999999g

[Wt2]

Here you enter the tare weight after sample is discharged.

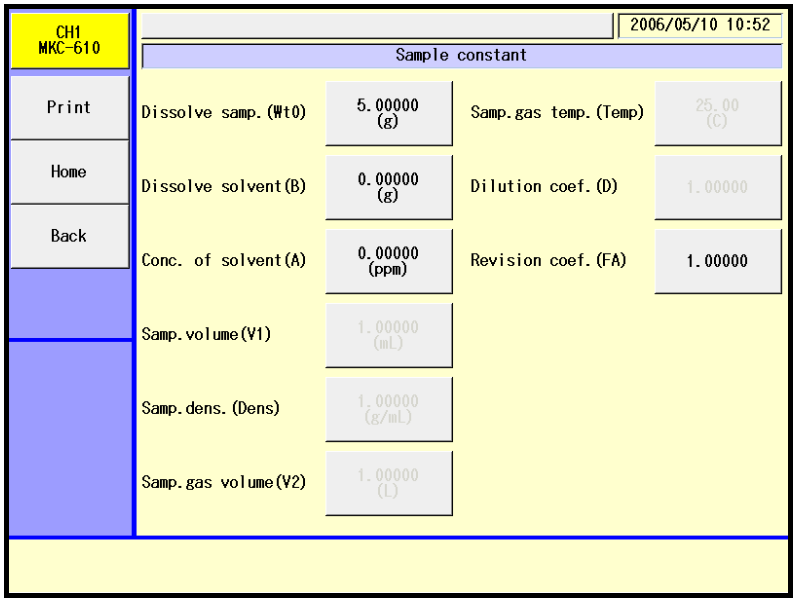
- 0.00000000 ~ 99999.99999999g

[Balance]

Here you can enter the weight direct from an electronic balance.

[Constant]

Here you enter the constant particular to those measurements for gas or samples, which are dissolved with solvent extraction before titration. Sample constants can be setup when “Sample” is selected in the [Function] – [Other settings] – [Constant properties] (see the section 3-5-10), settable only on the constants that are being used for the Calc. No. of the calculation parameters of presently selected method.



Note:

For details of sample variable, refer to “3-7-4. Calculation Parameter”.

3-3-1. Sample File Mode

This mode is useful when a multiple sample changer is connected or when you wish to preset sample parameters in advance. To use this mode, select "Yes" for sample file on Sample Setup in Function.

3-3-1-1. Outline of Sample File

The sample file consists of the following elements shown in the below chart.

Example: When you set the number of samples to 99, and 5 for the next measurement number:

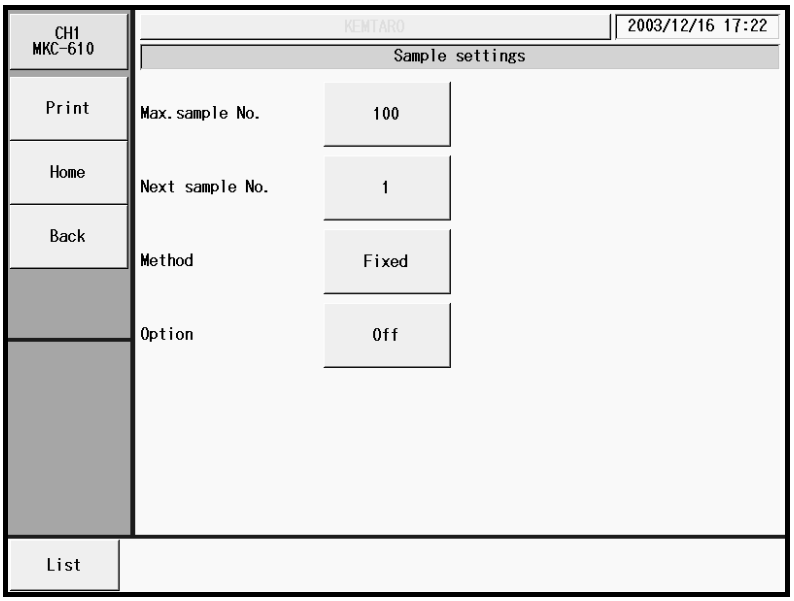
		Sample parameter						
	No.	Sample No.		Sample name	Sample ID	·····	Wt1	Wt2
	1	01	01	Blank		·····	0.0000	0.0000
	2	01	02	Blank		·····	0.0000	0.0000
Max sample No.	3	01	03	Blank		·····	0.0000	0.0000
	4	12	01	Sample A	20030501	·····	5.5213	4.5123
Next sample No.->	5	12	02	Sample A	20030501	·····	5.5312	4.5111
	:	:	:	:	:	·····	:	:
	:	:	:	:	:	·····	:	:
	95	21	02	Sample A	20030506	·····	5.5216	4.5122
Measured samples	96	21	03	Sample A	20030506	·····	5.5315	4.5121
	97	33	01	Standard B	990123	·····	1.0201	0.0000
	98	33	02	Standard B	990123	·····	1.0121	0.0000
	99	33	03	Standard B	990123	·····	1.0341	0.0000

When measurement is started, it begins with sample parameters of No. 5, and continues the series of measurements up to No. 99 under the conditions preset in advance.

Note:
For switching to Sample File Mode, refer to "3-5-4. [Sample mode]".

3-3-1-2. Sample file parameter

Press [Sample] button on Main display to show “Sample settings”.



[Max. sample No.]

Here you enter the largest number of samples for Sample File.

- 1 ~ 100

[Next sample No.]

The number for the next measurement is selected here.

- 1 ~ 100

[Method]

Here you select the mode for measurement method.

- Fixed : Measure with preset Method.
- Variable : You can define individual Method for each sample. This is useful for continuous measurement of blank and sample as well as measurement with an oven of which evaporation temperature is to be changed from time to time.

[Option]

Here you select “On” when you use an optional evaporator or a multiple sample changer.

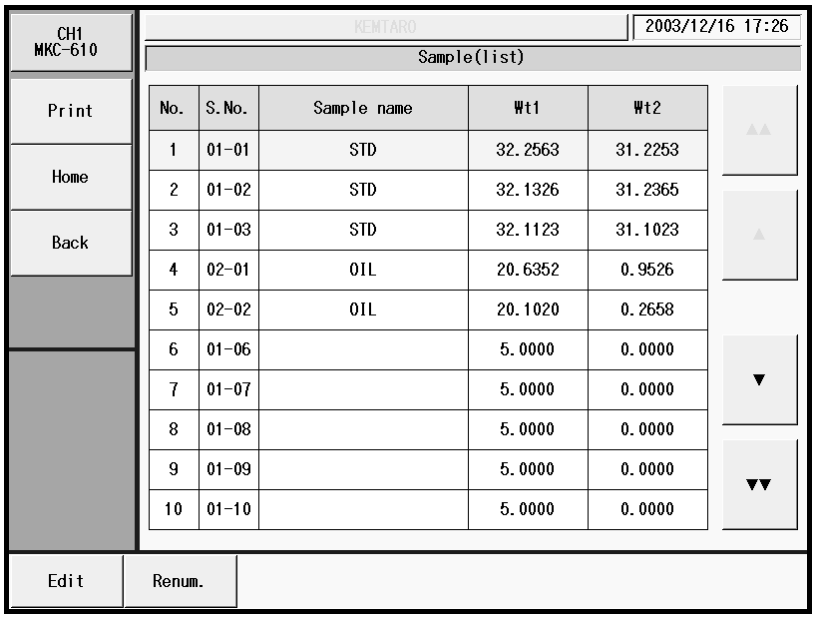
- Off : No options to be used.
- ADP- : Selected when measuring combined with the Drying oven. Such device will work to the Option parameter preset on Method.
- CHK- : Selected when measuring combined with the Multiple sample changer. Such device will work to the Option parameter preset on Method.

[List]

Here the list for sample parameters appears where you select sample conditions for each sample.

3-3-1-3. Sample (list)

The below display appears when you press [List] button on “Sample settings” in sample file mode.



No.	S.No.	Sample name	Wt1	Wt2
1	01-01	STD	32.2563	31.2253
2	01-02	STD	32.1326	31.2365
3	01-03	STD	32.1123	31.1023
4	02-01	OIL	20.6352	0.9526
5	02-02	OIL	20.1020	0.2658
6	01-06		5.0000	0.0000
7	01-07		5.0000	0.0000
8	01-08		5.0000	0.0000
9	01-09		5.0000	0.0000
10	01-10		5.0000	0.0000

[▲], [▼]

Use these keys to move the cursor on the list.

[▲▲], [▼▼]

These keys begin a new page of the list. The cursor moves to the top number on the list after page break.

[Edit]

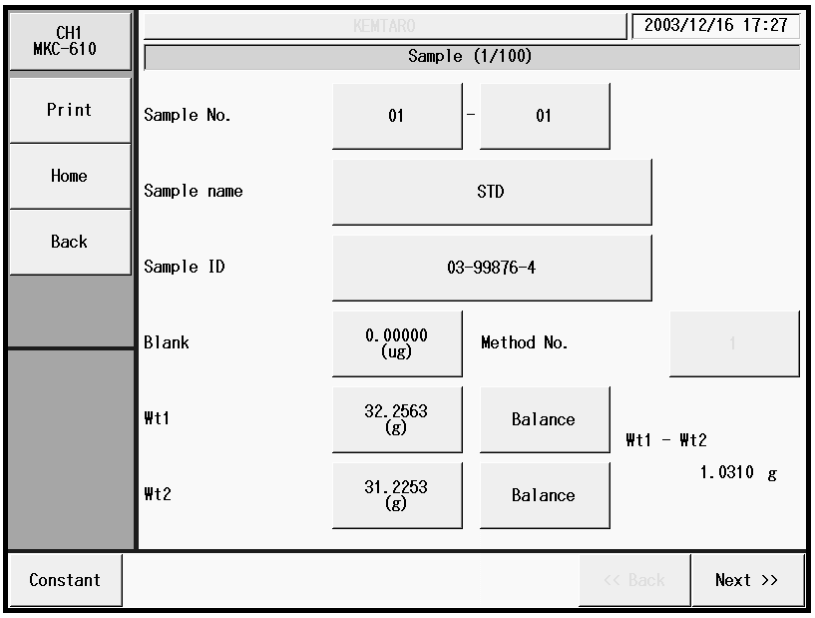
Here you can edit sample parameters. Point the cursor on the number where you want to edit the list. The display will change to “Sample” with this button.

[Renum.]

You can batch edit sample numbers (S.No.).

The batch edit begins with the sample number on the list with cursor on and selects numbers in series down to the sample of lower in number.

3-3-1-4. Sample (sample file mode)



[Sample No.]

Here you select sample number. The high order number represents the group number, and the low order number shows individual sample. Samples can be grouped by a high order number.

- 00 ~ 99

[Sample name]

You can name a sample with characters up to 20 letters.

[Sample ID]

Samples can be identified with individual ID code or Lot number with characters up to 20 letters.

[Blank]

Here you enter the blank value. The blank value selected for the Blank No. in Method calculation parameter will be taken in automatically as default.

- 0.00000 ~ 99999.99999ug

[Method No.]

Here you select Method number, which becomes significant only when “Variable” is chosen for method on sample file parameter.

- 01 ~ 50

[Wt1]

Here you enter the total weight of tare and sample.

- 0.00000000 ~ 99999.99999999g

[Wt2]

Here you enter the tare weight after sample is discharged.

- 0.00000000 ~ 99999.99999999g

[Balance]

Here you can enter the weight direct from an electronic balance.

[Constant]

Here you enter the constant particular to those measurements for gas or samples, which are dissolved with solvent extraction before titration. Sample constants can be setup when "Sample" is selected in the [Function] – [Other settings] – [Constant properties] (see the section 3-5-10), settable only on the constants that are being used for the Calc. No. of the calculation parameters of presently selected method.

Note:

For details of sample variable, refer to "3-7-4. [Calculation Parameter]".

[Next >>]

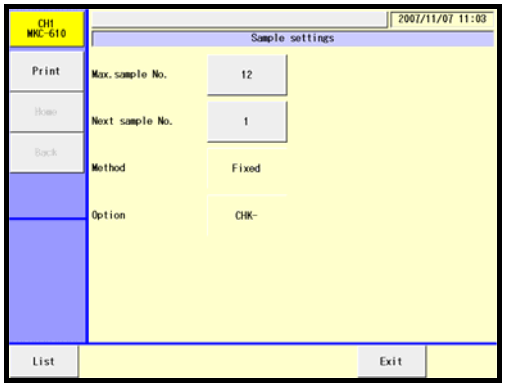
The next of sample setup display appears with this button.

[<< Back]

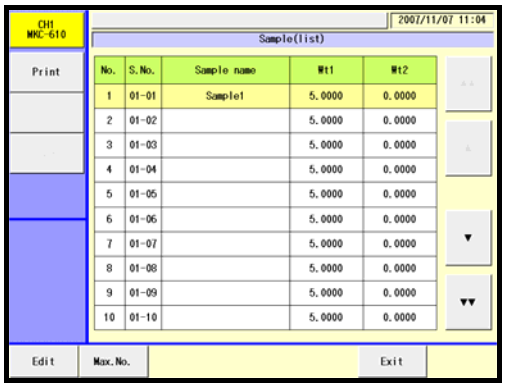
The preceding page appears with this button when pressed.

3-3-1-5. Sample setup after starting titration

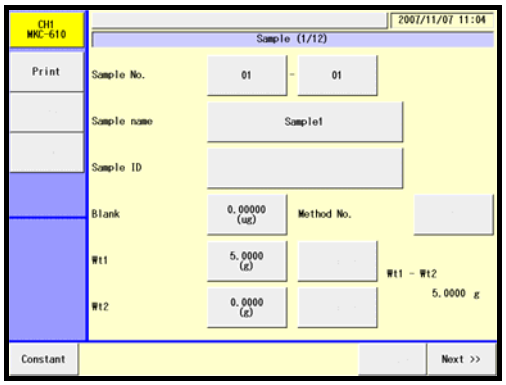
With a sample file in use, configure sample setup and add samples with [Sample] button after starting a titration.



1) After starting a titration, pressing [Sample] button will lead to the ”Sample settings” screen display, where you can change “Max. sample No.”.
2) Press [List] button.



3) When the “Sample (list)” screen appears, point the cursor on the sample setup to edit.
   Use [▲], [▼], [▲▲] or [▼▼] button to move the cursor or you can select a sample setup directly on the list.
4) Press [Edit] button. (When changing the max sample number, press [Max No.] button to return to the above Step 1.)



5) Enter setup parameters.
6) Press [Next] button for sample setup in the same manner as Step 5.
7) Press [List] button to return to Step 3.

8) Press [Exit] button.

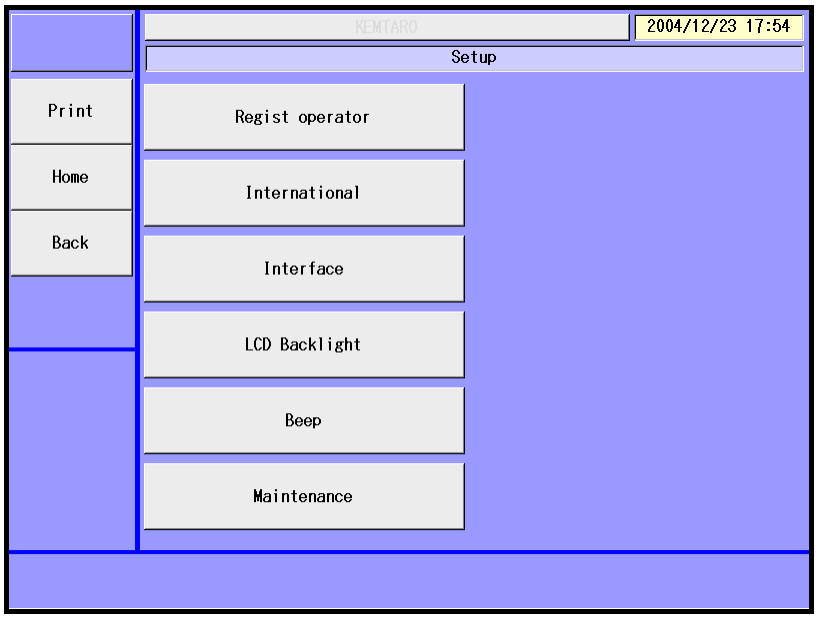
Note:

Sample No. and Method No. for currently ongoing measurement cannot be modified. For the samples added during the last measurement underway, the added sample is not measured.

3-4. About Setup

You can configure system setup using the function of Setup.

Press [Setup] on Main display to show the below screen where you can select desired functions.



[Regist operator]

Here the operator is defined for identification.

[International]

Languages, date and clock time can be set.

[Interface]

Here you configure settings for your printer and the balance.

[LCD Backlight]

Here the backlight of LCD can be adjusted.

[Beep]

Beep tone for alarm can be selected on this display.

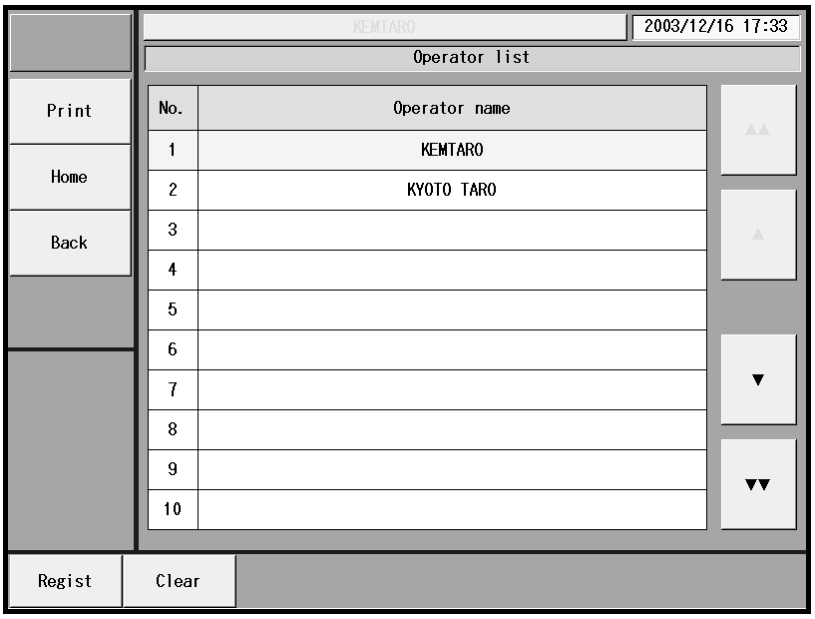
[Maintenance]

Here you can delete the information on devices that are connected to CH1 and/or CH2, and clear the memory.

3-4-1. [Regist operator]

Up to 50 operators can be registered with individual names. The registered name will be automatically printed out together with measurement results. (Characters: alphanumeric including capital and small letters)

Press [Regist operator] button on “Setup” to show the list of operators.



[▲], [▼]

Moves the cursor on the list page.

[▲▲], [▼▼]

The list page turns with these buttons. The cursor moves to the top number after page break.

[Regist]

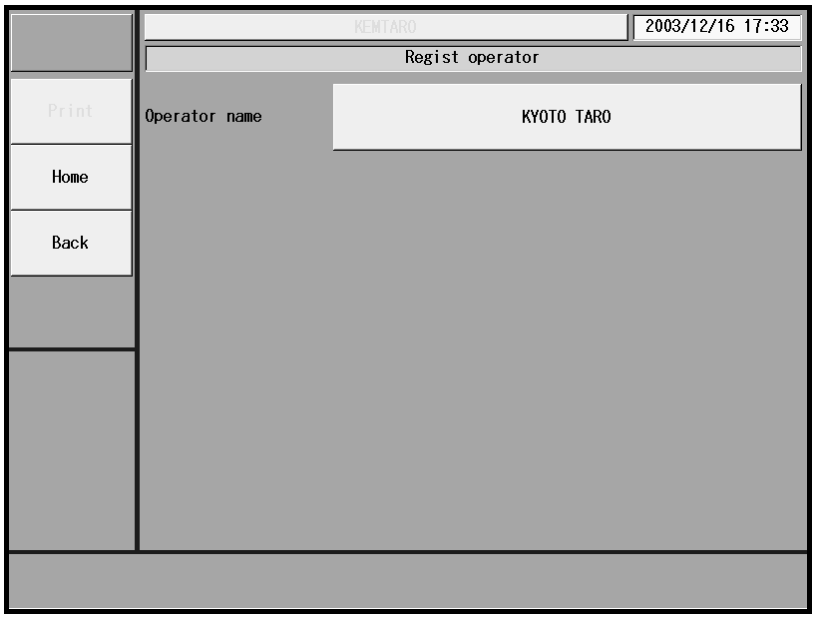
Here the operator is registered. The display for “Regist operator” will appear with this button after pointing the cursor on the operator’s number on the list.

[Clear]

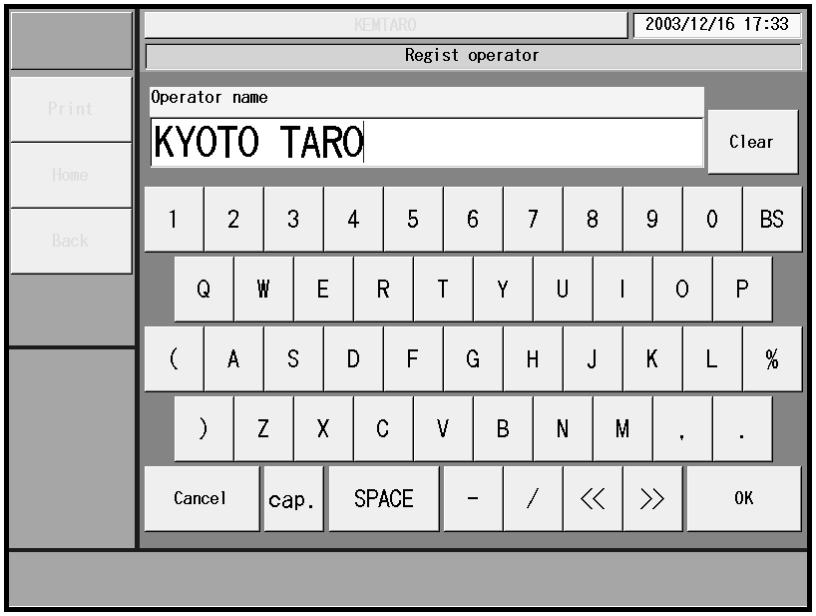
With the cursor pointed on the number you wish to clear, the display will appear to prompt your confirmation.

3-4-1-1. [Regist] button

Press this button on “Operator list” to display “Regist operator” dialog box.



Press the area of operator name. Enter the operator’s name in below display, and press [OK] button. Press [CAP.] button to use capital letter and [cap.] button for small letter.



3-4-2. [International]

Languages, date and clock time can be set.

Press [International] button on “Setup”.

[Language]

Choose a language either English or Japanese you wish to view and use in operation, and press [OK] button. **The language you have selected will appear after the power is turned off and on again.**

- English
- Japanese

[Date format]

Here you select and update the date of year, month and day. Press [OK] button.

- YYYY/MM/DD : Christian year/month in number/day of the month
- MM/DD/YYYY : month in number/day of the month/Christian year

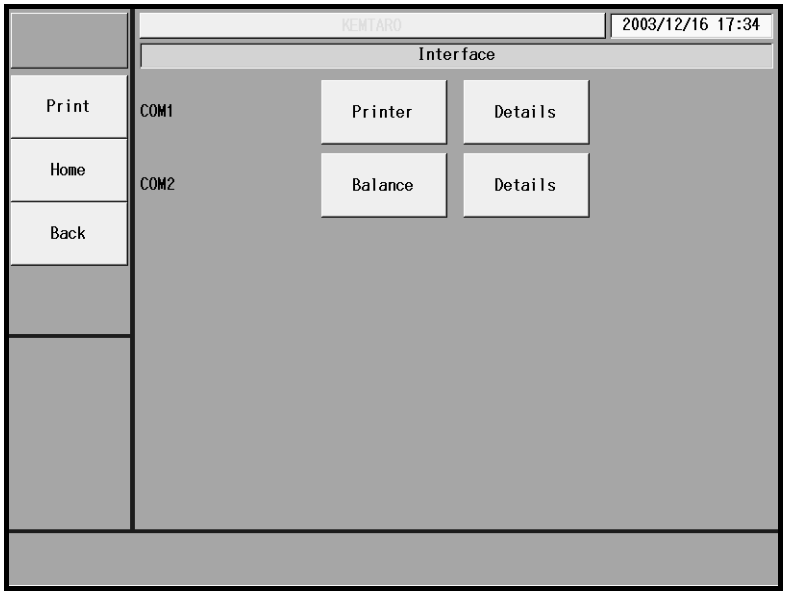
[Date&Time]

Here the date and time are updated. Press the date button for calendar and select the present date and time. The hour and minute can be entered with numerals which appear on display. Then, press [OK] button.

- Date : 2001/01/01 ~ 2099/12/31
- Time : 00:00 ~ 23:59

3-4-3. [Interface]

Here you set up the use of printers, balance and/or Personal computers. Press [Interface] button on “Setup”.



[COM1], [COM2]

The COM ports are for the output to a printer, data transfer from an electronic balance and/or the output of measurement results to a personal computer. There are two COM ports available; data can be output to the printer through either COM port. Pressing [SET] button will turn the screen display to the Option screen display, where the properties of COM port can be set.

Selection:

- Not connected
- Printer
- Balance
- PC

[Details]

Whether COM1 or COM2 is chosen, either “Printer setting” or “Balance setting” appears depending on your choice.

Note:

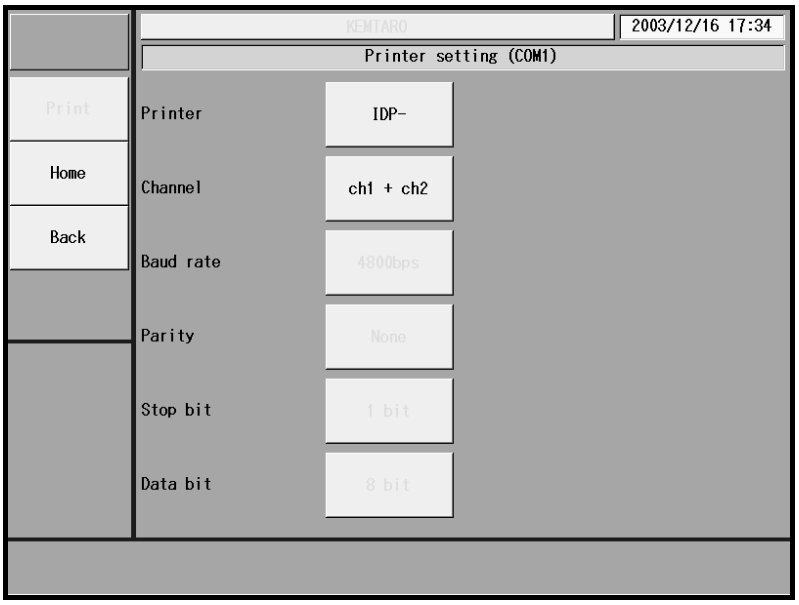
For details on printer or balance setting, refer to “3-4-3-1. Printer setting” or “3-4-3-2. Balance setting”.

Note:

When you want to transfer the output data to a personal computer, you need to purchase our optional Data Capture Software (SOFT-CAPE). But you have to check the version of the Data Capture Software because some software cannot be compatible with the titrator. For more information, please contact your sales representative nearest to or local dealer.

3-4-3-1. Printer setting

Choose either COM1 or COM2 on “Interface”, and press [Detail] button to show below display.



[Printer]

Select a type of printer you are going to use:

- IDP- : KEM’s impact dot printer model IDP-100
- DP- : KEM’s thermal printer model DPU-414
- Other : Other printer than the above

Note:

When any other printer is to be connected, check with your local dealer to see if it can be used with this instrument. The “other” printer will not print out graphs.

[Channel]

Two channels can be selected in three ways as follows:

- ch1 : The data from the unit connected to channel 1 are printed out.
- ch2 : The data from the unit connected to channel 2 are printed out.
- ch1+ch2 : The data from the unit connected to channel 1 and 2 are printed out.

[Baud rate]

If you use other printer as defined on “Printer”, you have to select baud rate for your printer:

- 600bps
- 1200bps
- 2400bps
- 4800bps
- 9600bps

[Parity]

If you use other printer as defined on “Printer”, you have to select parity for your printer:

- None
- Even
- Odd

[Stop bit]

If you use other printer as defined on “Printer”, you have to select parity for your printer:

- 1 bit
- 1.5 bit
- 2 bit

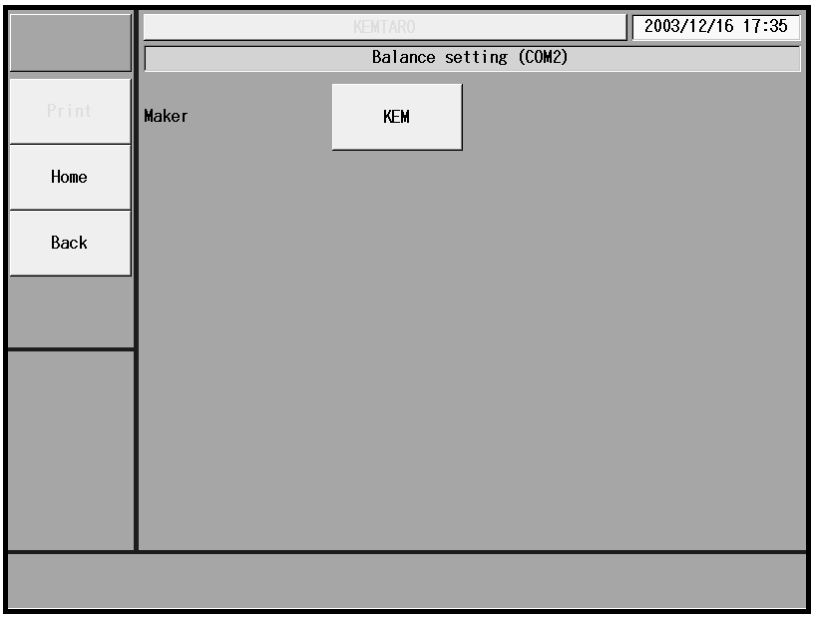
[Data bit]

If you use other printer as defined on “Printer”, you have to select data bit for your printer:

- 7 bit
- 8 bit

3-4-3-2. Balance setting

After Balance is selected on “Interface” by way of COM1 or COM2, press [Details] button to show the display as below:



[Balance]

Select the maker’s name of your balance:

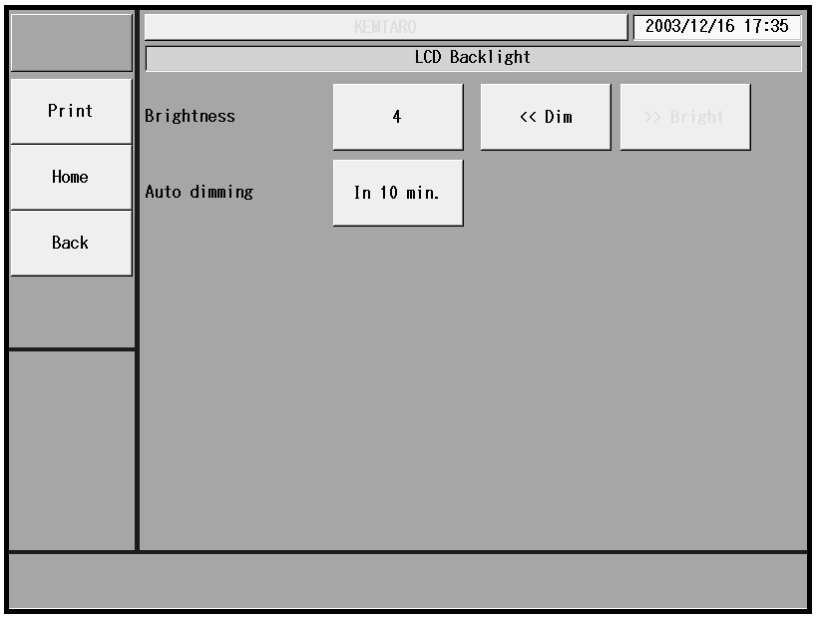
- KEM
- Mettler
- A&D
- Shimadzu
- Sartorius

Note:

Make sure to contact your local dealer to see if any particular connecting cable may be required.

3-4-4. [LCD Backlight]

Here the brightness of backlight for LCD and its auto dimmer can be adjusted:



[Brightness]

The brightness of backlight can be adjusted with 4 steps:

- 1/2/3/4

[Auto dimming]

The auto dimmer turns off the backlight after the preset time elapses:

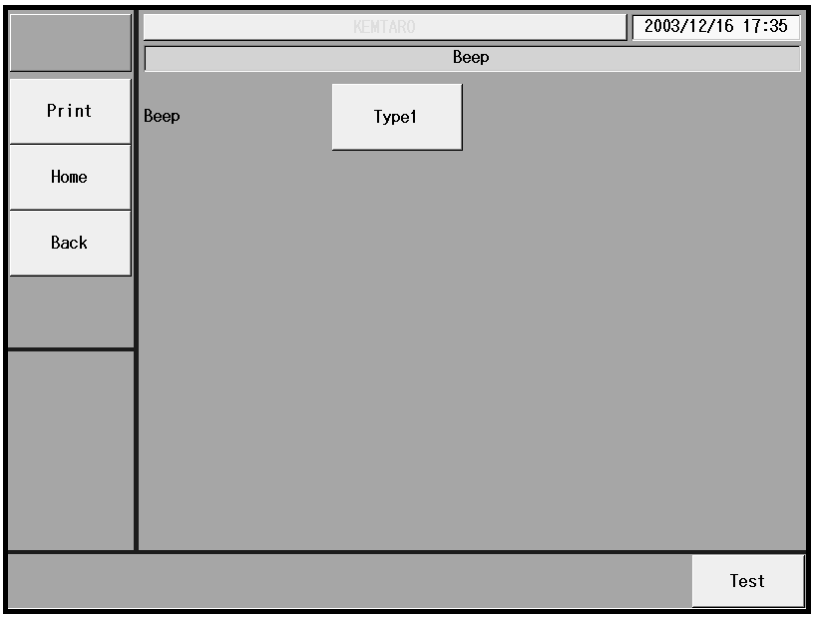
- Off
- In 10 min.
- In 20 min.
- In 30 min.
- In one hour
- In two hours

Note:

When 'Auto dimming' is selected and no key entry has been made for three hours, the backlight will eventually go out following auto dimmer feature. In this event, the backlight feature will recover to the state before the dimmer utility was on by touching the screen panel.

3-4-5. [Beep]

Here you can select the beep and its tone as follows:
Press [Beep] on “Setup”.



[Beep]

There are five types of beep tone you can choose from:

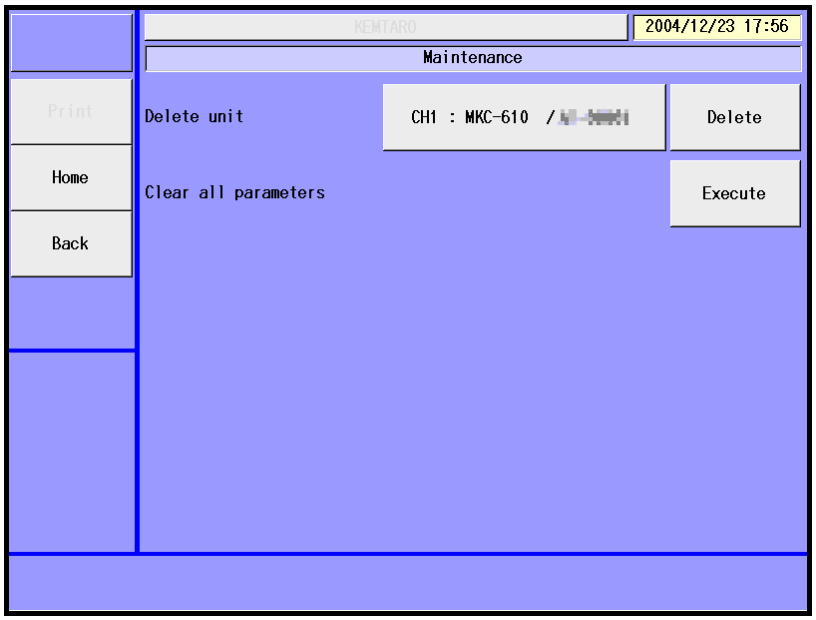
- Off : Setting of beep sound is cancelled. Beep sound is muted even for key operations.
- Type 1 : Beep sound lasts for about two seconds: “pi, pea-pea-pea-pea”
- Type 2 : Beep sound lasts for about four seconds: “pi-pi-pi-pi-pi-pi”
- Type 3 : Beep sound lasts for about ten seconds: “pi, pea-pea-pea-pea”
- Type 4 : Beep sound lasts for about one second: “pi-pi-pi-pi-pi-pi”
- Type 5 : Beep sound lasts for about one second: “pi, pea-pea-pea”

[Test]

The selected beep tone can be tested here.

3-4-6. [Maintenance]

Turn on the mains of the Main Control Unit, MCU-610, only.
Press [Maintenance] button on the “Setup” screen display.



[Delete unit]

The following procedures are necessary when a different measuring unit or units are registered where CH1 and CH2 are occupied by measuring units such as MKC-610, MKA-610 or AT-610.
The first step is the selection of information on the measuring unit to be initialized:

- CH1 : (Unit name)/ (Serial No.): Select information on the measuring unit connected to CH1.
- CH2 : (Unit name)/ (Serial No.): Select information on the measuring unit connected to CH2. Pressing [Delete] button will lead to deleting the device information on the selected measuring unit.

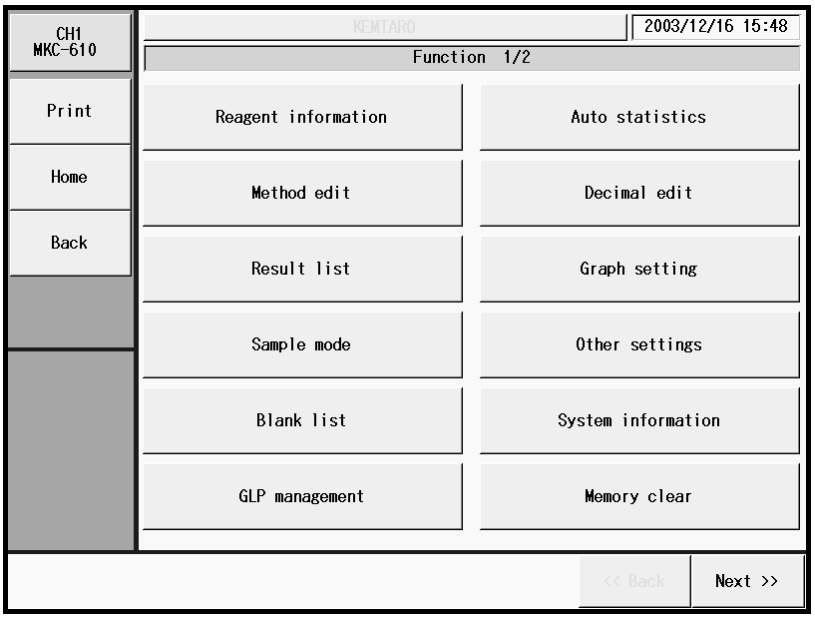
[Clear all parameters]

Here you can initialize all data and setup configurations stored on the measuring units occupying CH1 and CH2. Pressing [Execute] button will allow to initialize all data on the units.
When an initialization is executed, the displayed language will turn to Japanese and the display date format becomes “YYYY/MM/DD”. Change these settings to ‘English’ and to “MM/DD/YYYY”’, respectively, referring to the Section 3-4-2 “International”.

Note:
Be sure to save all necessary measurement and method data to a CF card before initializing measuring units or executing all memory clear.

3-5. About Function

Press “Function” button on Main display.



[Reagent information]

Here you set in the information on reagents including their names, shelf life, replacement date, etc.

[Method edit]

Here you can manipulate settings for Method including create, edit or save, etc.

[Result list]

You can view the list of measurement results where you can re-calculate or batch-calculate them.

[Sample mode]

Here you can set up how to maneuver sampling after measurement or preset sample parameters in sample file mode, etc.

[Blank list]

This is the list of blank values including 10 different ones you can store.

[GLP management]

Here you set up functions to meet with GLP requirements including periodic check, advance notice of check date at intervals, etc.

[Auto statistics]

The series of measurements performed under the same conditions (Method) can be automatically printed out by this function.

[Decimal edit]

This function includes setting the number of decimal places for a sample size when printed out or displayed on screen as well as how to round off in calculation.

[Graph setting]

A graphic curve can be depicted for water content per time vs. unit time as well as integrated water amount.

[Other settings]

This includes the auto input of averaged values and the alarm function, etc.

[System information]

You can view the list of equipment presently connected to the channels in work as well as the information on software version.

[Memory clear]

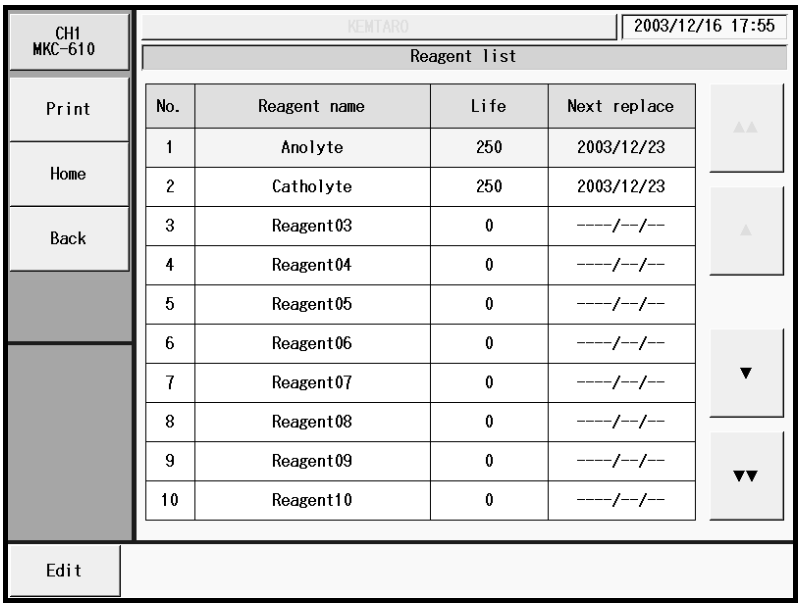
With this function, you can erase measurement results, methods or sample parameters selectively by individual sample.

[Operation of CF Card]

Load the data saved on CF card into the measuring unit or delete the saved data.

3-5-1. [Reagent information]

On “Function” display, press [Reagent information] button to show the list of reagent.



No.	Reagent name	Life	Next replace
1	Anolyte	250	2003/12/23
2	Catholyte	250	2003/12/23
3	Reagent03	0	----/--/--
4	Reagent04	0	----/--/--
5	Reagent05	0	----/--/--
6	Reagent06	0	----/--/--
7	Reagent07	0	----/--/--
8	Reagent08	0	----/--/--
9	Reagent09	0	----/--/--
10	Reagent10	0	----/--/--

[▲], [▼]

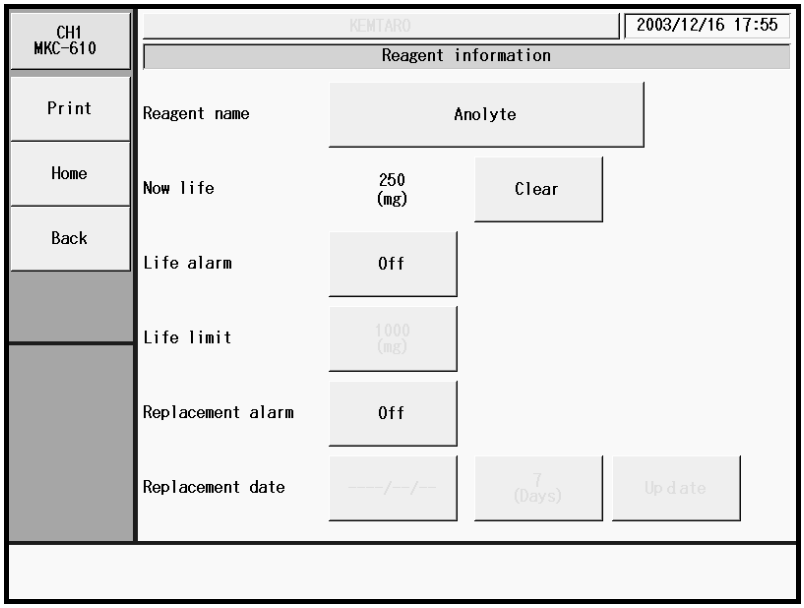
Moves the cursor on the list.

[▲▲], [▼▼]

These keys are for page turning. The cursor moves to the top of the list after page break.

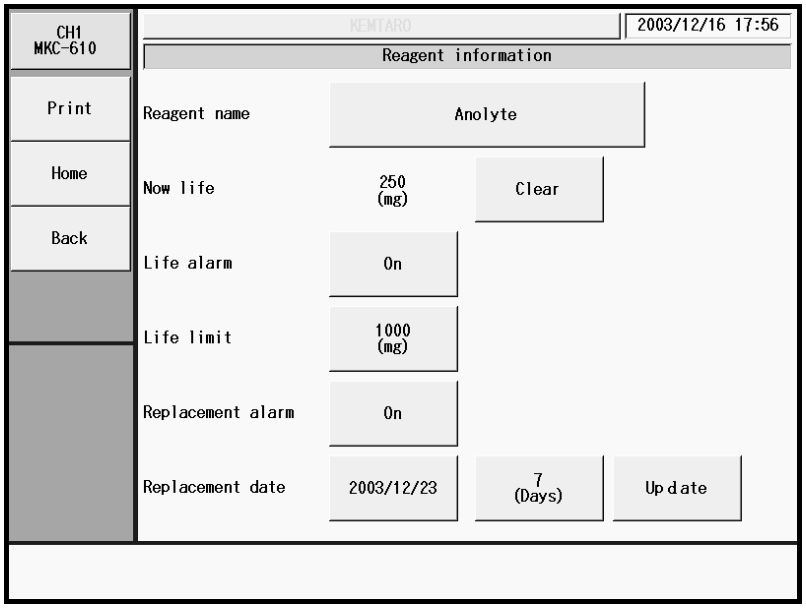
[Edit]

With this button, the display of “Reagent information” appears where you can edit the information on the reagent with the cursor pointed on. Such information includes reagent name, consumption volume, alarm setting, replacement date, etc.



3-5-1-1. [Edit] – [Reagent information]

Press [Edit] button on “Reagent list” to show “Reagent information”.



[Reagent name]

Here you enter the name of reagent. Press the button with reagent name for entry.

[Now life]

Presently consumed reagent volume is shown here. It turns to “0mg” when [Clear] is pressed.

[Life alarm]

This function alarms you about reagent consumption

- Off : No alarm
- On : Alarm is on

[Life limit]

Here you set up the upper level for life alarm. When the life level exceeds the preset level, the message appears prompting reagent replacement.

- 1 ~ 9999mg

[Replacement alarm]

Here you can choose from on or off for alarming reagent replacement.

- Off : No alarm
- On : Alarm is on

[Replacement date]

Here you can set up a time length by a number of days for next replacement of reagent.

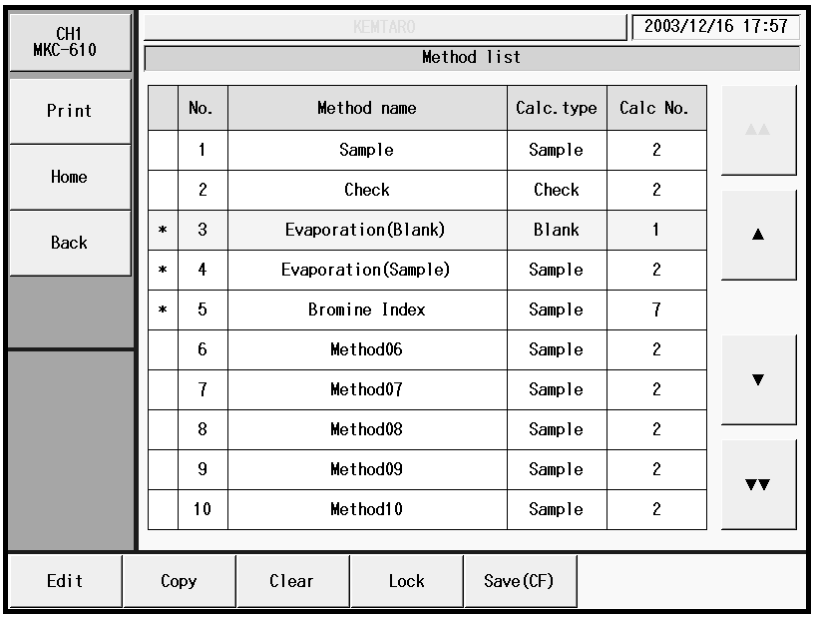
- [xx (Days)] : Set a time interval by a number of days
- [Update] : Set the next date for replacement as preset intervals

Note:

To use the alarm function, make “Alarm” turned “On” when you set up on [Function] – [Other settings].

3-5-2. [Method edit]

On “Function” display, press [Method edit] button to show “Method list”.



[▲], [▼]

Moves the cursor on the list.

[▲▲], [▼▼]

These keys are for page turning. The cursor moves to the top of the list after page break.

[Edit]

When “Method edit” display appears, you can edit the Method (measurement parameters) where the cursor stays on.

Note:
For details of Method, refer to “3-7. About Method”.

[Copy]

On “Method copy” display, you can copy the Method where the cursor stays on.

Note:
For details of Method copy, refer to “3-5-2-1. [Method copy]”.

[Clear]

The Method with cursor on is initialized to default preset at time of shipment in plant.

[Lock]

You can lock the Method with cursor on. The inhibited Method appears on the Method list with “*” mark. To cancel the lock, point the cursor on it and press this button once more.

[Save (CF)]

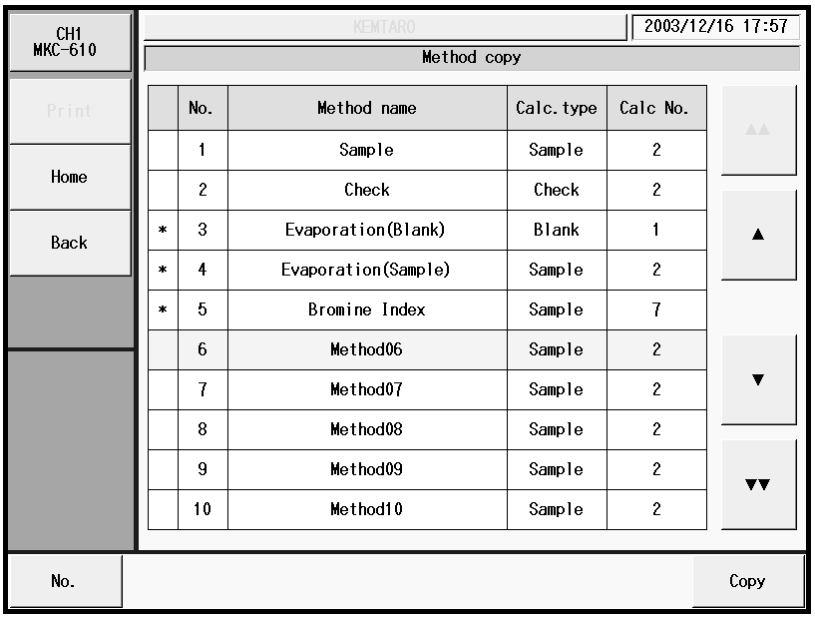
Save the method data into CF card. "Save method" will be displayed on the screen.

Note:

For the details on how to save methods into CF card, see the section, "3-5-2-2. [Save (CF)] (Method data)".

3-5-2-1. [Method copy]

Select the Method on “Method list”, and press [Copy] button. When “Method copy” display appears, select a destination where the copied Method will be transferred.



[▲], [▼]

Moves the cursor on the list.

[▲▲], [▼▼]

These keys are for page turning. The cursor moves to the top of the list after page break.

[No.]

Enter the Method number where the copied Method is transferred.

[Copy]

Executes copying the Method.

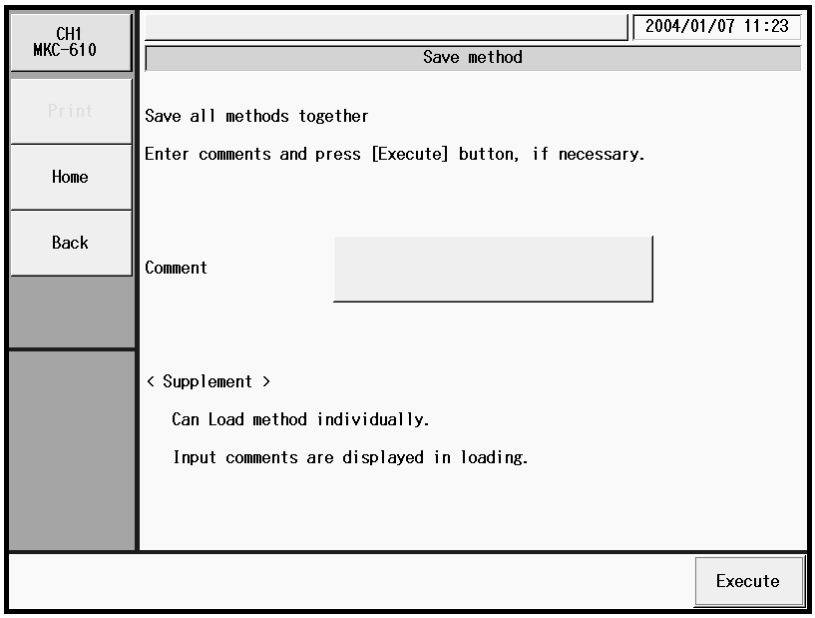
Note:

The copied and transferred Method rides over the existing Method. It is recommended to print out the existing Method before it is erased.

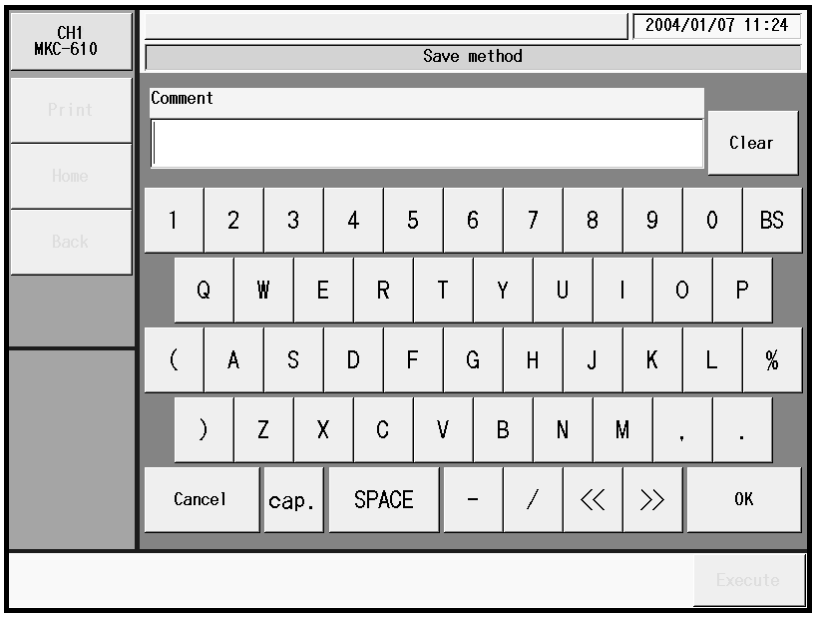
3-5-2-2. [Save (CF)] (Method data)

Save all methods into CF Card together.

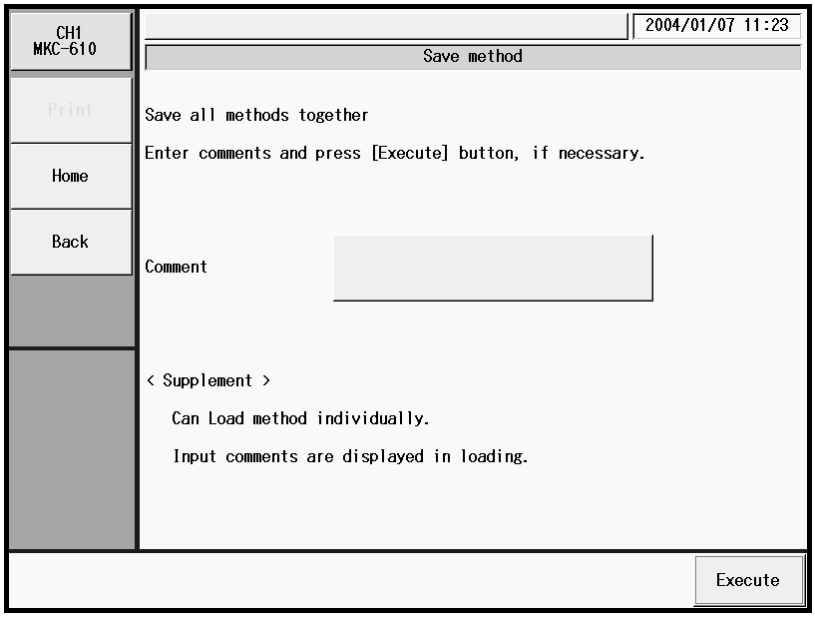
1) Press [Save (CF)] button on the “Method list” screen display. Then, “Save method” will be displayed on it.



2) When entering comments with the method data to be saved, press the portion where comment is displayed. After confirming the following screen display, enter comments and press [OK] button.



3) Press [Execute] button on the “Save method” screen display. Confirming the verifying-entry message, press [Yes] button.



4) All methods are saved into CF card and the screen display returns to the initial menu.

Note:

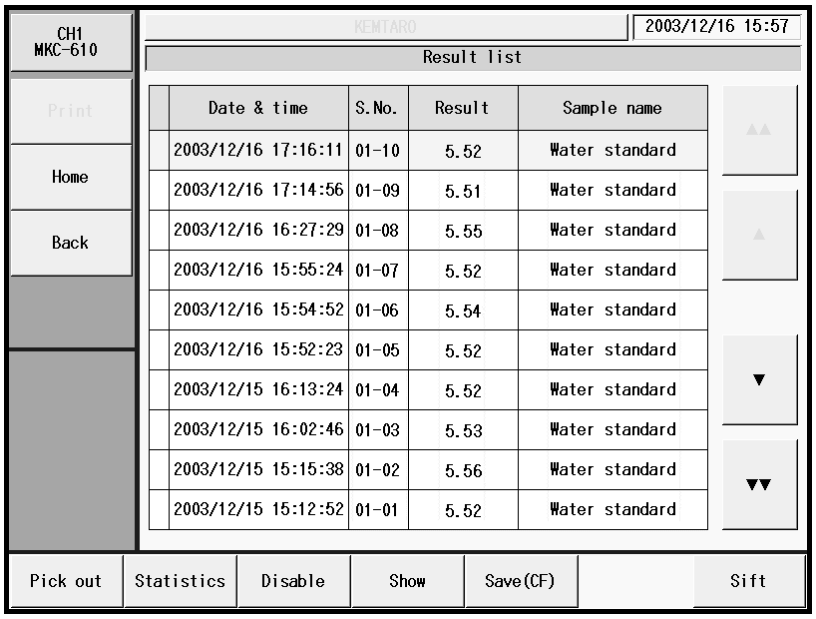
If only method data are saved into CF card, the memory storage is occupied in about 45K bytes. The number of files of method data to be saved in CF card is 100 in maximum. When measurement results are saved in CF card, the number of files saved will decrease depending on the memory capacity of CF card.

Note:

For details on loading the method data saved on CF card into the measuring unit, see the section 3-5-13-1, “Load/Delete Method”.

3-5-3. [Results list]

Press [Results list] button on “Function” to show “Results list”.



[▲], [▼]

Moves the cursor on the list.

[▲▲], [▼▼]

These keys are for page turning. The cursor moves to the top of the list after page break.

[Pick out]

On this screen you can select the results you are looking for among the data in the list.

Note:
For details of Pickout, refer to “3-5-3-1. [Pickout]”.

[Statistics]

The measurement results in the list are batch calculated. If the data are selected in Pickout, those selected data will be calculated.

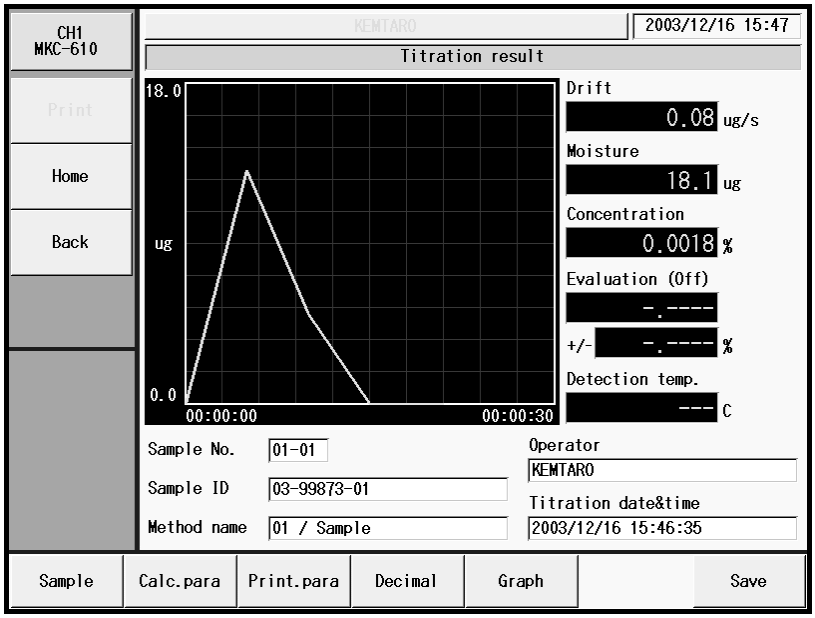
Note:
For details of Statistics, refer to “3-5-3-2. [Statistics]”.

[Disable]

You can delete the data to void batch calculation. Point the cursor on the data and press this button. Those data will be marked with “*”on display.

[Show]

You can view the data with cursor pointed on. This is useful in re-calculation or for re-print.



Note:
For details of resulting data, refer to "3-5-3-3. View titration results".

[Save (CF)]

Save the measurement data on CF card. When data is narrowed with [Pick out], the narrowed data will be saved on CF card.

Note:
For the details on saving measurement data on CF card, refer to "3-5-3-4 [Save (CF)] (Titration results)".

[All] or [Sift]

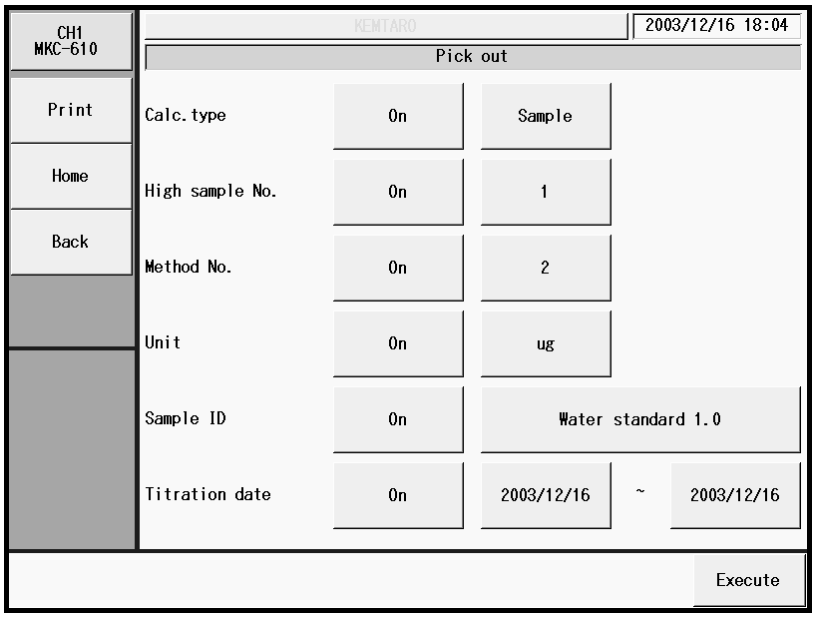
Here you choose from All or Sift in search for measurement results.

For setting search conditions, press the [Pickout] button.

3-5-3-1. [Pickout]

You can narrow down measurement results with Calc. type, High Sample No., Method No., Unit, Sample ID or Titration date.

Press the [Pick out] button on “Pickout” to show the “Result list”.



< Search conditions >

You can narrow down the data by selecting the following conditions:

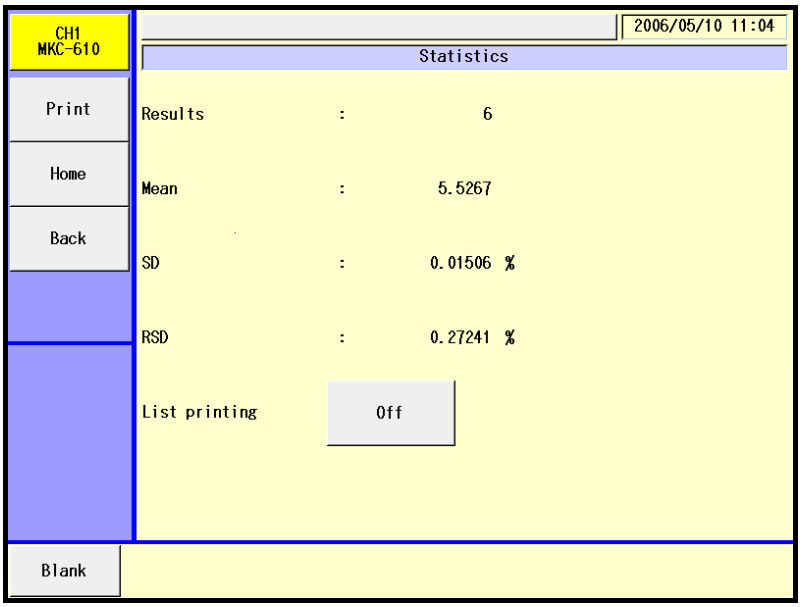
Calc. type	: The titration parameters preset on Calculation Parameter.
High sample No.	: The high order number for grouping the samples
Method No.	: The number of Method particular to it
Unit	: The unit used in calculation results
Sample ID	: The identification code particular to the sample
Titration date	: The date of measurement when it was performed

[Execute]

The selected data under the conditions as above will appear as a list of results on display.

3-5-3-2. [Statistics]

Press [Statistics] button on “Results list”. The data on the list are going to be batch calculated, and the calculated data will be printed out if [Print] button is pressed.



< About statistics >

The batch calculation determines Mean value, Standard deviation (SD) and Relative standard deviation (RSD), which is the same as coefficient variance (CV).

Those values are calculated by the built-in processor as follows:

Where n number of data (X1, X2, ….. , Xn):

Mean value $$\overline{X} = \frac{(X_1 + X_2 + \cdots + X_n)}{n}$$

Standard deviation $$SD = \sqrt{\frac{\sum_{i=1}^{n}\left(X_i - \overline{X}\right)^2}{n-1}}$$

Relative SD $$RSD(\%) = \frac{SD}{\overline{X}} \times 100$$

[List printing]

You can choose from Yes or No to print the statistical data:

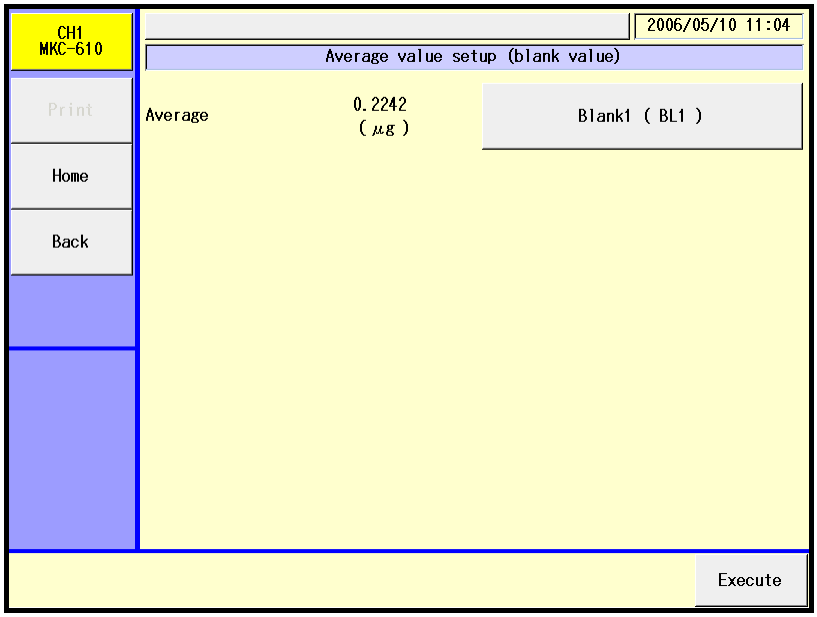
- On : Print the results list
- Off : No printout

Note:

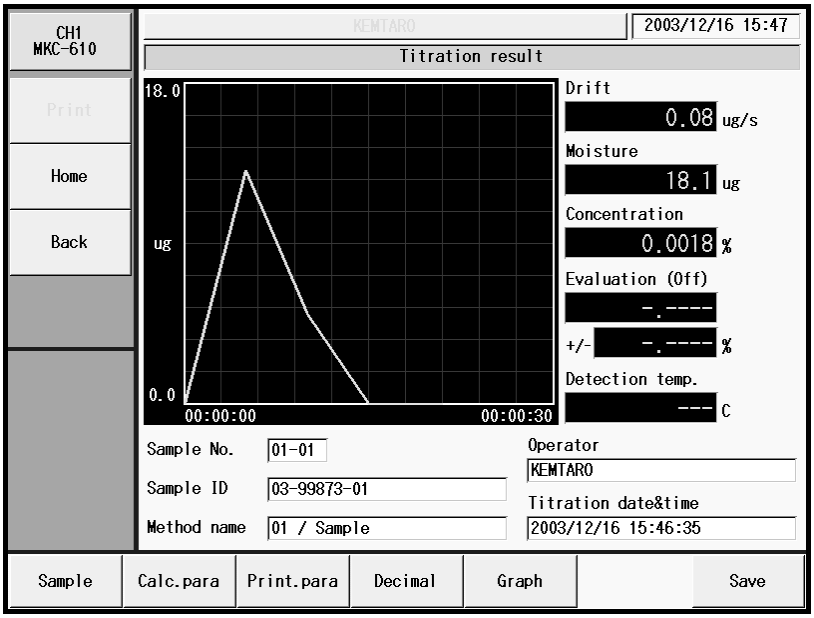
Statistics calculation should set up and perform seach conditions. For example, when the unit of “Pickout” is not set as “On”, the unit of Mean value and SD is not displayed. If the mean value is zero “0”, RSD will appear on display and be printed out as “– –” symbols not as zero “0”. The maximum number of characters that can be printed for the statistical calculation is seven (7) including decimal point.

[Blank]

Save the mean value obtained through statistical calculation to the blank value after selecting [Function] – [Blank list]. Selecting the blank value number to be saved and pressing [Execute] button allows to store the mean value on the Blank value n.



3-5-3-3. Titration results



[Sample]

You can change sample parameters including sample ID, sample name and sample size. These changes will be reflected on recalculation and recorded.

[Calc.para]

The equation used in calculation for a measurement appears here. If any changes are made, the results will be recorded as recalculation results.

[Print para]

The parameters for printing are shown here. If any changes are made, the results will be recorded as recalculation results.

[Decimal]

You can change the number of digits after decimal point. If any changes are made, the results will be recorded as titration results.

[Graph]

You can change the conditions for depicting a graph. If any changes are made, the results will be recorded as titration results.

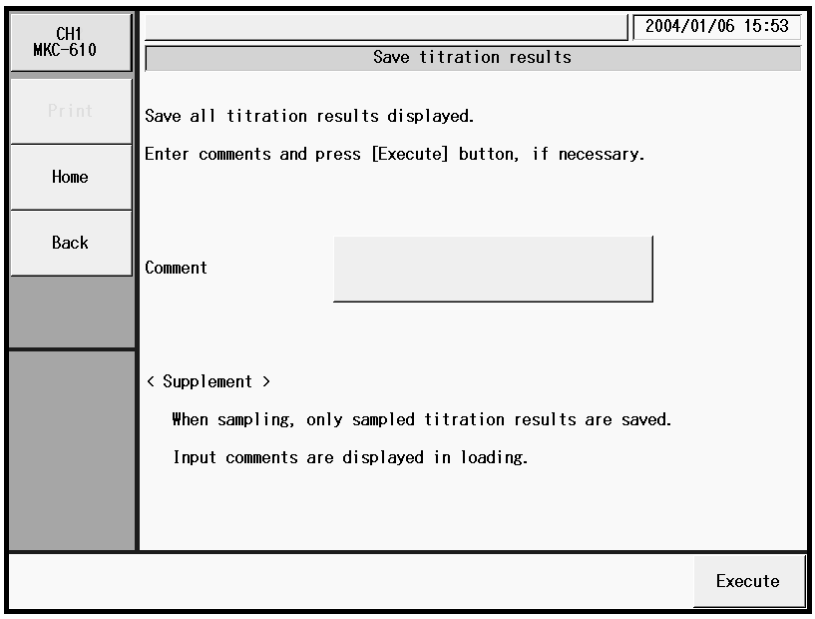
[Save]

Those changes that have been made are saved in memory.

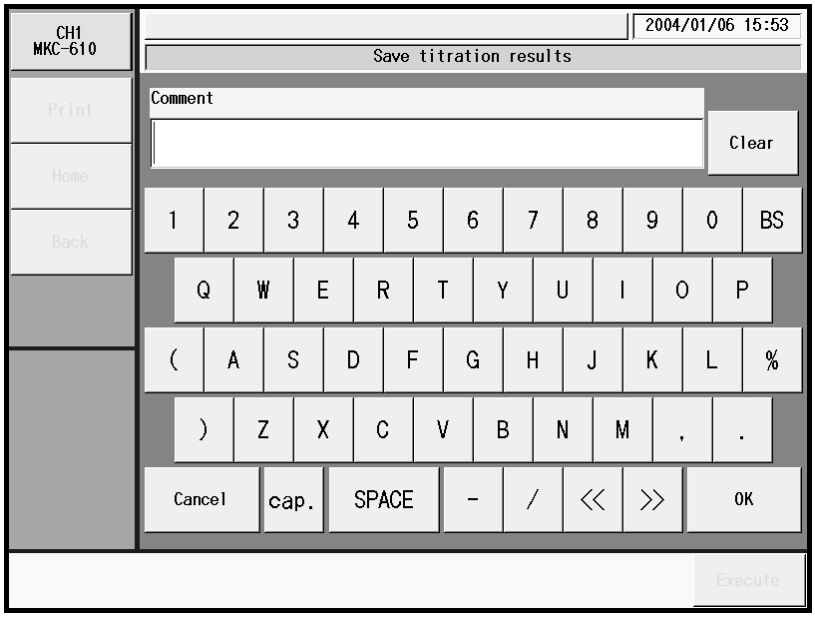
3-5-3-4. [Save (CF)] (Titration results)

Save the titration results on CF card.

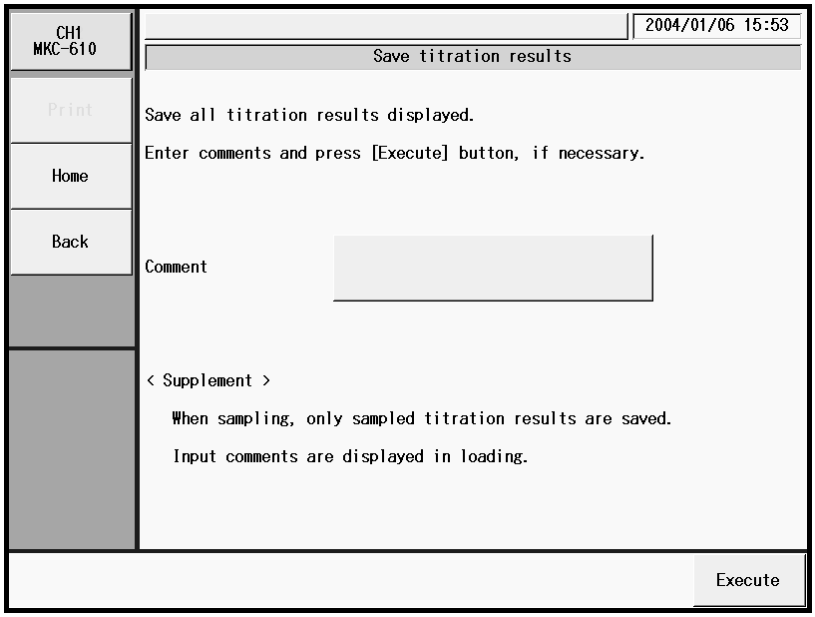
1) Narrow data to be saved according to the section “3-5-3-1 [Pickout]”.
2) Press [Save (CF)] button on the “Result list” screen display. “Save titration results” screen will be displayed.



3) When entering comments on the saved titration results, press the section of screen where comment is displayed.



4) Press [Execute] button on the “Save titration results” screen display. Then, the confirmation screen will be displayed and press [Yes] button.



5) Narrowed titration results are saved on CF card, followed by returning to the “Result list” screen display.

Note:

When 300 titration results are saved on CF card, about 7M bytes of storage will be used. In addition, the maximum file number to be stored on CF card is 100. When method data are stored on CF card, the number of file to be stored on CF card will decrease depending on the remaining memory capacity on CF card.

Note:

When you want to allow the titration results saved on CF card to be displayed on the screen of the measuring unit, refer to 3-5-13-2, “Load/Delete titration results”.

3-5-4. [Sample mode]

Press [Sample mode] button on “Function” to show “Sample mode” display, where you define sample settings as follows:

[Sample file]

Here you select sample file mode either for single measurement or measurement using a multiple sample changer or with a reserved sample for measurement.

- Off : Sample setting display works to Single sample measurement
- On : Sample setting display works to Sample file mode

[Before entry]

Here you select sampling mode before titration;

- Off : Titration starts with [Start] button.
- On : “Sample settings” display appears with [Start] button.
  On “Sample settings”, you enter the sample name and ID, sample size, etc. This display will not appear when “Auto” is set on Method control parameter for titration start mode.

[After entry]

Here you select sample size entry mode after titration is over:

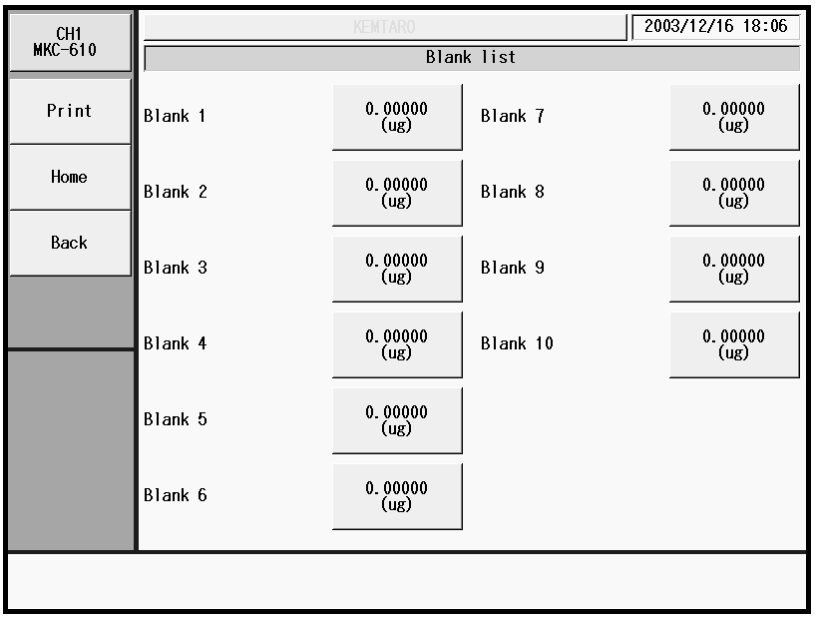
- Off : Water content is calculated and displayed for the sample size currently defined.
- On : After measurement is over, “Sample settings” display appears.
- Auto : After titration is started, it automatically determines if sample size is entered, and if not, the display for sample size entry appears.

Note:

For details of Sample Setup, refer to “3-3. About Sample settings”. “Before entry” and “After entry” sample options become valid only when setting these options to “Off” in using “CHK-501”.

3-5-5. [Blank list]

Press [Blank list] button on “Function” to show the display “Blank list”, where you can compensate water content blending in at time of sample injection. Up to 10 blank values can be preset.



[Blank 1] …..[Blank 10]

Here you enter blank values. Such numbered blank values can be selected and used in concentration calculation on Method parameter for calculation parameter. Changing the blank value specified by the “Blank No.” of the calculation parameter of the presently selected method will reflect the “Blank” in the sample setup.

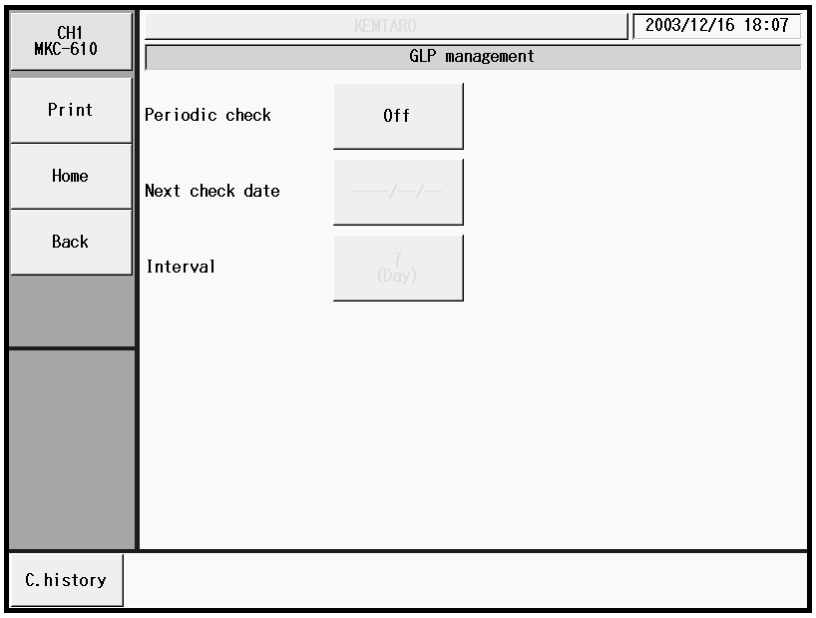
“Blank” can be also set through the statistical calculation results. (See the section 3-5-3-2.)

Note:

When a blank level is entered on Sample Settings, the value registered on Blank list is changed accordingly.

3-5-6. [GLP management]

Press [GLP management] button on “Function” to show the display “GLP management”, where you can check on precision of your instrument periodically. This function works when “Check” is preset on “Calc. type” for calculation parameter on Method parameter.



[Periodic check]

Here you can set check alarm at intervals:

- Off : No alarm will work for periodic check.
- On : Advance notice of check appears when the date becomes due. The check results can be viewed with [C.histry] button.

[Next check date]

You can select a next check day.

[Interval]

The next check day is updated automatically at preset intervals.

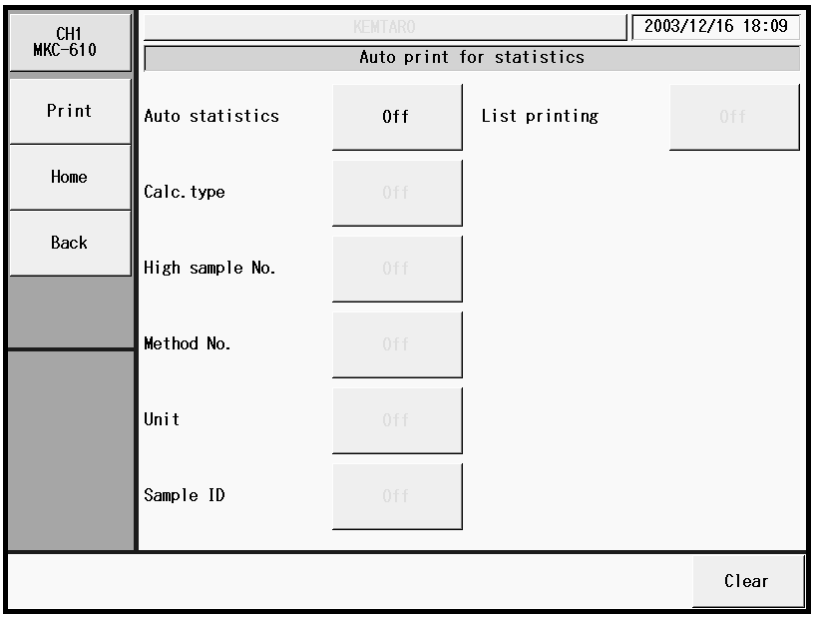
[C.histry]

You can view the periodic check record.

Note:
To use the alarm, turn on “Alarm” on [Function] – [Other settings].

3-5-7. [Auto statistics]

Press [Auto statistics] on “Function” to show the display [Auto statistics].



[Auto statistics]

Here the results of measurements performed under the same conditions are automatically batch calculated:

- On : The results of measurement performed under different conditions will be batch calculated as soon as the measurement is over. Otherwise, the results of measurements performed under the same conditions are automatically batch calculated. After batch calculated, the following data will be calculated. Once power is turned off, this setting will be cleared off.
- Off : No batch calculation

< Conditions for statistics >

A series of consecutive measurements will be batch calculated and printed out provided the following parameters are preset under the sample conditions:

- Calc. type : Calculation parameter preset on Method
- High sample No. : High order number for sample group
- Method No. : The Method number used in measurement
- Unit : Preset as a calculation parameter on Method
- Sample ID : The identification code present on Sample settings

[List printing]

Here you can choose from on or off for printout of statistics data list.

- On : Print out the list
- Off : No printout

[Clear]

You can erase the statistical data.

Note:

For details of statistics, refer to “3-5-3-2. [Statistics]”.

3-5-8. [Decimal edit]

Here you select a number of decimal place for view and printout.

Press [Decimal edit] button on “Function” to show the display “Decimal edit ”.

[Sample size]

Here you select a number of decimal place and fraction rounding for sample size as follows:

- Half adjust : rounded to nearest preset number of digits after decimal point
- Round off : rounded down to nearest preset number of digits after decimal point
- Round up : rounded up to nearest preset number of digits after decimal point

[Statistics]

Here you select a number of decimal place and fraction rounding for statistics as follows:

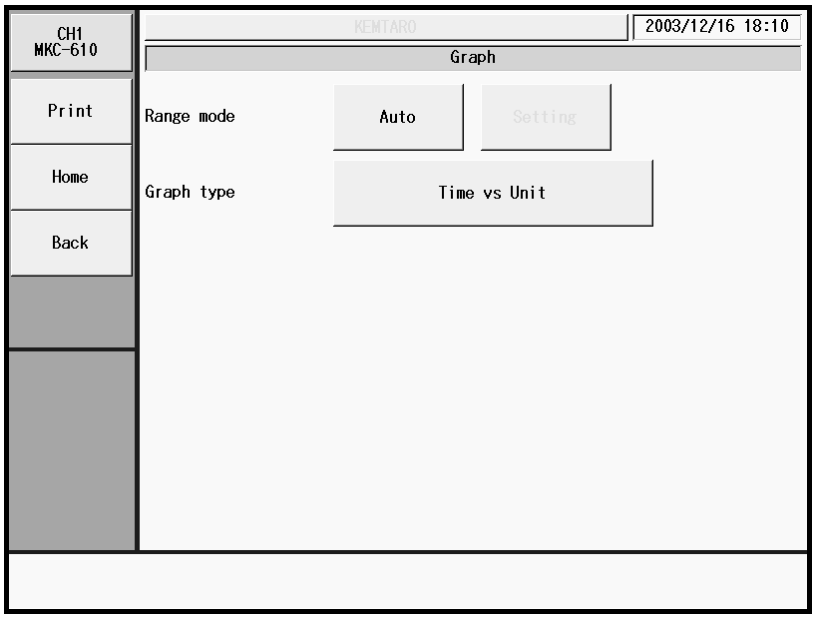
- Half adjust : rounded to nearest preset number of digits after decimal edit
- Round off : rounded down to ·nearest preset number of digits after decimal edit
- Round up : rounded up to nearest preset number of digits after decimal edit

Note:

The above setting of a number of decimal place appears on display and in printing.

3-5-9. [Graph setting]

Press [Graph setting] button on “Function” to show “Graph” display, where you arrange graphic display and printout.



[Range mode]

The graphic range mode can be selected as follows:

- Auto : Graphic range is automatically set up.
- Fixed : You can choose a fixed range by pressing [Setting] button.

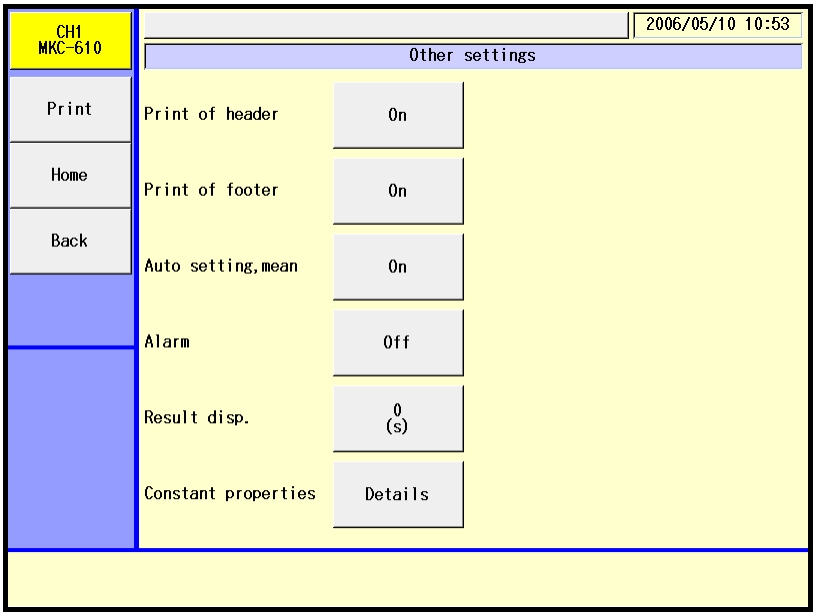
[Graph type]

Graphic type for vertical and level axis can be selected as follows:

- Time vs Unit : Water content per unit time on vertical axis is plotted with time on level axis.
- Time vs Total : Accumulated water content on vertical axis is plotted with time on level axis.
- Time vs Unit&Total : Water content per unit time and accumulated amount are plotted on vertical axis with time on level axis.

3-5-10. [Other settings]

Press [Other settings] button on “Function” to show “Other settings” display, where you can select the auto input of mean value and alarm function, etc.



[Print of header]

You can select the header printed together with measurement results, which shows the model name, serial number and printed date. This setup is made on Print parameter of Method parameter.

- On : Header is printed.
- Off : No header is printed.

[Print of footer]

You can select the footer printed together with measurement results, which shows the printer’s name. This setup is made on Report parameter of Method parameter.

- On : Footer is printed.
- Off : No footer is printed.

[Auto setting, mean]

The average value of a plural number of blank levels that have been measured will be automatically set into the blank value to be used in sample setup.

- On : Auto set in the blank.
- Off : No blank setting.

Note:

In the automatic setting of the mean value, the data of the unexpected value is not adopted. (As for the blank value, neither a negative value nor the value of 100000µg or more are adopted.)

[Alarm]

This gives the alarm about reagent life, periodic check, etc.

- On : Alarm is on.
- Off : No alarm.

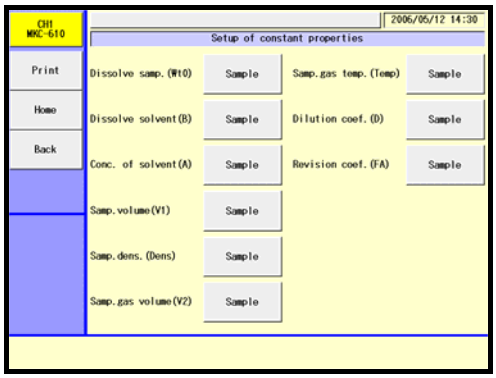
[Result disp.]

You can select the display time length of measurement results. Zero “0” second means the display is to be held on screen.

- 0 ~ 3600s

[Constant properties]

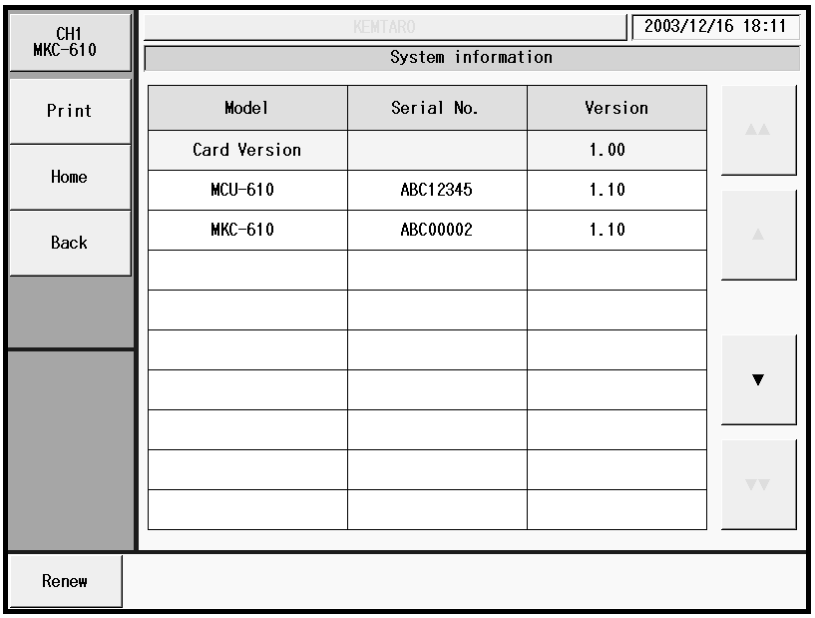
Concerning the constants used in the method calculation, select them on either the method or the sample. Pressing [Details] button leads to the display of the “Setup of constant properties” screen.



- Sample : Set constants on the sample. (See the section 3-3.)
- Method : Set constants on the “Method constant” screen display for the calculation parameter of the method. (See the section 3-7-4.)

3-5-11. [System information]

You can access to the information about the connected peripherals on their serial number and software version by pressing [System information] button on “Function”.



[Renew]

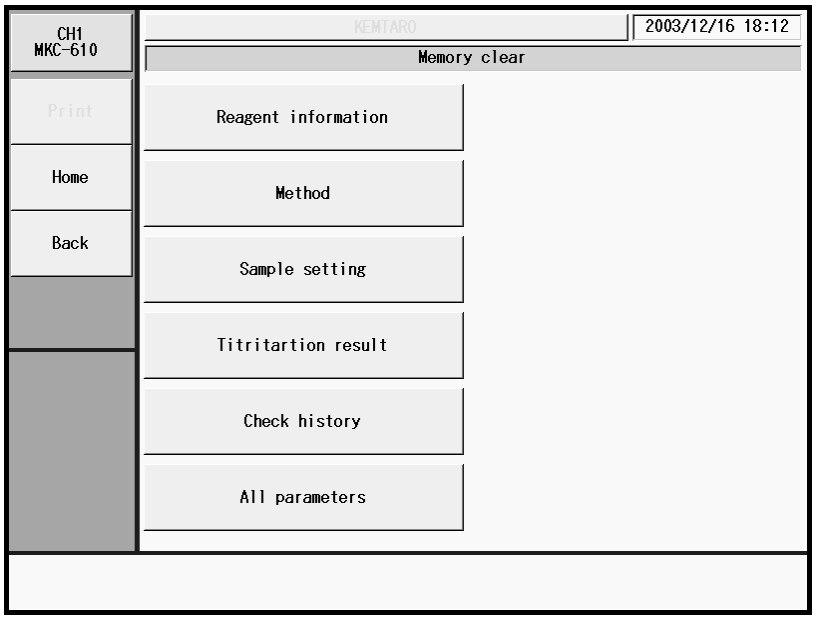
You can make sure if all of the peripherals are connected securely.

Note:

When any peripherals is connected, make sure of their connections by Renew.

3-5-12. [Memory clear]

You can erase all the stored data and set back to default as in “7-4-3. Parameter List”.
Press [Memory clear] button on “Function” to display “Memory clear”.



[Reagent information]

You can erase all the information about reagents.

[Method]

You can erase all of the Methods.

[Sample setting]

All the set up contents are erased.

[Titration result]

All the titration results are erased.

[Check history]

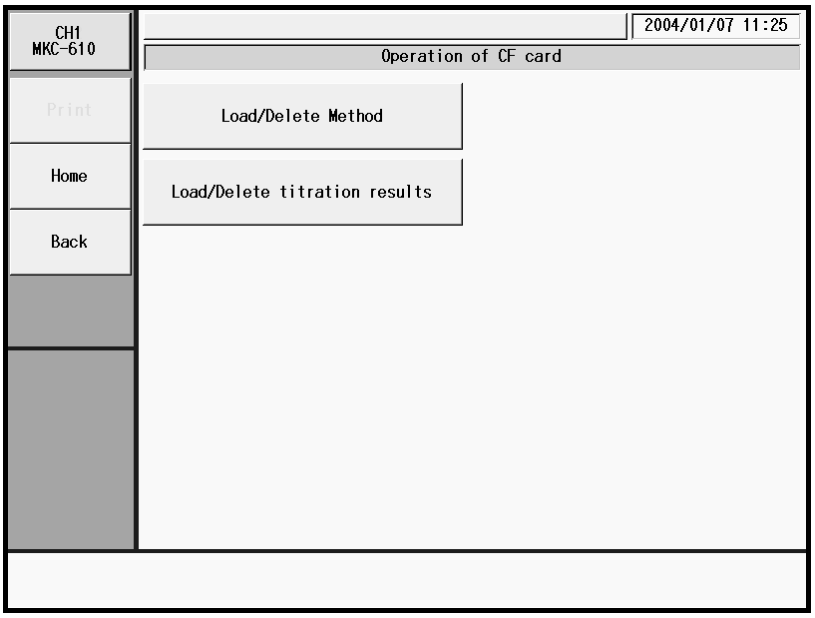
All the check records are erased.

[All parameters]

All the information and data other than setup contents are erased.

3-5-13. [Operation of CF Card]

Either load the data stored on CF card into the measuring unit or delete the data stored on CF card. After pressing [Next] button on the “Function” screen display, press [Operation of CF Card] button. Then, [Operation of CF Card] screen will be displayed.



[Load/Delete Method]

Either load the method data stored on CF card into the measuring unit or delete the data stored on CF card.

Note:
In regard to loading/deleting method, refer to 3-5-13-1, “Load/Delete Method”.

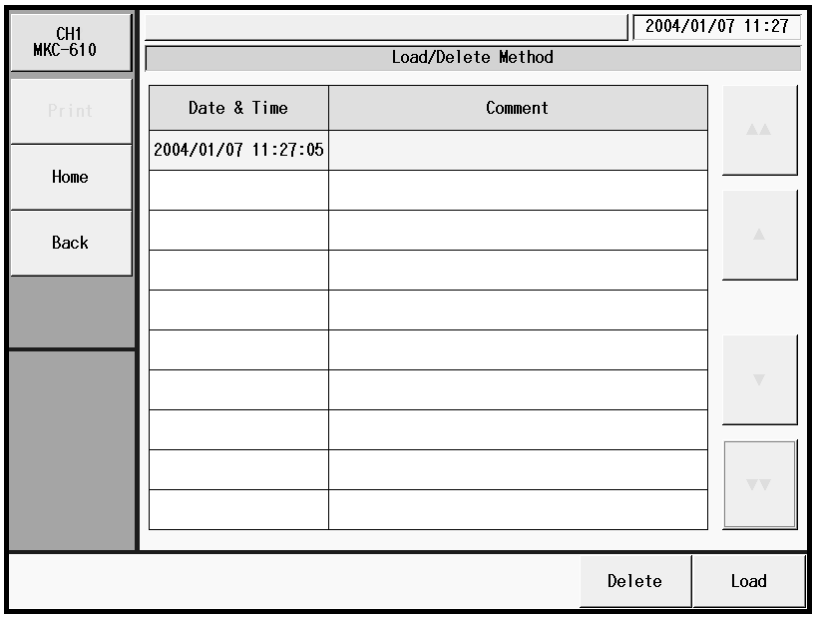
[Load/Delete titration results]

Either display the measurement results stored on CF card for the measuring unit or delete the measurement results stored on CF card.

Note:
In regard to loading/deleting titration results, refer to 3-5-13-2, “Load/Delete titration results”.

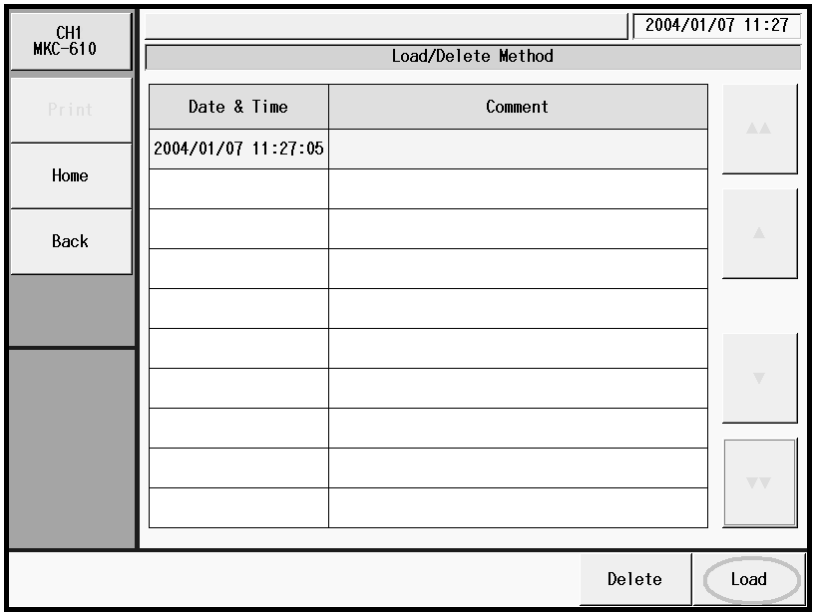
3-5-13-1. [Load/Delete Method]

Press [Load/Delete Method] button on the “Operation of CF Card” screen display. Then, “Load/Delete Method” screen will be displayed.

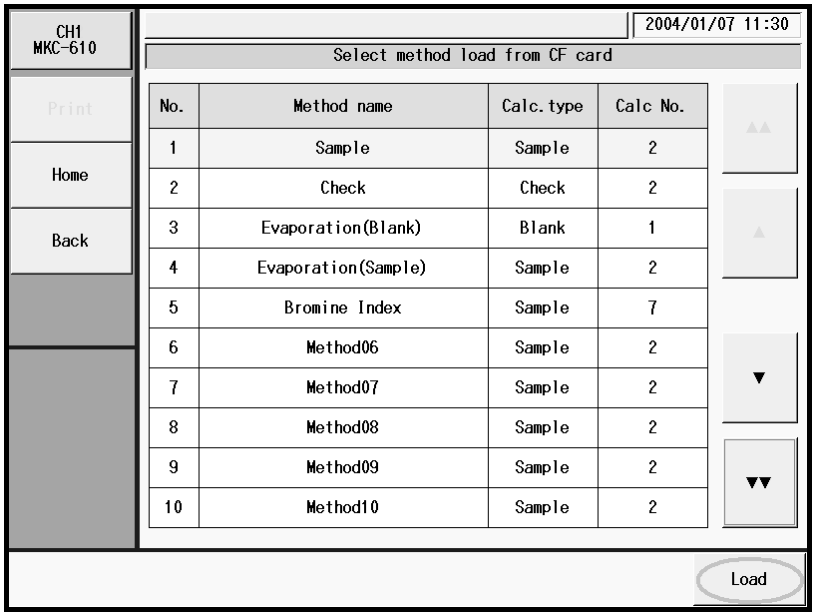


< How to load method >

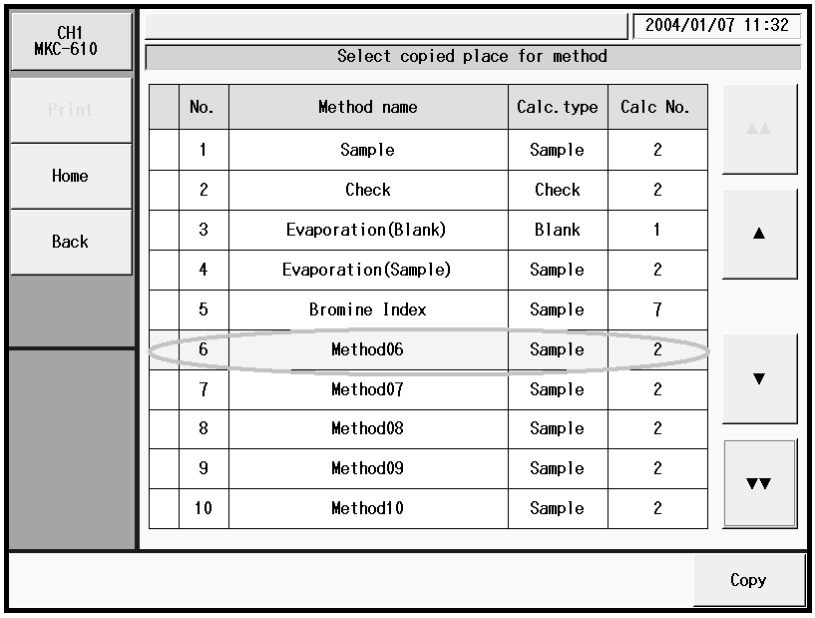
1) Select the method file to be loaded into the measuring unit on the “Load/Delete Method” screen display and then press [Load] button.



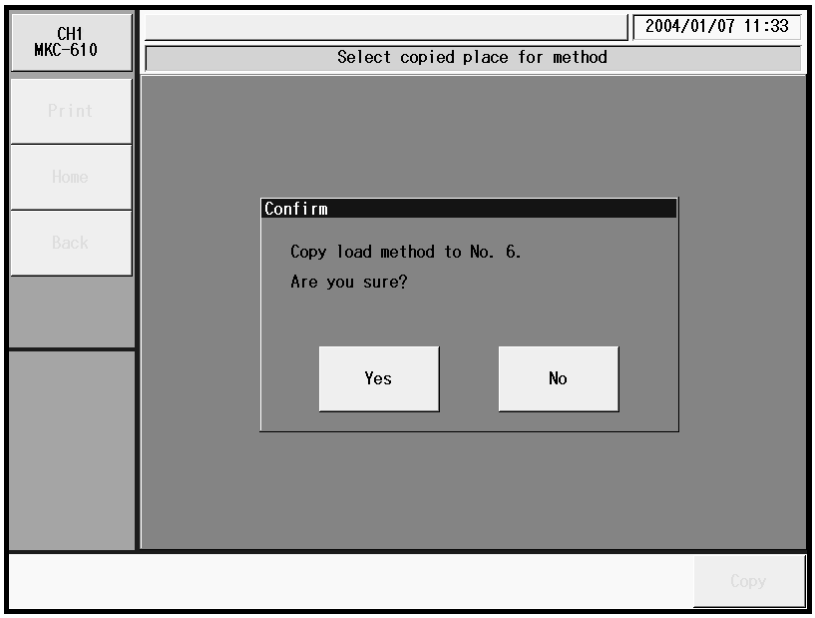
2) The screen of “Select method loaded from CF card” will be displayed. Then, select the method to be loaded into the measuring unit and press [Load] button.



3) The screen of "Select copied place for method" will be displayed. Then, select the method copied to and press [Copy] button.



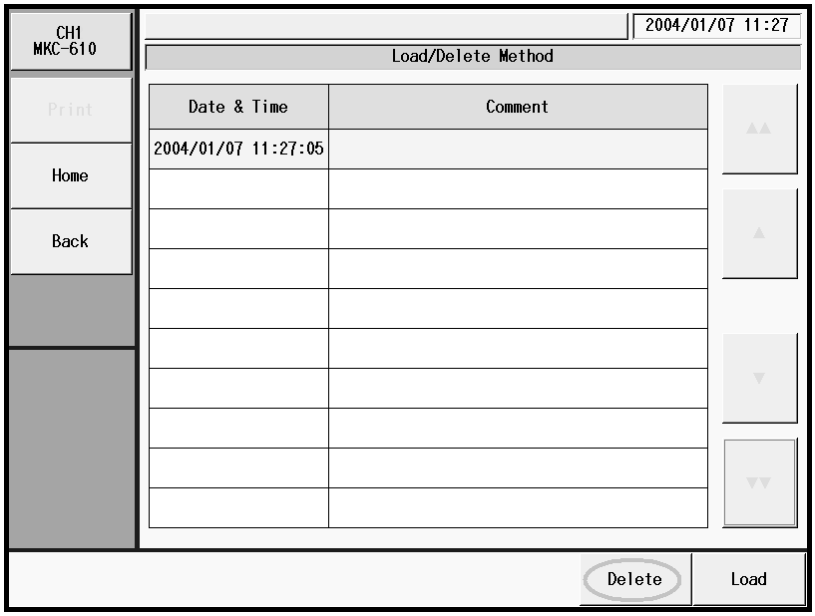
4) When the confirmation screen is displayed, press [Yes] button.



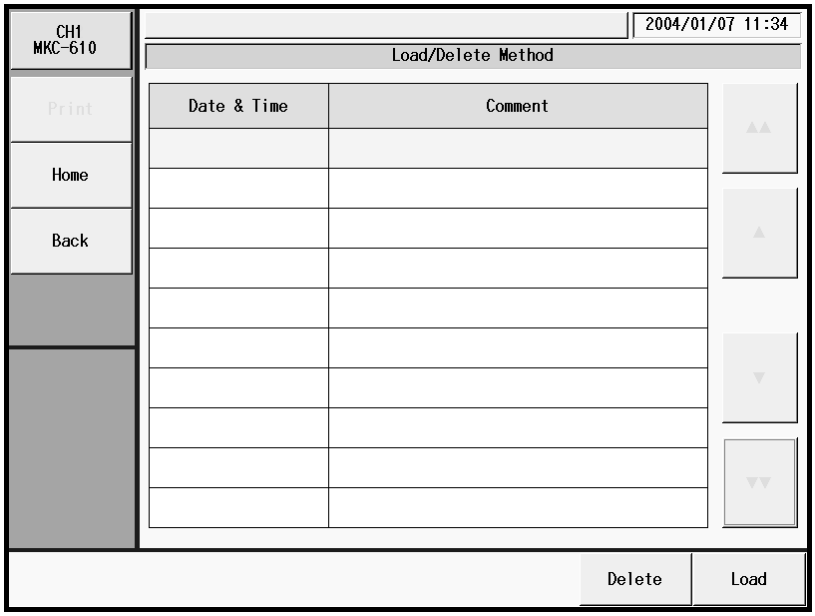
5) The method will be copied onto the method selected in the method list and the screen display will return to "Select method loaded from CF card". When loading further methods, repeat the above steps 2) through 4).

< How to delete method >

1) Select the method file to be deleted on the “Load/Delete Method” screen display and then press [Delete] button. The screen display will turn to the confirmation screen. Then, press [Yes] button.

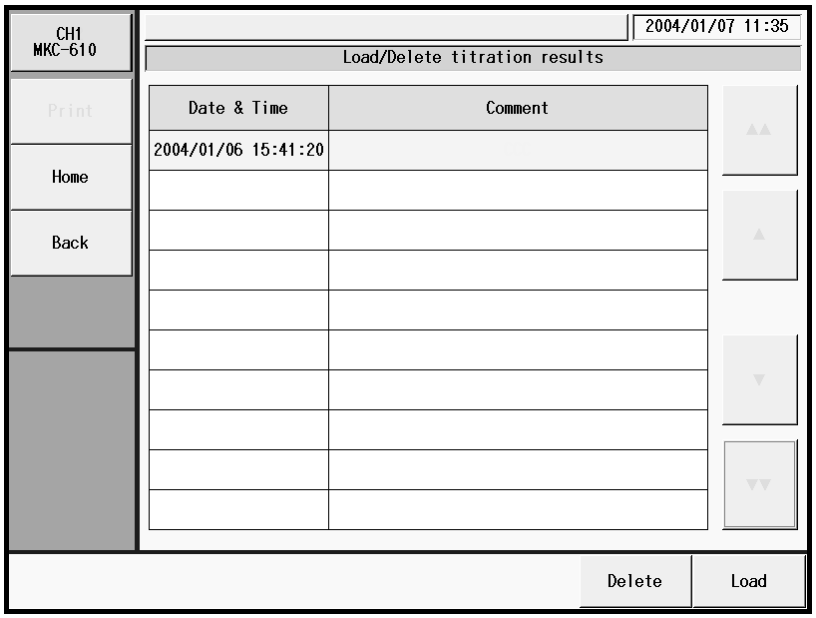


2) The method file selected on CF card will be deleted and the screen display will return to “Load/Delete Method”. When deleting further method files, repeat the above steps 1).



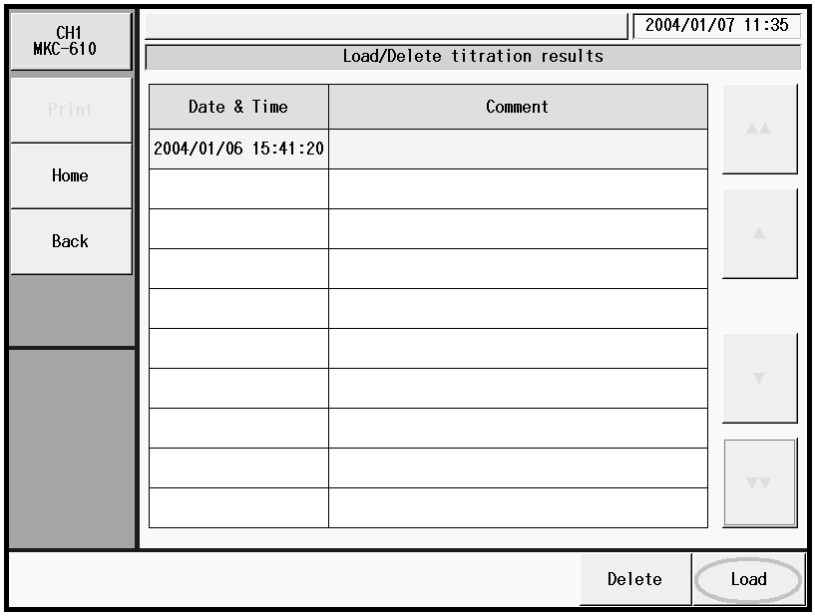
3-5-13-2. [Load/Delete titration results]

Press [Load/Delete titration results] button on the “Operation of CF Card” screen display. Then, the “Load/Delete titration results” screen will be displayed.

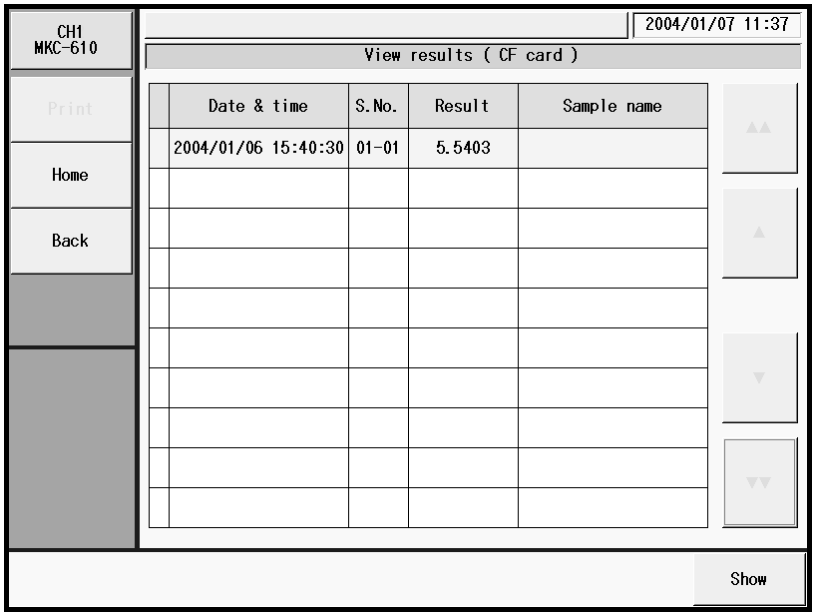


< How to load titration results >

1) Select the file having titration results to be displayed on the “Load/Delete titration results” screen and press [Load] button.



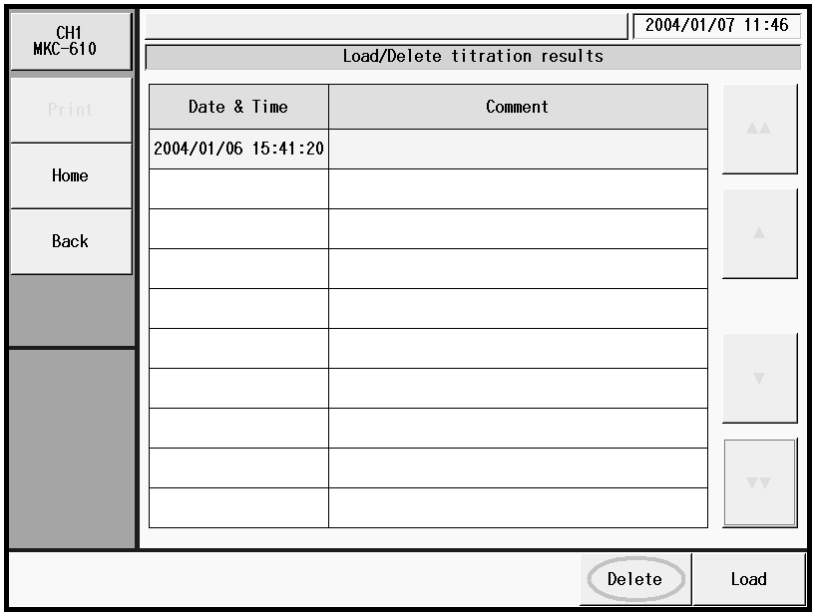
2) The screen of “View results (CF card)” will be displayed. Select the titration results to be displayed on the measuring unit and press [Show] button.



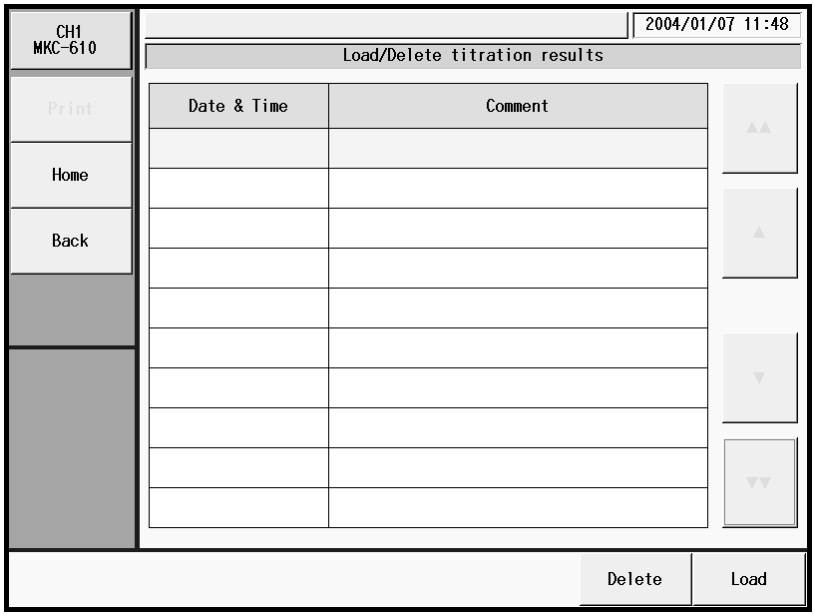
3) The selected titration results will be displayed on the measuring unit.

< How to delete titration results >

1) Select the file to be deleted on the “Load/Delete titration results” screen and press [Delete] button. The screen display will turn to the confirmation screen. Then, press [Yes] button.



2) The file selected on CF card will be deleted and the screen display will return to “Load/Delete titration results”. When deleting further files of titration results, repeat the above steps 1).

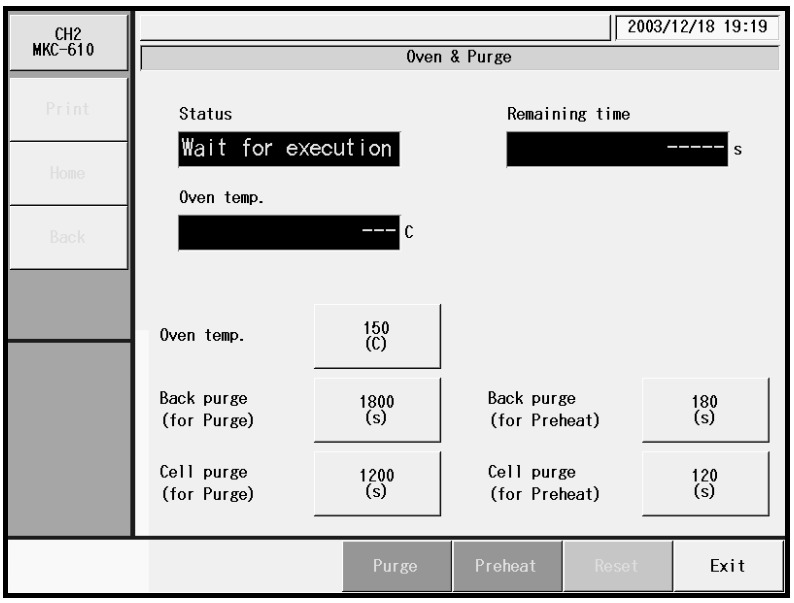


3-6. About Option

3-6-1. [Oven purge]

When the ADP-611 oven for evaporation is connected, ageing is necessary to purge out moisture inside the heating unit and other tube lines. Follow the below descriptions for ageing setup and ageing procedure.

Press [Option] button on Main display to show “Oven & Purge” screen.



[Oven temp.]

Select an oven temperature. Setting heating temperature will automatically transfer the temperature to Evaporator.

- 0 ~ 300°C

[Back purge (for Purge)]

The sampling line from sample inlet in the oven to the sample boat is purged with carrier gas.
Select a time length in seconds:

- 0 ~ 99999s

[Cell purge (for Purge)]

Enter a time length for purging the sample inlet in the oven to the titration cell with carrier gas.

- 0 ~ 99999s

[Back purge (for Preheat)]

Select a time length to purge the sample inlet in the oven to the sample boat with carrier gas.

- 0 ~ 99999s

[Cell purge (for Preheat)]

Enter a time length for purging the sample inlet in the oven to the titration cell with carrier gas.

- 0 ~ 99999s

[Purge]

Moisture inside the heating unit and other tube lines are extracted under the preset conditions.

[Preheat]

The sample boat is blank heated in the oven to purge out the adhered moisture at a preset temperature.

[Reset]

Halt purging and Preheating.

[Exit]

The display returns to Main.

Display screen for Status:

Will indicate the operating state on Evaporator.

- Wait for execution
- Back purging
- Purging in cell
- Sample boat moving

Display screen for Oven temp.:

Will indicate the present oven temperature. The oven temperature is automatically loaded from the currently selected method file (temperature set in optional parameter settings).

Display screen for Remaining time:

Will display the remaining time for purging or preheating.

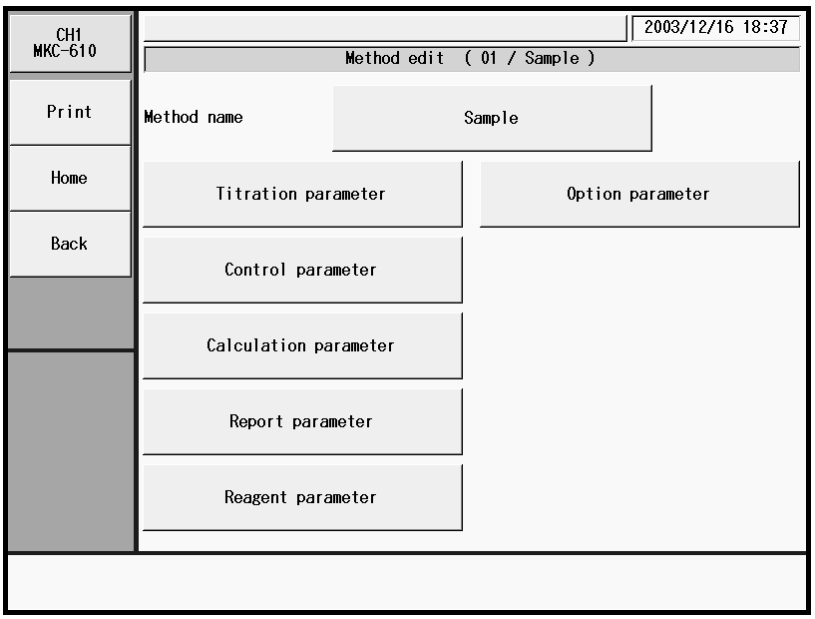
3-7. About Method

3-7-1. General description

In order to run a precise and timely measurement, it is necessary to preset conditions appropriate for the sample and titration method. Those conditions for measurement and concentration calculation are called a Method. This unit can store in memory those Methods up to 50, which can be identified with individual name or code.

A Method consists of [Titration parameter], [Control parameter], [Calculation parameter], [Report parameter], [Reagent parameter] and [Option parameter].

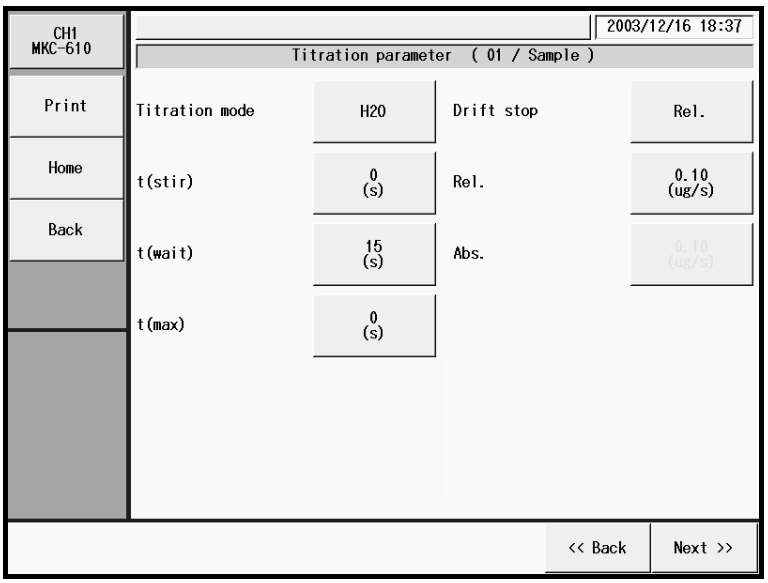
To edit a Method, press [Function] – [Method edit] button on Main display to show "Method list", and press [Edit] button by pointing the cursor on the Method you want to edit.



Each parameter can be selected with corresponding button on display.

Note:
For details of each parameter, refer to individual item in this manual.

3-7-2. [Titration parameter]



[Titration mode]

Titration mode is selective as follows:

- H2O : This mode is selected for measurement of water content, for regular moisture titration.
- Br2 : This is for measurement of bromine number

[t(stir)]

Select a time length to wait for titration (electrolysis) start after a sample is discharged into the titration cell, particularly for those samples which are hard to dissolve in the anolyte and difficult to extract moisture.

- 0 ~ 99999s

[t(wait)]

Enter the shortest time length for a measurement from start to end in case a plural number of inflection points exist or unexpected endpoint is detected due to fluctuating drift level.

- 15 ~ 99999s

[t(max)]

Limit a time length for a titration (electrolysis). This means the total time length from start to end is [t(stir)] + [t(wait)]+ [t(max)]. The printing covers the measuring process [t(wait)] + [t(max)]. The event during [t(stir)] will not be printed out. [t(max)=0] means titration will not terminate by time limit. This is useful when an oven is connected and End point is hard to be found due to drift.

- 0 ~ 99999s

[Drift stop]

Selection of three modes by drift level as follows:

- Off : Regardless of drift level, end point is determined when [t(stir)]+ [t(wait)]+ [t(max)] elapses. This mode is useful when end point is not found by drift or when the amount of water extraction per unit time is needed.
- Rel. : This mode determines end point when the drift level during titration goes down below [Drift at time of start] + [Relative drift]. This mode is typical for regular direct titration method.
- Abs. : Regardless of drift level at start, end point is determined when the drift level during titration goes down below [Absolute drift] level. In this mode, titration will not end if the drift level at the end of titration goes up. To prevent this, select a [t(max)]to end the titration.

[Rel.]

Here you enter a relative drift level. This entry appears only when “Drift stop” is set to “Rel.”.

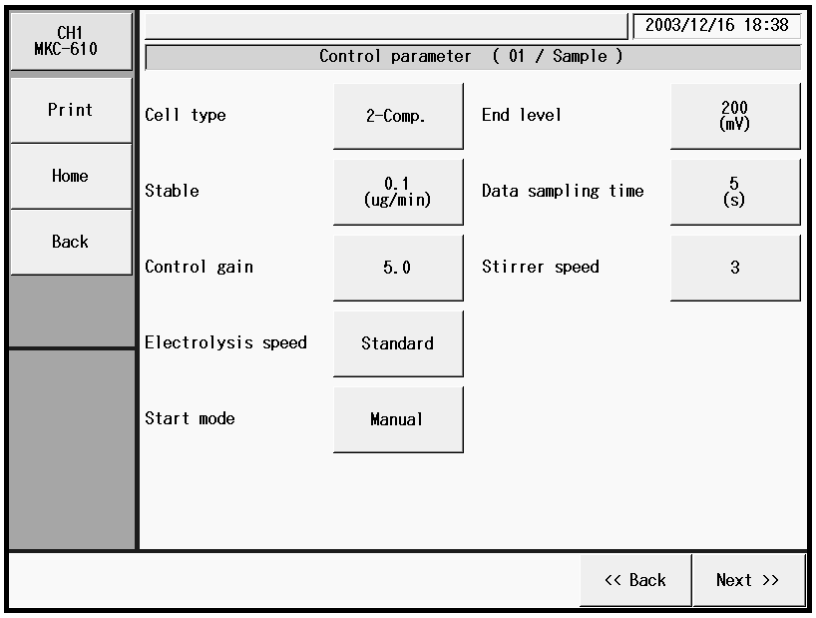
- 0.00 ~ 9.99ug/s

[Abs.]

Enter an absolute drift level. This entry appears only when “Drift stop” is set to “Abs.”.

- 0.00 ~ 9.99ug/s

3-7-3. [Control parameter]



[Cell type]

Selection of titration cell type:

- 2-comp. : This cell is generally used for titration with anode/cathode reagent using an electrolytic electrode with diaphragm.
- 1-comp. : This cell is generally used for titration using anode reagent (anolyte) only and diaphragm-less electrode.

[Stable]

To display “Stable” status, you need to enter the drift change rate Δug/min. Typically for regular moisture titration, enter Δ0.1ug/min and for bromine number, Δ0.5ug/min. The “Stable” message appears when the rate of drift change goes down lower than preset level. Select a larger amount for the rate in case the moisture in carrier gas is unstable to start titration. However, this means it will increase the error and deviation of measurement results.

- 0.00 ~ 9.99ug/min

[Control gain]

Here you enter a coefficient for electrolysis speed, typically 5.0. If reaction speed is so fast that an over-titration is expected, decrease the value. To the contrary, if reaction speed is expected to be slow with a sample which contains a large amount of water, increase this value.

- 1.0 ~ 9.9

[Electrolysis speed]

Selection of electrolysis mode:

- Standard : Use this mode for regular type of measurement.
- Fast : Use this mode for a sample with water more than 5000ug/H_2O.

Note:

Measurement results may be deviated with "Fast" mode more than "Standard".

Check on the expected precision with the sample you are going to measure.

[Start mode]

Selection of titration start:

- Manual : Use this mode for blank test or for samples with a small amount of water.
- Auto : Titration starts automatically by sensing water increase in the sample after discharged into the cell.

Note:

Select "Auto" for measurement with a sample changer connected.

[End level]

Select an endpoint potential, usually 200mV for water and 300mV for bromine number.

- 200 ~ 1000mV

[Data sampling time]

Select a time interval for data sampling. Titration volume and accumulated amount will be automatically sampled at the interval of an input time.

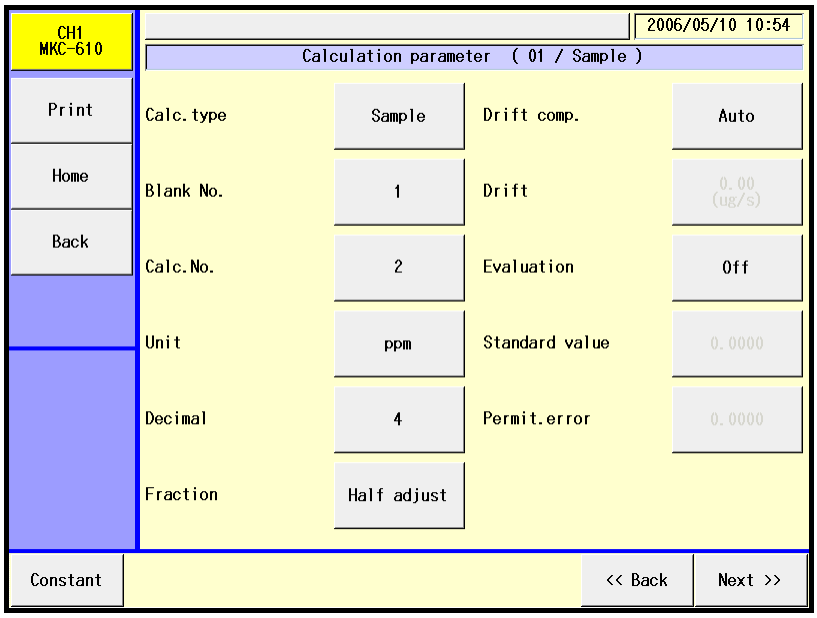
- 1 ~ 99999s

[Stirrer speed]

Here you select stirrer speed depending on the sample type:

- 0 ~ 9

3-7-4. [Calculation parameter]



[Calc. type]

Selection of calculation type:

- Sample : Set up a Method for sample measurement.
- Blank : Set up a Method for blank measurement.
- Check : Set up a Method for check measurement with standard substance.

Note:

When "Check" is chosen, the measurement results will be stored in memory as a check history.

[Blank No.]

Number a blank value you use in calculation. Refer to [Function] – [Blank list] for blank values.

- 1 ~ 10

[Calc. No.]

Here you select the numbered equation. Choose Eq.1 for water content and Eq.2 for concentration:

- For titration mode of H2O 1 ~ 6
- For titration mode of Br2 7 ~ 8

Note:

For calculation units and numbers, refer to "3-7-4-1. Calculation formula".

[Unit]

Here you select a unit used in calculation.

Note:

For calculation units and numbers, refer to "3-7-4-1. Calculation formula".

[Decimal]

Enter a number of digits after decimal point for calculation results:

- 0 ~ 8 place

[Fraction]

Selection of fraction rounding in calculation:

- Half adjust : rounded to nearest preset number of digits after decimal point
- Round off : rounded down to nearest preset number of digits after decimal point
- Round up : rounded up to nearest preset number of digits after decimal point

[Drift comp.]

Selection of drift compensation:

- Off : No compensation is made. Select this to know total water content including drift.
- Manual : Enter offset value. This is useful when there is much difference in drift level between start and the end of titration.
- Auto : The drift level is automatically corrected with the level at time of start.

[Drift]

Enter the offset value for correcting the drift level. This is significant only for "Manual" compensation.

- 0.00 ~ 99.99ug/s

[Evaluation]

The measurement results will be evaluated by this function:

- On : The measurement results are evaluated.
- Off : Not evaluated.

[Standard value]

Enter a standard value to make the evaluation in the following range:

- 0.00000000 ~ 99999.99999999

[Permit. error]

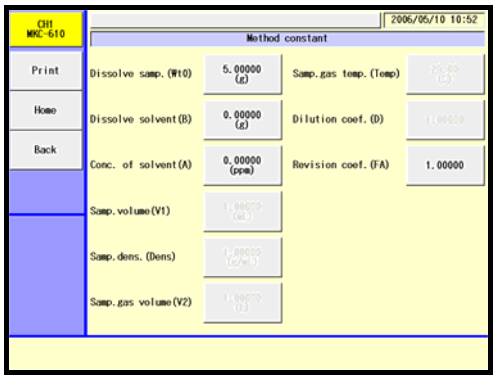
Enter permit error to determine if the calculation result is off the range against the standard value.

- 0.00000000 ~ 99999.99999999

[Constant]

Display the Method constant screen.

Set the sample-dependent constants used for the measurements on gas samples or samples dissolved with solvents. Method constants can be setup when “Method” is selected in the [Function] – [Other settings] – [Constant properties] (see the section 3-5-10), settable only on the constants that are being used for the Calc. No. of the calculation parameters of presently selected method.



3-7-4-1. Calculation formula

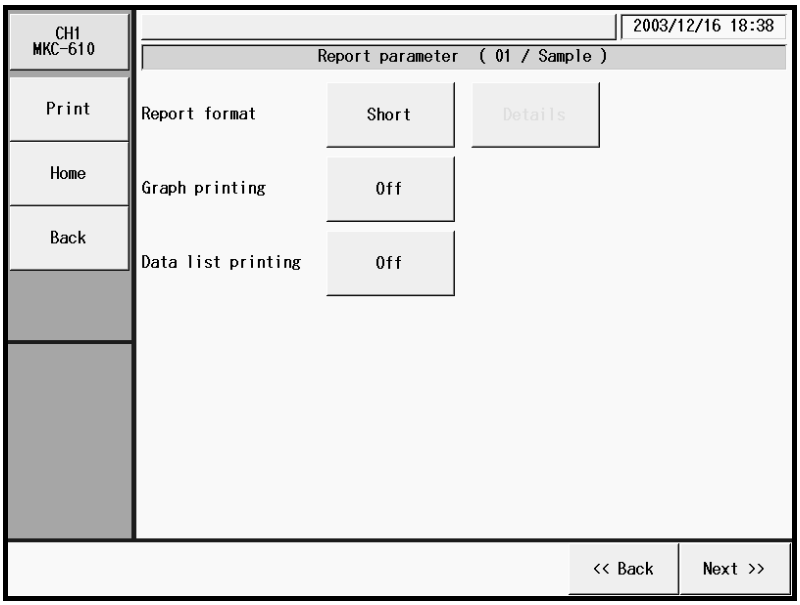
Calc. No.	Purpose	Equation
1	Calculation of water content	$FA \times (Moisture) \times k$ Unit: μg (k=1), mg (k=0.001)
2	Concentration of liquid or solid by weighing	$FA \times \frac{Moisture}{Wt1 - Wt2} \times k$ Unit: % (k=0.0001), ppm (k=1)
3	Concentration of a weighed part of water in liquid or solid dissolved with solvent extraction	$FA \times (\frac{Moisture}{Wt1 - Wt2} \times \frac{B + Wt0}{Wt0} - \frac{A \times B}{Wt0}) \times k$ Unit: % (k=0.0001), ppm (k=1)
4	Concentration when the volume of liquid sample is measured	$FA \times \frac{Moisture}{V1 \times Dens} \times k$ Unit: % (k=0.0001), ppm (k=1)
5	Concentration when the volume of gas sample is measured	$FA \times \frac{(Moisuture) \times 22.4}{V2 \times 18} \times (1 + \frac{Temp.}{273}) \times k$ Unit: % (k=0.0001), ppm (k=1)
6	Concentration of a weighed part of water in solid dissolved with solvent extraction (Sample is not soluble)	$X = \frac{Moisture}{Wt1 - Wt2} \times (\frac{B}{Wt0} + \frac{X}{10^6}) - \frac{A \times B}{Wt0}$ $\therefore FA \times X \times k$ Determine X from this equation Unit: % (k=0.0001), ppm (k=1)
7	Concentration when liquid or solid is weighed in bromine number measurement	$FA \times \frac{Moisture}{Wt1 - Wt2} \times D \times k$ Unit : Bromine number g/100g (k=0.0001) Bromine index mg/100g (k=0.1)
8	Concentration when the volume of liquid sample is measured in bromine number measurement	$FA \times \frac{Moisture}{V1 \times Dens} \times D \times k$ Unit : Bromine number g/100g (k=0.0001) Bromine index mg/100g (k=0.1)

* “Moisture” in the equation is identical to “Data – Drift x t – Blank”.

< Symbols used in calculation formulas >

Moisture (μ g)	: Net water amount Water obtained by subtracting “Drift value x titrating time and Blank value” from total water titrated (electrolyzed).
FA	: Compensation coefficient for calculation results
Data (ug)	: Total water content after electrolysis in the titration cell
Drift (ug/s)	: Drift level which changes by ambient moisture and carrier gas permeating into the titration cell
t (s)	: Titration time length from start to the end of titration after sample is discharged. When titration ends by preset time, it runs for [t(wait)] + [t(max)].
Blank (ug)	: Blank level. This is the moisture coming in from other source than sample itself, and must be deducted from titrated water volume.
Wt1 (g)	: The total weight of sample and sampler before sample is discharged. The sample actually discharged is $\lvert Wt1 - Wt2 \rvert$.
Wt2 (g)	: The total weight of sampler and sample residue after sample is discharged. The sample actually discharged is $\lvert Wt1 - Wt2 \rvert$.
Wt0 (g)	: The amount of sample discharged into extracting solvent, a part of which is taken out for measurement
B (g)	: Weight of solvent extraction to dissolve a sample, a part of which is taken out for measurement by Indirect method
A (ppm)	: Water concentration of solvent extraction before the sample is discharged into the solvent in Indirect method.
V1 (mL)	: The amount of sample discharged by volume
Dens (g/mL)	: Density of sample discharged by volume
V2 (L)	: The volume of gas sample
Temp. (°C)	: Temperature of gas sample when measured
D	: Dilution coefficient in measurement of sample for its bromine number
K	: Unit conversion coefficient

3-7-5. [Report parameter]



[Report format]

Selection of print format:

- Off : No printout
- GLP : Prints all of measurement parameters and results
- Short : Prints sample number, measurement date, sample size, measurement results, drift level, titration time
- Variable : You can choose from printing items from [Details] button when pressed.

[Details]

The display "Report format " appears where you can select those items you want to print out.

This buttons works only when the above "Variable" for report format is chosen.

Note:
For print parameters and items, refer to "3-7-5-1. Report format".

[Graph printing]

Selection of graphic print together with measurement results when they are printed out.

Graphic printout is significant when it is set in "Graph setting" on "Function".

- On : Printout of graph
- Off : No printout of graph

[Date list printing]

Selection of printout of the data list, which is significant with data sampling time preset on "Control parameter".

- On : Printout of data list
- Off : No printout of data list

3-7-5-1. Report format

	Print format			
Item	Off	Short	GLP	Variabel
Model/Serial	Off	Off	On	On/Off
Sample No.	Off	On	On	On/Off
Titration date	Off	On	On	On/Off
Sample ID	Off	Off	On	On/Off
Method name	Off	Off	On	On/Off
Calc. No.	Off	Off	On	On/Off
Sample size	Off	On	On	On/Off
Result	Off	On	On	On/Off
Drift	Off	On	On	On/Off
Blank	Off	Off	On	On/Off
Reagent name	Off	Off	On	On/Off
Reagent life	Off	Off	On	On/Off
Titration time	Off	On	On	On/Off
Factor	Off	Off	On	On/Off
Operator	Off	Off	On	On/Off

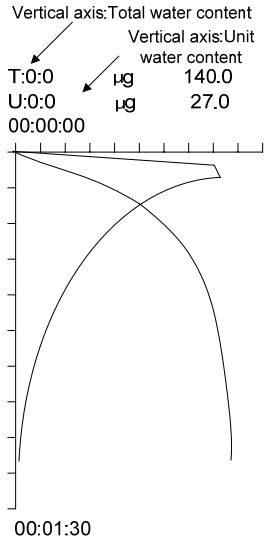
Note:

For meanings of parameter name, report format and setup contents, refer to Parameter List at the end of this manual.

< Example of printout >

[Data list]

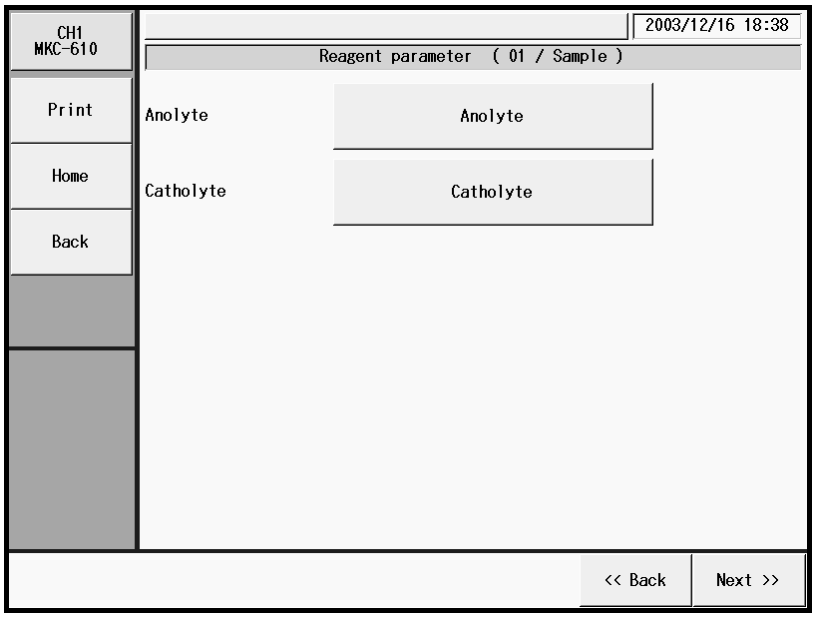
Time	Unit	Total
00:00:05	21.9	21.9
00:00:10	22.9	44.8
00:00:15	17.5	62.3
00:00:20	13.3	75.6
00:00:25	10.3	85.9
00:00:30	7.9	93.8
00:00:35	6.1	99.9
00:00:40	4.9	104.8
00:00:45	3.6	108.4
00:00:50	2.6	111.0
00:00:55	2.0	113.0
00:01:00	1.6	114.6
00:01:05	1.3	115.9
00:01:10	1.2	117.1
00:01:15	1.0	118.1
00:01:19	0.8	118.9



A comment appears when titration is reset halfway or sample size is input after titration. →

Model : MKC-610	←	Model
Serial No. : XXX99999	←	Serial number
Print : 2003/10/23 17:04	←	Printed date
Recalculation		
Method No./Name :	←	Method name
01/Sample		
Sample No. : 01-02 (#)	←	Sample number
Sample name :	←	Sample name
ABCDEFGHIJKLMNOPQRST		
Sample ID :	←	Sample ID
12345678901234567890		
Date 2003/10/23 17:02	←	Titration date
Calc.No. : 1	←	Calculation number
Drift 0.05 ug/s	←	Drift
Moisture 109.4 ug	←	Moisture
Result :	←	Result
122.36 ppm		
Evaluation : OK	←	Evaluation
Anolyte :	←	Anolyte name
Anolyte		
A.life : 1 mg	←	Anolyte life
Catholyte :	←	Catholyte name
Catholyte		
C.life : 1 mg	←	Catholyte life
Titr.time : 00:01:19	←	Titration time
Wt1 : 71.1096 g	←	Net weight
Wt2 : 70.2155 g		
Net : 0.8941 g		
FA : 1.00000	←	Constant
Blank : 0.00000 ug	←	Blank
(Stop by reset)		
Operator :	←	Operator: when re-calculated,
KEMTARO		its person's name appears here

3-7-6. [Reagent parameter]



[Anolyte]

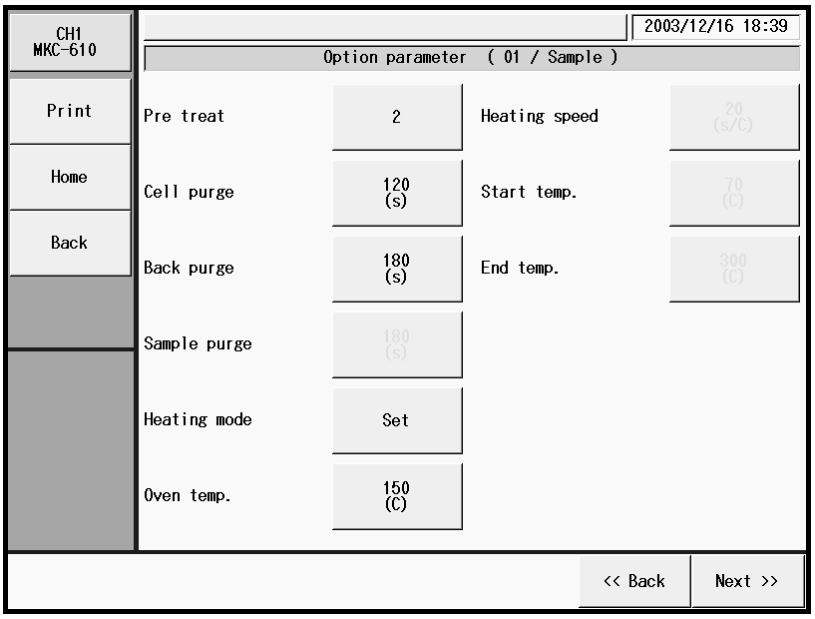
Selection of anode reagent from the “Reagent information” in “Function”

[Catholyte]

Selection of cathode reagent from the “Reagent information” in “Function”

3-7-7. [Option parameter]

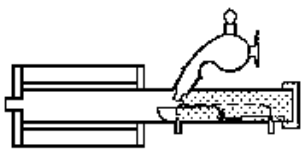
This parameter is provided for measurement with an oven or a sampler connected to Mains.



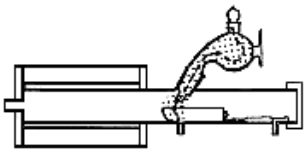
[Pre treat]

Selection of sampling into the oven:

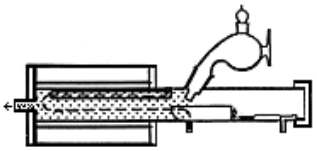
- Pre treat 1 : An optional eggplant shape sampler is used for sampling and discharge into the sample inlet. It begins with back purge, sample purge and cell purge, and then, starts measurement process when the drift level becomes stable while carrier gas is flowing through the system.
- Pre treat 2 : This is direct discharge of sample into the oven. It begins with back purge and cell purge, and then, starts measurement process when the drift level becomes stable while carrier gas is flowing through the system.
- Pre treat 3 : Use the sample boat. Weigh the dried sample boat with a sample on it, and weigh it, and then, move it into the oven. It begins with back purge and cell purge, and then, starts measurement process when the drift level becomes stable while carrier gas is flowing through the system.



Back purge



Sample purge



Cell purge

* Put a port plug onto the eggplant sampler for Pre treat 2 or 3.

[Cell purge]

Select a purge time to dry up the line from sample inlet of heating unit to the titration cell with carrier gas.

- 0 ~ 99999s

[Back purge]

Select a purge time to dry up the sample inlet of heating unit and the sample boat outlet with carrier gas.

- 0 ~ 99999s

[Sample purge]

Select a purge time to dry up the inside oven with carrier gas.

- 0 ~ 99999s

Note:

When the option of the sample setting is set to "CHK-", the settings for "Pre-treat" and "Back-purge" become invalid.
When CHK-501 is in use and the setting of "Cell purge" and "Sample purge" is 9999s or more, the time is automatically set at "9999s".

[Heating mode]

Select a heating method for the oven.

- Set : This is for a sample of which vaporizing point is known.
- Scan : This is for scanning temperature characteristic of a sample. Heating process depends on heating speed from the "start temp." up to the "end temp.". After measurement is over, a recommended temperature appears on display with measurement results just for information. When using the scan mode in combined use of CHK-501, be sure to set the "Oven Temp. Set" to "Auto" on CHK-501.

[Oven temp.]

Select a temperature to heat up the oven. This is for a sample of which vaporizing point is known. Turn on the above "Set" option. When using CHK-501 together, set the "Oven Temp. Set" to "Auto" on CHK-501 in order to make the setting of heating temperature valid.

- 0 ~ 300°C

[Heating speed]

Select a heating speed of the oven. Turn on the above "Scan", typically at 20s/°C. If the test material is thermally slow conductive, select a degree between 30 ~ 60s/°C span of range.

- 1 ~ 99999s/°C

[Start temp.]

Select a degree of temperature to start with. This is significant when "Scan" is chosen. When measurement is started, the oven temperature goes up to the "start temp.". Typically set it to 100°C. Any degree higher than the "end temp." cannot be selected.

- 0 ~ 300°C

[End temp.]

Select a degree of finishing temperature. This is significant when "Scan" is chosen. When the temperature reaches preset degree in measurement, it stops heating. Typically set it to 300°C. Any degree lower than "start temp." cannot be selected.

- 0 ~ 300°C

4. Other usage

4-1. Connecting Balance

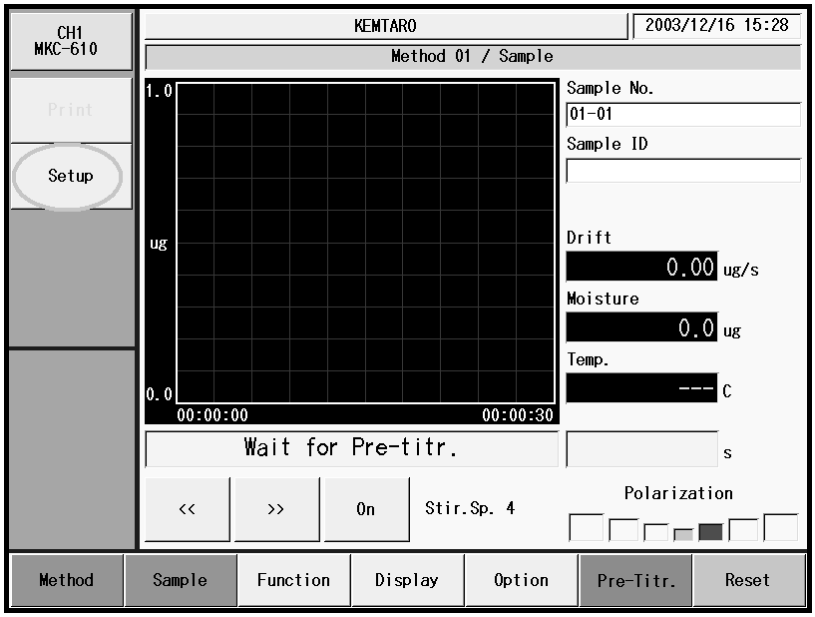
4-1-1. How to connect a balance

When an electronic balance is connected and set up appropriately, the sample size (weight) is automatically input into the measuring unit.

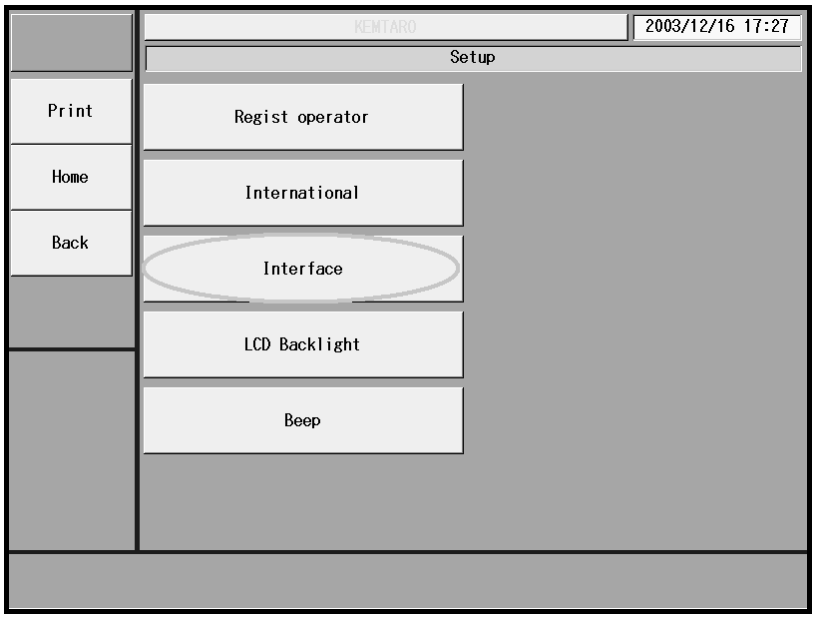
Note:

Check with your local dealer to see if your balance needs a special cable to be connected.

1) Press [Setup] button on Main display.

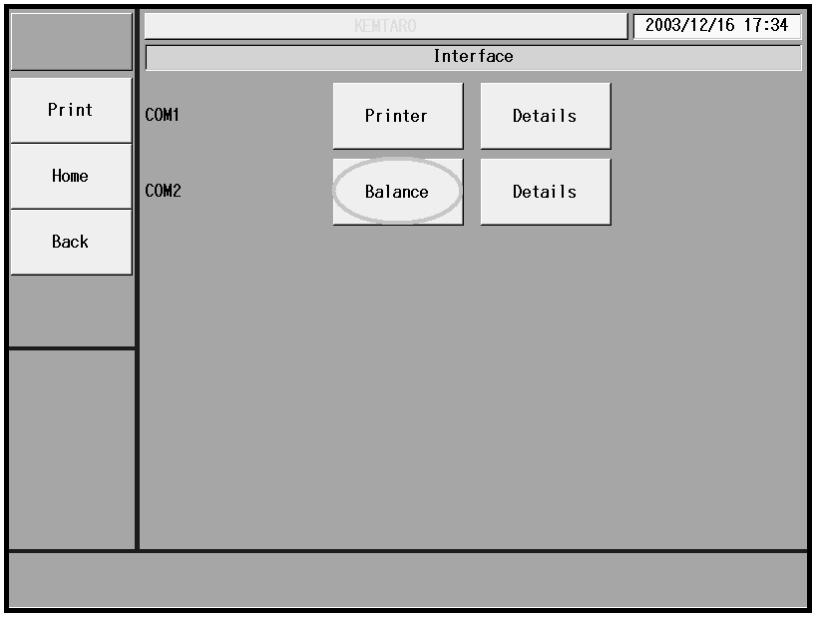


2) Press [Interface] button on “Setup”.

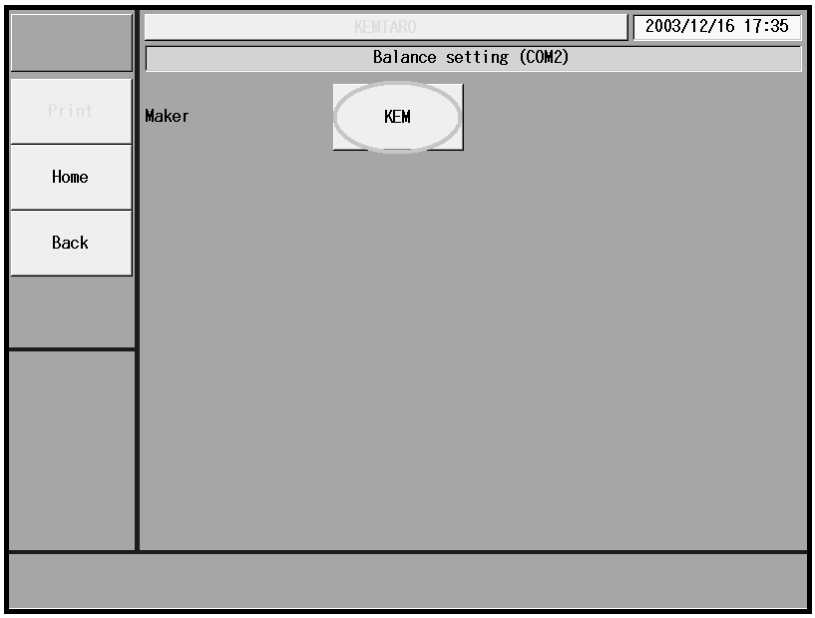


3) Select a COM port for “Balance” on “Interface”.

4) Press [Details] button.



5) Choose the maker of your balance from the list on display.

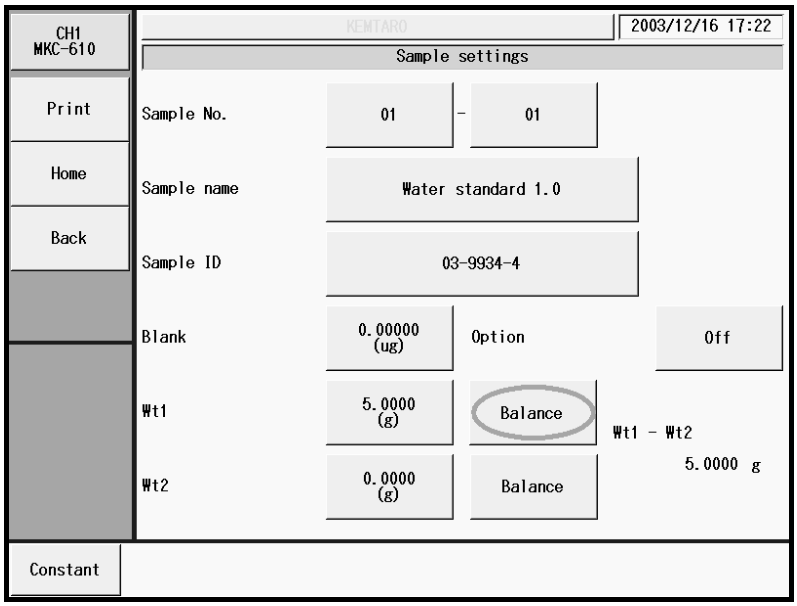


Note:

Only one balance can be connected to the unit. You cannot connect two balances to COM1 and COM2 at a time.

4-1-2. Input sample size on balance

1) Press [Sample] button on Main display to show “Sample settings”.



2) Press [Balance] button for sample weight (Wt1). The present input data in balance appears on “Sample settings” on display. When the reading becomes stable, press [OK] button. The display returns to “Sample settings”.

3) To continue the weight input, press [Wt2] button for Wt2, and input the weight from the balance.

Note:

When the “After entry” is selected on sample mode, the display for sample size input appears after titration is over. Press [Balance] button likewise for balance input.

4-2. Bromine number and index

4-2-1. Measurement of bromine number and index

The degree of unsaturated hydrogen carbide in oil and petroleum products is indicated by bromine number or index. The volumetric test method is specified in ASTM D2710, JIS K2605 and K2435. The coulometric method with this unit is easier than volumetric, however, it is recommended to refer to the volumetric testing procedure and specifications.

< Bromine number and index >

Bromine number : The amount of bromine (unit: g/100) consumed in 100g sample
Bromine index : The amount of bromine (unit: mg/100) consumed in 100g sample

< Principle of measurement >

The unsaturated hydrogen carbon reacts with bromine as follows:

$R\text{-}CH=CH\text{-}R^{-} + Br_2 \rightarrow R\text{-}CHBr\text{-}CHBr\text{-}R^{-}$ ····· (1)

In coulometric titration, bromine is generated by electrolysis of anolye containing bromine ion:

$2Br^{-} \rightarrow Br_2 + 2e^{-}$ ····· (2)

When generated bromine is consumed according to Eq. (1), the electrode detects bromine consumption, and continues generating bromine according to Eq. (2).
Such bromine is generated in proportion to the electricity determined by Faraday's Law. From Eq.(1), Bromine reacts with coupled C=C evenly (1:1). Thus, one mol of bromine (159.8g) is equivalent to 2 × 96500 coulomb, which means 1.2 coulomb/1mgBr_2.
Based on the above principle, the electricity consumed in electrolysis is converted to the exiting bromine.

Note:

Follow the below instructions in order to obtain correct measurement results:
Replace anode and cathode reagent with new one respectively each day.
When the anolyte turns to white turbidity, change it with new one.
When the same anolyte and catholyte are continuously used, the measurement results may produce larger amount in value than expected. Change the anolyte in this case.
Do not share the titration cell with moisture titration.

4-2-2. Preparation of reagent

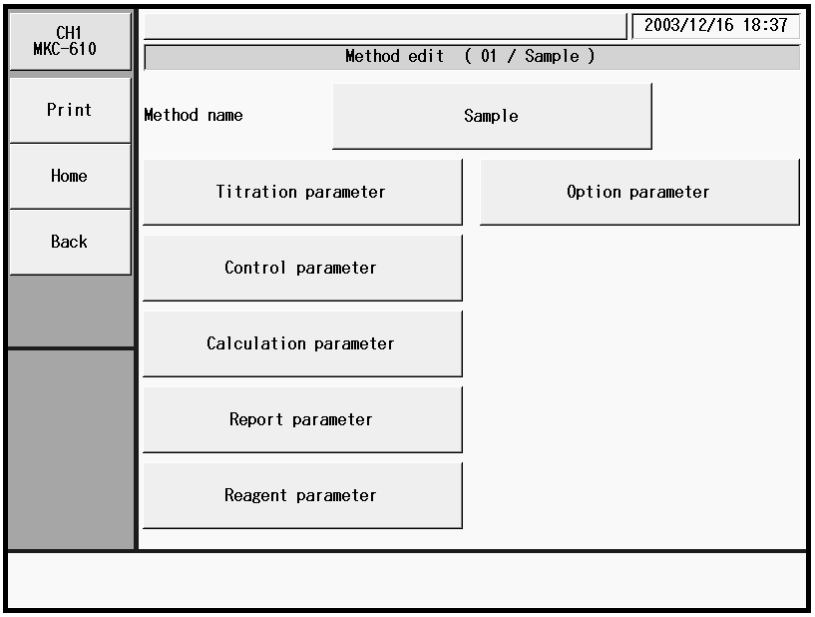
Use the following reagent for measurement of bromine number or index:

Anode reagent	: Mixture of Acetic acid (high grade) 600mL; Methanol (high grade) 260mL; 1M-Potassium bromide solution 140mL. Blend it well and use 100mL each time.
Cathode reagent	: 0.2M-Potassium chloride solution. Use 5mL each time.
Check solution	: 0.05Wt-Cyclohexene·toluene mixture (Aprox. 93 ~ 102mgBr_2/100g). Theoretical value is calculated by the below formula:

$$\text{Theoretical value (mg } Br_2/100g) = \frac{159.83(\text{bromine molecular mass}) \times \text{cyclohexene(g)}}{82.15(\text{cyclohexene molecular mass})} \times \frac{100}{\text{toluene(g)} + \text{cyclohexene(g)}} \times 1000$$

4-2-3. Parameter setting

Measurement conditions must be set up for measurement. Enter parameters as indicated on [Function] – [Method edit].



[Titration parameter]

Titration mode	: Br2
Drift stop mode	: Rel.
Rel.	: 1.0ug/s

[Control parameter]

Cell type	: 2-comp.
Stable	: 0.5ug/min
Electrolysis speed	: standard
End level	: 300mV

[Calculation parameter]

Calc. No.	: No.7 or 8
Unit	: g/100g or mg/100g

4-2-4. Reagent and measurement procedure

< Prepare reagent >

Refer to the below chart for sample size:

Bromine index (mg/100g)	Sample size (g)
Below 10	10 ~ 15
10 ~ 50	5 ~ 10
50 ~ 100	3 ~ 5
100 ~ 200	1 ~ 3
More than 200	~ 1

For bromine number, a sample is diluted with toluene to Bromine number 0.2 (g/100g), and approximately 1g is used for measurement. Calculate the toluene to be used for diluting to Bromine number 0.2 (g/100g) with the following equation:

$$\text{toluene(g)} = \text{sample(g)} \times \frac{\text{Expected bromine number in sample}(gBr_2/100g)}{0.2(gBr_2/100g)}$$

Obtain the dilution coefficient in advance according to the following equation:

$$\text{Dilution coefficient} \quad D = \frac{\text{sample(g)} + \text{toluene(g)}}{\text{sample(g)}}$$

< Measurement procedure >

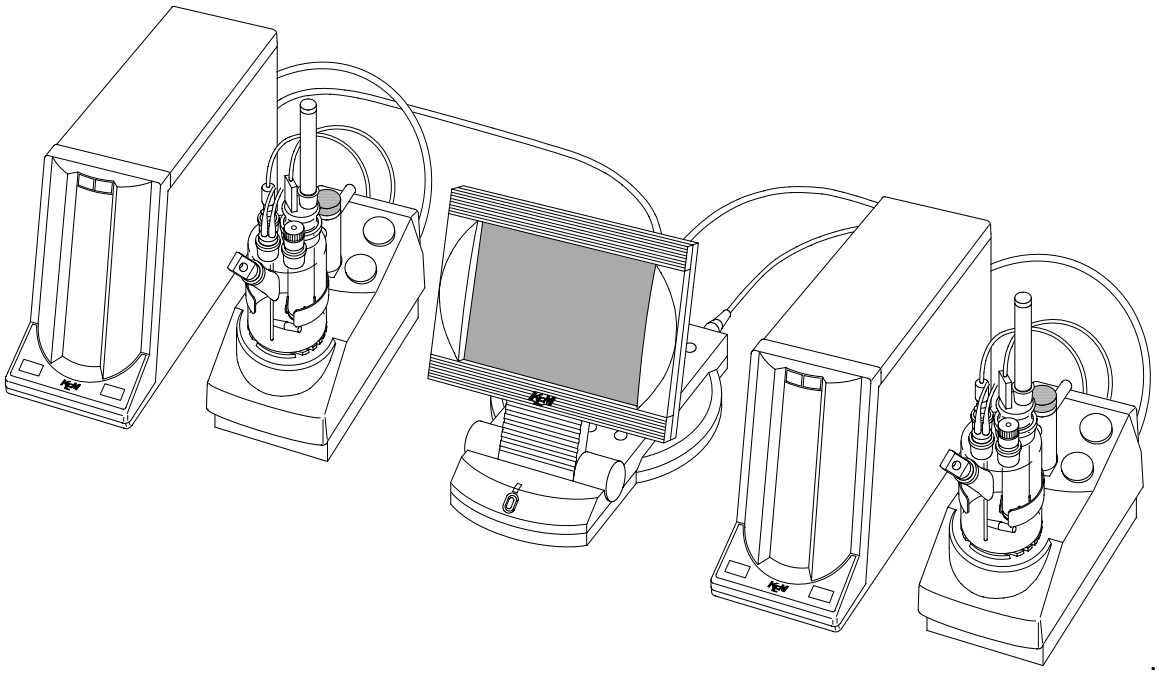
1) Discharge 20 ~ 100μL check solution into the electrolysis cell, and press [Pretitr.] button.
2) After pre-titration is finished, press [Sample] button to enter sample name, its ID and size, and enter the dilution coefficient (D) in [Constant] button. Press [Back] to Main display.
3) Press [Start] button, and discharge the sample into the cell. Again press [Start] button for titration to start.
4) After titration is over, the measurement results appear on display with printout when a printer is connected.

Note:

When discharged samples exceed 100mL in total, change the anolyte. Changing the anolyte may be required each time for those samples, which do not dissolve in anolyte or measurement results deviate substantially each time.

4-3. Connecting a plural number of measuring unit

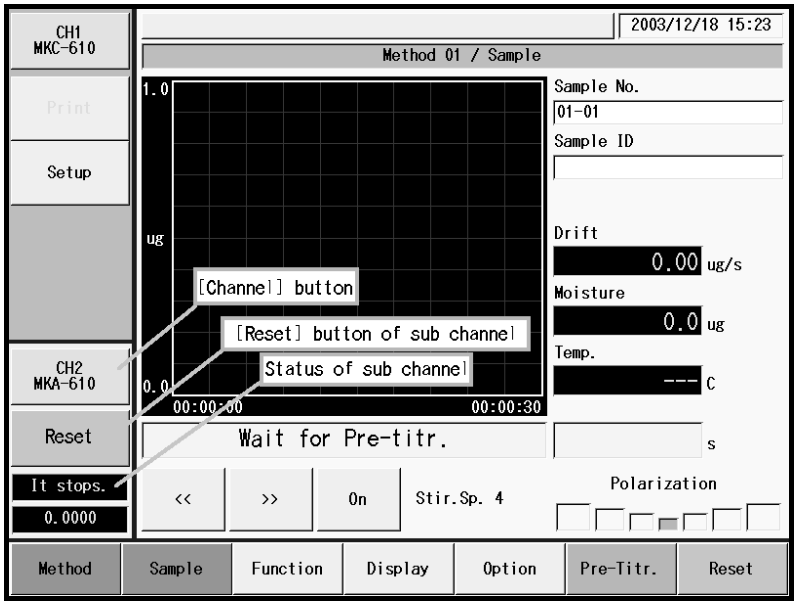
1) Connect the additional unit and Main control unit MCU-610 as below.
2) Set MCU number on the back of the additional unit to “1”.
3) Turn on the power of the measuring units and optional peripherals.
4) Turn on MCU-610. The additional measuring unit is taken for channel2 (CH2).



Note:

The power for Main control unit MCU-610 must be turned on only after the peripherals are turned on. Do not turn ON simultaneously the power supply of measuring units and optional peripherals.

< When MKA-610/2ND is connected >



4-4. Use CF card

The optional CF card can store the method data, titration results or sample file configurations. Insert the CF card into the slot of the Main Control Unit (MCU-610) for use.
Further, the data stored on CF card can be sent to a PC with the optional Titration Data Analysis Software Tview6. The Titration Data Analysis Software Tview6 features the consolidation, recalculation, generation of Word®-formatted report, storage in CSV format on measured data and so on.
This software can run on the Windows® 2000 or XP platform.

<Basic functions of Titration Data Analysis Software Tview6>	
Displayed contents	Titration curve, Calculation results, Data list
Recalculation	Sample amount, ID, Factor, Changeable blank data
Statistical calculation	Mean, Standard Deviation (SD), Relative SD
Printing	One result/one page, Two results/one page Four results/one page, View all results
Data processing	Generation of Word®-formatted report, Save in CSV format

Note:

- **Use CF card with FAT (FAT16) formatted. The Memory Card (P/N: 98-435-0008) is already FAT16 formatted when purchased. Otherwise, use your PC to initialize the card for the FAT (FAT16) format.**
- **Do not copy data files from a PC to the CF card. Failure can lead to the inability of access of data on the CF card by the titrator main unit.**
- **Do not execute scandisk from a PC to the CF card. Failure can lead to the inability of access of data on the CF card by the titrator main unit.**
- **The data stored with Tview6 cannot be read by the titrator main unit through the CF card.**

Note:

For storage of method data, refer to "3-5-2-2. [Save CF] (Method data) ".
For storage of titration results, refer to "3-5-3-4. [Save CF] (Titration results) ".
For manipulating stored data, refer to" 3-5-13. [Operation of CF card] ".

⚠ Caution!

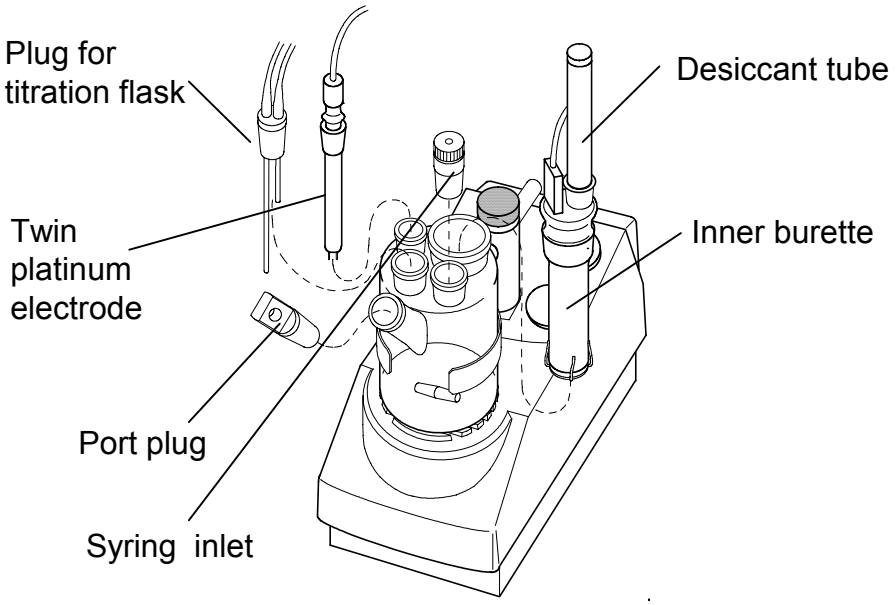
Do not detach the CF card from the slot when making access to it.

5. Maintenance

5-1. Daily checkup

5-1-1. Karl Fischer grease

Twin platinum electrode, inner burette, syringe inlet, desiccant tube, port plug, and plug for titration flask are removed from a titration cell. Apply KF grease around glass contact areas. Check those parts once a week to ensure they rotate smoothly. If not, apply thin coating of grease. Do not apply too much grease as it may penetrate the titration cell and increase the background owing to the water content of the grease.



⚠ Caution!

Check the glass joints from time to time so that applied grease will not solidifies.

If grease on the glass contact areas becomes hard and the respective parts are difficult to separate, take the following steps;

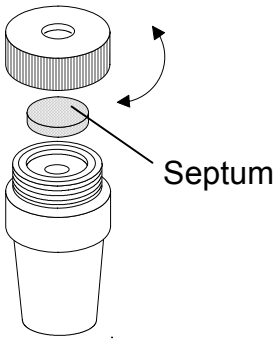
1) Discharge anolyte and catholyte.
2) Heat the glass contact areas with a hair dryer to melt the grease.

⚠ Warning!

Care should be taken not to get burned when heating the unit. Do not try and open solidified jointed parts by force. Glassware may break into piercing pieces for injury.

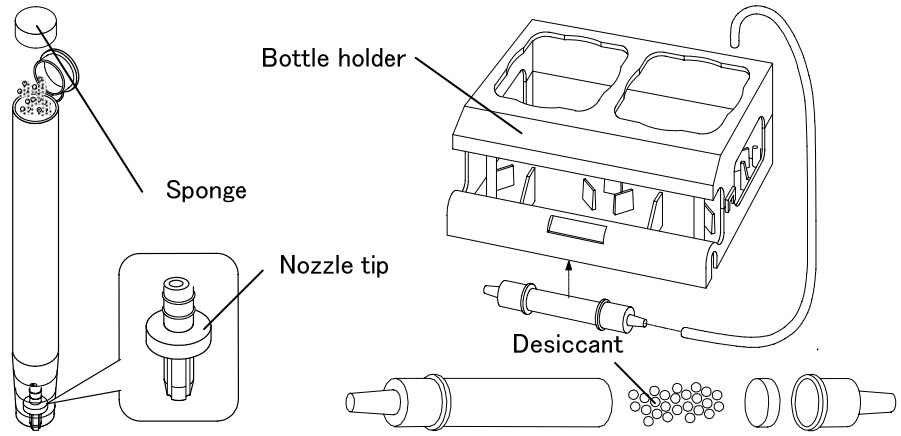
5-1-2. Replacement of septum

The syringe inlet is removed from a titration cell like the clause of an application of KF grease. Change the syringe inlet port septum occasionally. An old septum is easily broken and allows air into titration cell to increase the background.



5-1-3. Changing the desiccant

The desiccant tube is removed from a titration cell like the clause of an application of KF grease.
And the desiccant tube is removed from a bottle holder.
Replace the desiccant with new one when its moisture absorption turns down to reddish color.
Be sure to apply KF grease around sliding area between the titration cell and desiccant tube A.



< Desiccant tube A > < Desiccant tube >

Note:

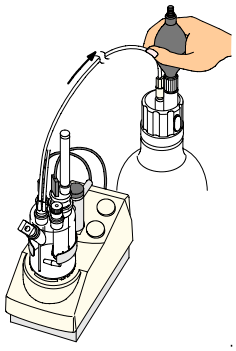
If the nozzle chip slips from the desiccant tube when replacing the desiccant, ensure that you return the nozzle chip in the tube with its trenches downward as shown above.

5-1-4. Replacement of Karl Fischer reagent

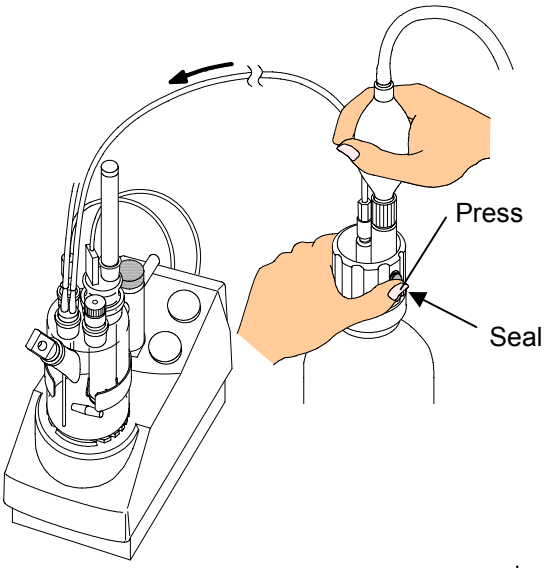
5-1-4-1. Replacement of the anolyte (anode reagent)

Change the anolyte when the accumulated moisture measurement (=reagent life) has reached 1000mgH_2O after the last replacement with new one, when the surface of anolyte exceeds the upper line on cell wall when sample liquid is discharged into the cell or when drift level goes up. (For reagent capacity, see Instruction of the reagent you have purchased.)

1) Drain out the old anolyte using the dispenser. Press and pump the rubber globe on top of the waste bottle a few times to transfer the liquid into the waste bottle.



2) Fill the titration cell with new reagent. Hold the seal attached to the top of regent bottle with your finger, and pump the rubber globe. The reagent will flow into the cell. Fill the titration cell with 100mL reagent for two component cell, and fill the titration cell with 150mL reagent for one component cell. (The lower line outside the titration cell indicates approx.100mL line for anolyte, and the middle point between upper and lower line marked outside the titration cell indicates approx.150mL line for anolyte.) To stop filling, detach your finger which is holding the seal.



3) After the anode is filled with new anolyte, press [Clear] button and set the Now life to zero “0”.

5-1-4-2. Replacement of the catholyte (cathode reagent)

Change the catholyte when the accumulated moisture measurement (=reagent life) has reached 300mgH_2O after the last replacement with new one or when drift level goes up. (For reagent capacity, see Instruction of the reagent you have purchased.)

1) Suck the old catholyte out to the supplied washing bottle.
2) Fill the cathode with 5mL of new catholyte.
3) After the cathode is filled with new catholyte, press [Clear] button and set the Now life indicator to zero "0".

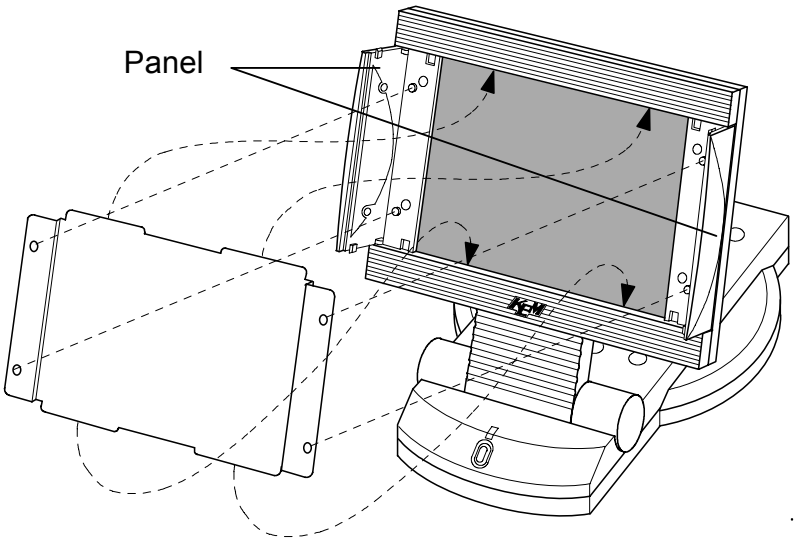
Note:

Negligence of replacing cathode reagent will cause higher drift level, foreign objects generated around the diaphragm and may lead to measurement errors. The optional single component titration cell does not need the above process. The lower line on cell wall indicates approximately 5mL filling.

5-1-5. Replacement of protection film

Change the protection film on the touch-on panel of Main control unit MCU-610 with new one when it is stained or if you observe dirt retention on it.

1) Turn off power of MCU.
2) Open its left and right doors on panel.
3) Remove the old film. (The film is inserted onto the panel vertically.)
4) Insert the new film while aligning the film holes with hooks on panel.
5) Close the panel doors.



5-2. Other Maintenance

5-2-1. Storage of the instrument

Store the instrument, if it is not going to be operated for a long period of time in a place where there is no direct sunlight or under no vibration, and the place is dry, not humid. It is recommended to pack it in the carton box in which the instrument was first delivered.
Store in a desiccant container the disassembled titration cell, inner burette and electrode as they are after cleansed and dried.

5-2-2. Cleaning the electrode

If the electrode is heavily stained and the potential is unstable and measurement reading fluctuates, cleanse it with nitric acid, and after cleaning by methanol, wipe off with clean gauze.

5-2-3. Cleaning the titration cell

1) Remove Detection electrode, Inner burette and Sampling port stopper, and then drain out the reagent.
2) Wipe off the grease around the sliding area with methanol.
3) Rinse by neutral detergent under running water.
4) After drying the glassware in a heater, either cool them in desiccator or dry them.

Note:
Insufficiently dried glassware may cause higher drift level.

5-2-4. Cleaning the inner burette and how to dry it

Periodical cleaning of inner burette is recommended since if the inner burette is stained, the electrolysis reaction will not run smoothly, and may cause a longer time length in measuring process with measurement results higher than theoretical value.

< Cleaning with alcohol: general method >

1) Turn off all the powers.
2) Disconnect the electrodes from their ports.
3) Take out both anolyte and catholyte.
4) Wipe off grease around sliding area with methanol.
5) Rinse the inner burette with methanol, and fill it with approximately 10mL of methanol, and then, put it in a beaker. Fill the beaker with methanol up to the level of methanol inside the inner burette, and leave it for about 30 minutes.
6) After the above 5), dry the inner burette.

< Cleaning with chromic acid mixture >

If foreign objects are observed on diaphragm and platinum surface, use chromic acid mixture instead of methanol for cleaning.

Chromic acid mixture : 1.5g approx. potassium dichromate dissolved in 100mL of concentrated sulfuric acid

⚠ Caution!

Chromic acid mixture is a very strong oxidizing reagent. When handling this chemical, protect yourself with gloves and glasses. If it touches your skin, immediately rinse it with running water.

1) Follow the same steps as above for methanol.
2) Drain out the chromate inside the cell, and rinse it with pure water for 5 to 6 times until yellowish color disappears.
3) Clean the inner burette with methanol or with alcohol.
4) After cleaning, dry the inner burette.

⚠ Caution!

Chrome is a heavy metal. Do not discard the used mixture or rinsing solvent as wastewater. First, dilute the collected chromic acid mixture down to 1% concentration, and then, reduce it. After confirming no Cr^{6+} is contained in it, adjust its pH to 7.5 ~ 8.5. Filter the liquid, and store the precipitation.

For more details, refer to the corresponding documents regarding how to dispose of heavy metals.

< How to dry the inner burette >

Dry it in a decompression dryer for more than 2 hours.

Below sketch shows an example of commercially sold drying under reduced pressure.

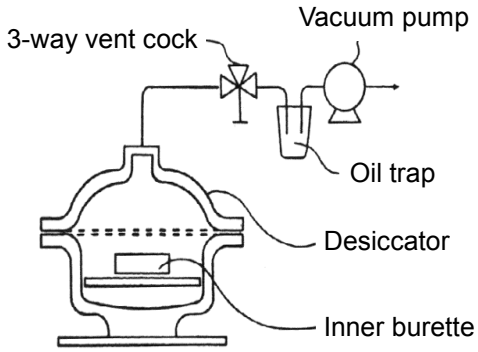
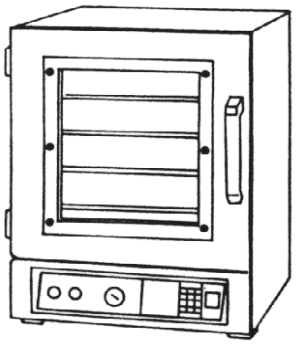


Diagram of Decompression dryer



Commercially available vacuum dryer

⚠ Caution!

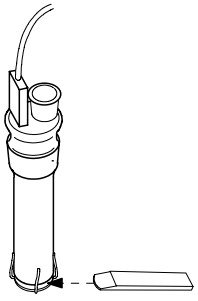
Dry the inner burette itself only after removed from the titration cell in order to avoid possible breakage of inside ceramic diaphragm.

Note:

Use a hair dryer if a compression dryer is not available. With a hair dryer, dry the inner burette well enough as long as for more than 10 minutes, especially dry the diaphragm until it is really dried. Any residue of moisture will cause high drift level.

< Distance adjustment between anode electrode and diaphragm >

If the anode electrode in the inner burette and the diaphragm are too close together, electrolysis reaction will not run in normal condition. Use the supplied anode adjuster to adjust the distance in between.



5-2-5. Cleaning the drain tube

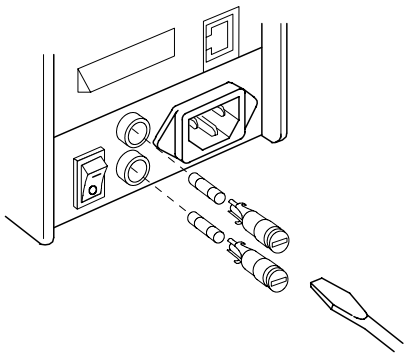
1) Remove the tube line, and clean it with ethanol.
2) Connect the tube, and inject solvent, and see if it is drained out smoothly.

Note:

KF reagent contains substantial amount of salt. If it is not used for an extended period of time, the salt may precipitate out of solution and clog the pipe. Rinse and clean all tube lines if not to be used for an extended period of time.

5-2-6. Changing the blown off power fuse

1) Turn the power switch to off position, and remove the power cord.
2) Open the cover over the power receptacle with a flat screw driver.
3) Remove the fuse holders using the screw driver.
4) Insert new fuse into the holder and close the cover.



⚠ Warning!

Be aware of electric shock. When replacing the power fuse, always turn off the power first, and remove the power cord.

⚠ Caution!

There are two fuses. It is recommended to change them all at a time.

5-2-7. Replacing the clock battery

If the clock does not function correctly, the inside battery needs to be replaced with new one. Ask your local dealer for its replacement.

6. Troubleshooting

6-1. Error message and remedies

Error message	Trouble	Remedies
Pot. not detected ↑↓ Check det. electrode	· Connecting cable is not connected.	· Check on connection between the detection electrode and stirrer.
	· Electrode cable is broken or loosely connected.	· Replace the electrode.
Short-circuit in det. electrode ↑↓ Check det. electrode	· When the electrode is shorted. · Twin Pt pins of electrode are in contact.	· Correct the two pins to extend in parallel.
	· It is over-titration.	· Add water to polarize the cell.
	· The tip of electrode is cracked.	· Replace the detection electrode.
Potential Too Low ↑↓ Inject sample	· Over-titration is underway. · Reagent with too much iodine is cell.	· Add water to the cell.
	· The titration cell is under direct sunlight.	· Refrain from direct sun's ray or use a brown cell.
	· The anode is stained with foreign objects.	· Clean the inner burette and the electrode.
Beyond meas. Range ↑↓ Decrease Samp. Amt.	· When measurement exceeds the range.	· Change the catholyte. Also change the anolyte if necessary.
	· One time measurement exceeds 100mgH2O.	· Reduce sample size not to exceed 200mgH2O, and try again.
Wrong Parameter Set ↑↓ Review settings	· Measurement is unable with preset parameters. · T (max) (0s) is set in without Drift stop.	· Change the setting of titration limit time and drift stop mode.
	· To use the oven is selected on parameter setup without oven.	· Turn it off to use the option.
Cannot titrate ↑↓ Check inner cell	· Sample liquid resistance is too high or the electrode cable is broken causing no current flow for electrolysis in inner cell.	· Check on electrode connection. · Reduce sample size.

Error message	Trouble	Remedies
Problem occurred ↑↓ Please press [Reset] button	· Communication with measuring unit runs out of time or runs into failure.	· Check on connecting cable to see if it is not disconnected. · Change the connecting cable.
Epidemic on Preamp. ↑↓ Contact the manufacturer	· Preamplifier circuit is now defective.	· Contact your local dealer.
Oven won't operate ↑↓ Check connect.	· The power for oven is turned off.	· Make sure of the power turned on.
	· Connecting cable is disconnected.	· Make sure of its connection.
	· Connecting cable is broken.	· Replace the connecting cable.
Connect meas. unit, ↑↓ Please turn power on	· When the measuring unit does not start when power is turned on. · When the system fails in connecting the measuring unit.	· Turn off the power of measuring unit and main control unit once, and turn on the power again.
Problem occurred. ↑↓ Please press [Reset] button	· Communication failure on the device other than MCU-610 main unit.	· Check and see the connection of connectors and cables on the measuring devices, followed by touching [Reset] button. (If touching [Reset] button does not lead to the solution, i.e. the error message still stays, then) · Reboot the system. · After backing up titration results or parameters on CF card or the like, initialize all parameters stored on the system by selecting [Function] – [Memory clear] – [All parameters].

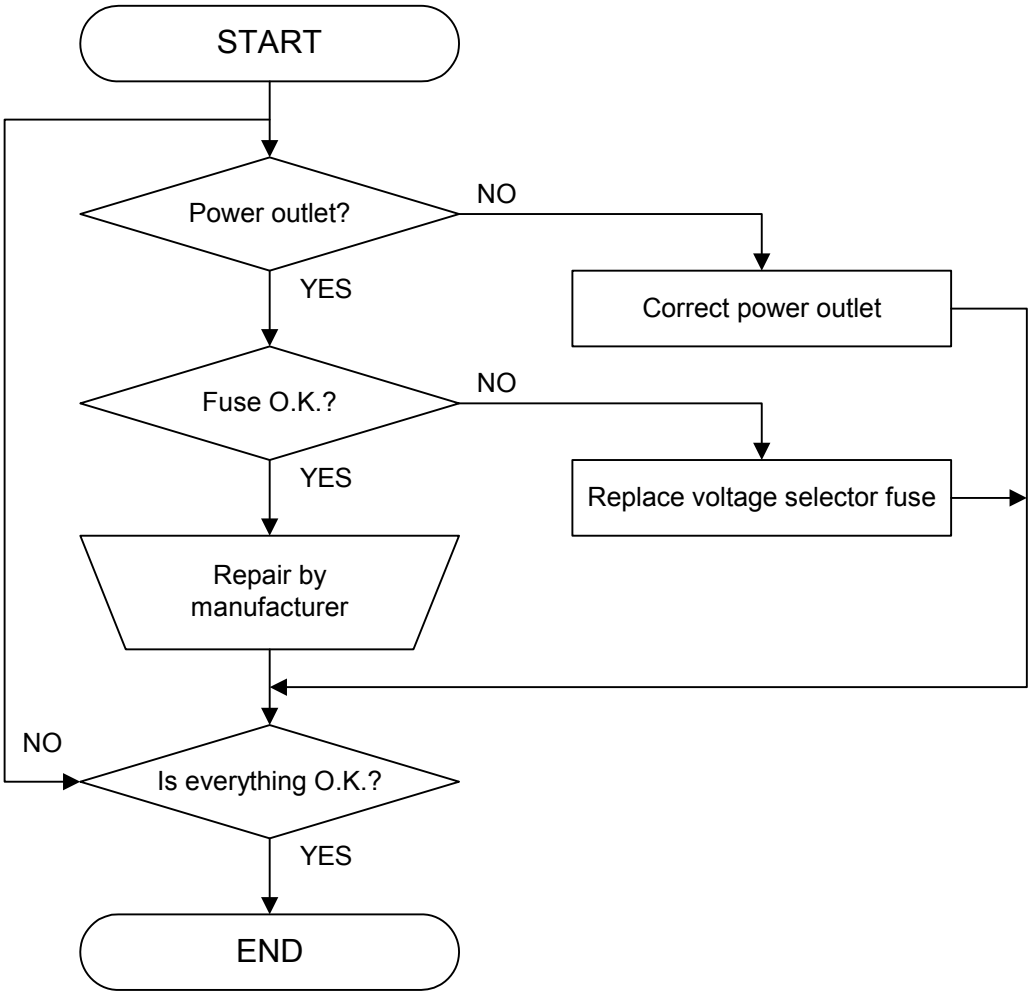
6-2. Alarm message and remedies

Alarm message	Reason	Remedies
Beyond upper limit of Anolyte life ↑↓ Replace an anolyte	Because the total anode reagent consumed in electrolysis exceeds the preset level.	Change the anolyte and clear the reading and reset the now life to zero.
Beyond upper limit of Catholyte life ↑↓ Replace a catholyte	Because the total cathode reagent consumed in electrolysis exceeds the preset level.	Change the catholyte and clear the reading and reset the now life to zero.
Replacement date an anolyte ↑↓ Replace an anolyte	Because the date for changing the anolyte becomes due today.	Change the reagent and clear the due date setting.
Replacement date a catholyte ↑↓ Replace a catholyte	Because the date for changing the catholyte becomes due today.	Change the reagent and clear the due date setting.
Replacement of an anolyte overdue ↑↓ Replace an anolyte	Because the date for changing the anolyte is past.	Change the reagent and clear the due date setting.
Replacement of a catholyte ↑↓ Change Catholyte Now	Because the date for changing the catholyte is past.	Change the reagent and clear the due date setting.
Replace an anolyte in xx days	Because the preset due date to change anolyte is xx days.	Change the reagent and clear the due date setting.
Replace a catholyte in xx days	Because the preset due date to change catholyte is xx days.	Change the reagent and clear the due date setting.
Periodic check date ↑↓ Make a periodic check	Because the preset check date becomes due.	Use the check method until the results fall in permit error.
Periodic check date overdue ↑↓ Make a periodic check	Because the check date is past.	Use the check method until the results fall in permit error.
Periodic check in xx days	Because the preset due date to check is xx days.	Perform the check for verification and evaluation.

Note:

Measurement can continue even with the alarm message being on display.

6-3. Power failure



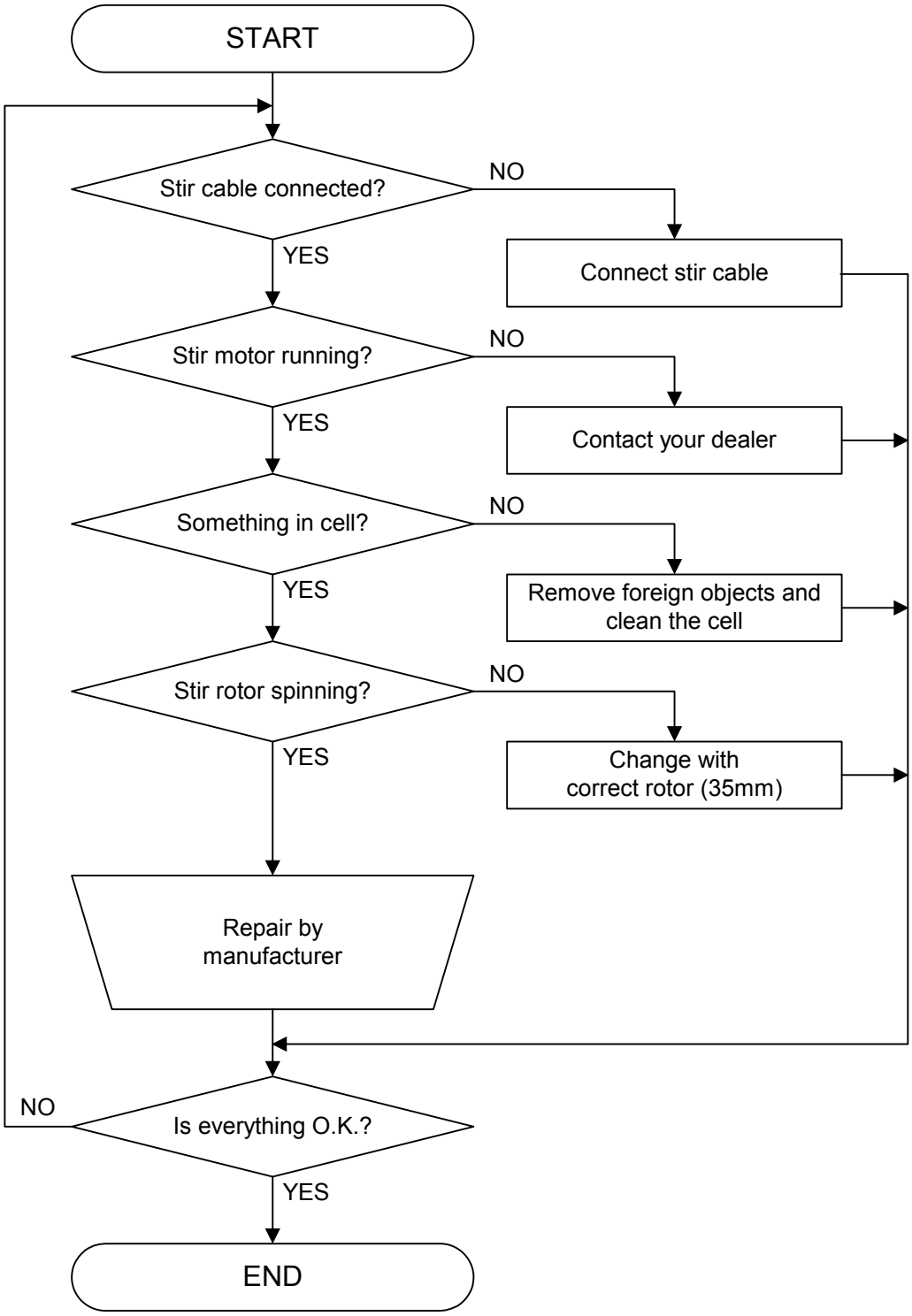
⚠ Warning!

For continued protection against risk of fire:
Replace only with same type and rating of fuse.

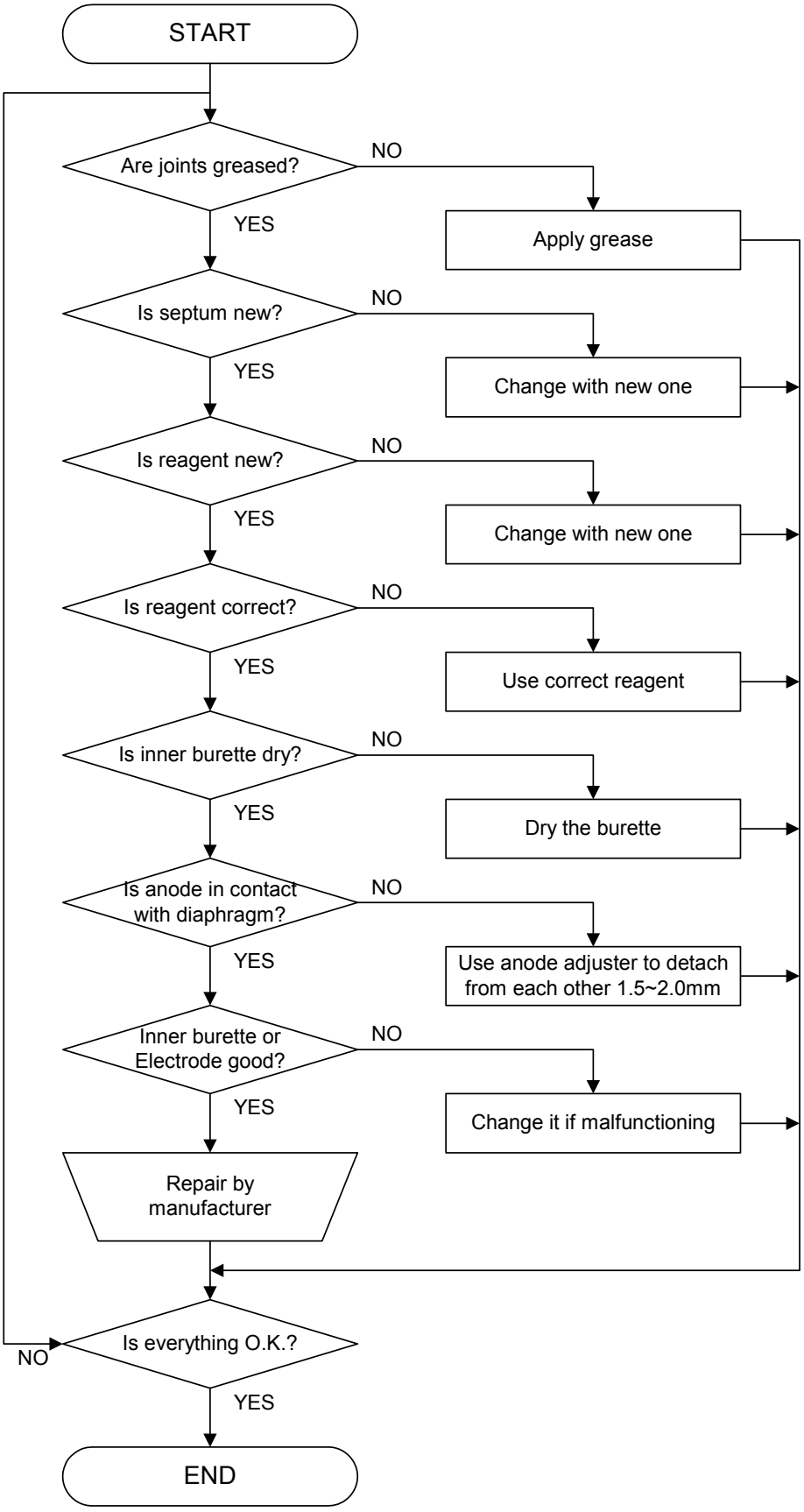
⚠ Caution!

The warranty does not apply to any troubles on the electric circuit when input voltage is applied improperly.

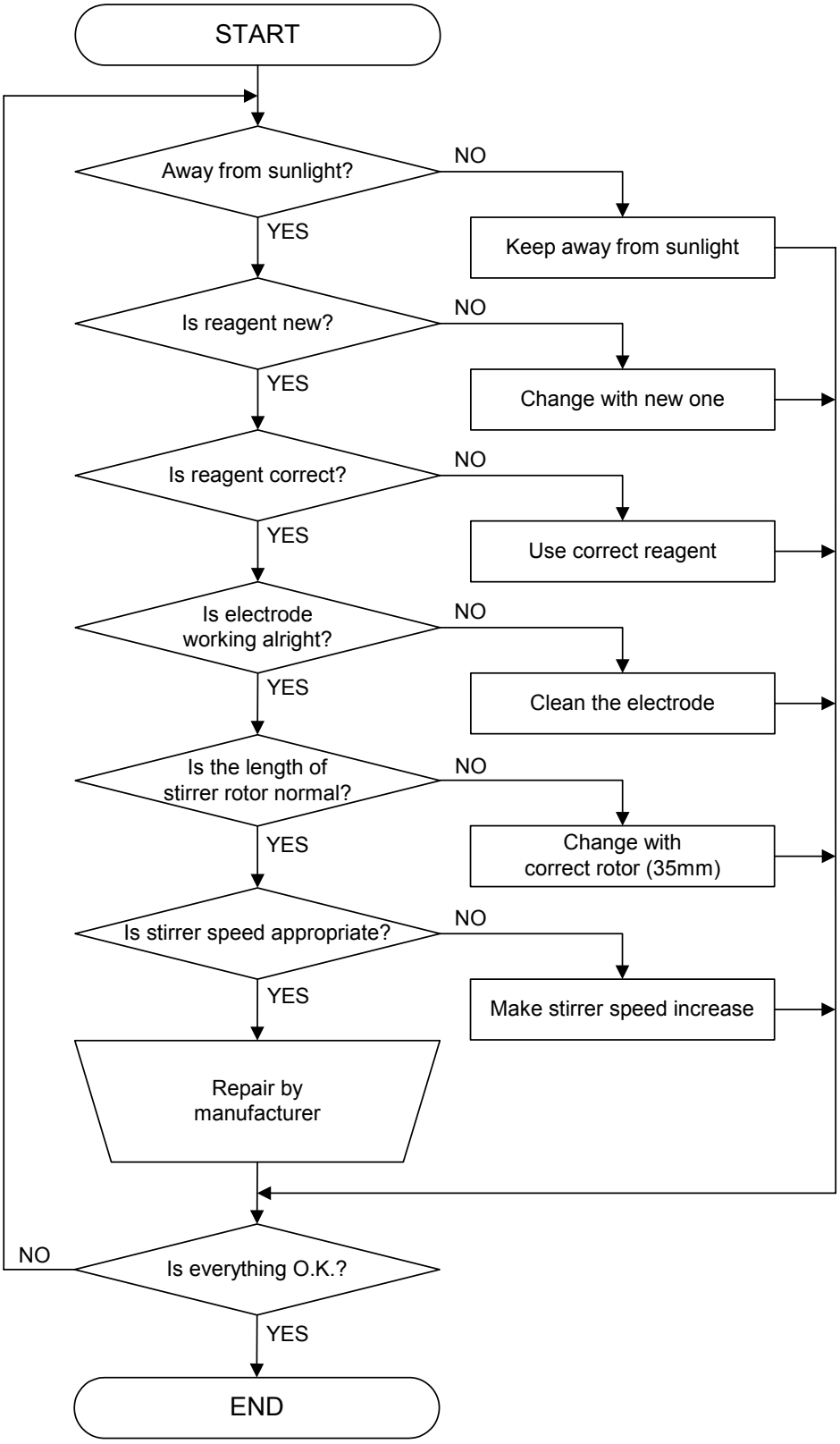
6-4. Stirrer does not work properly



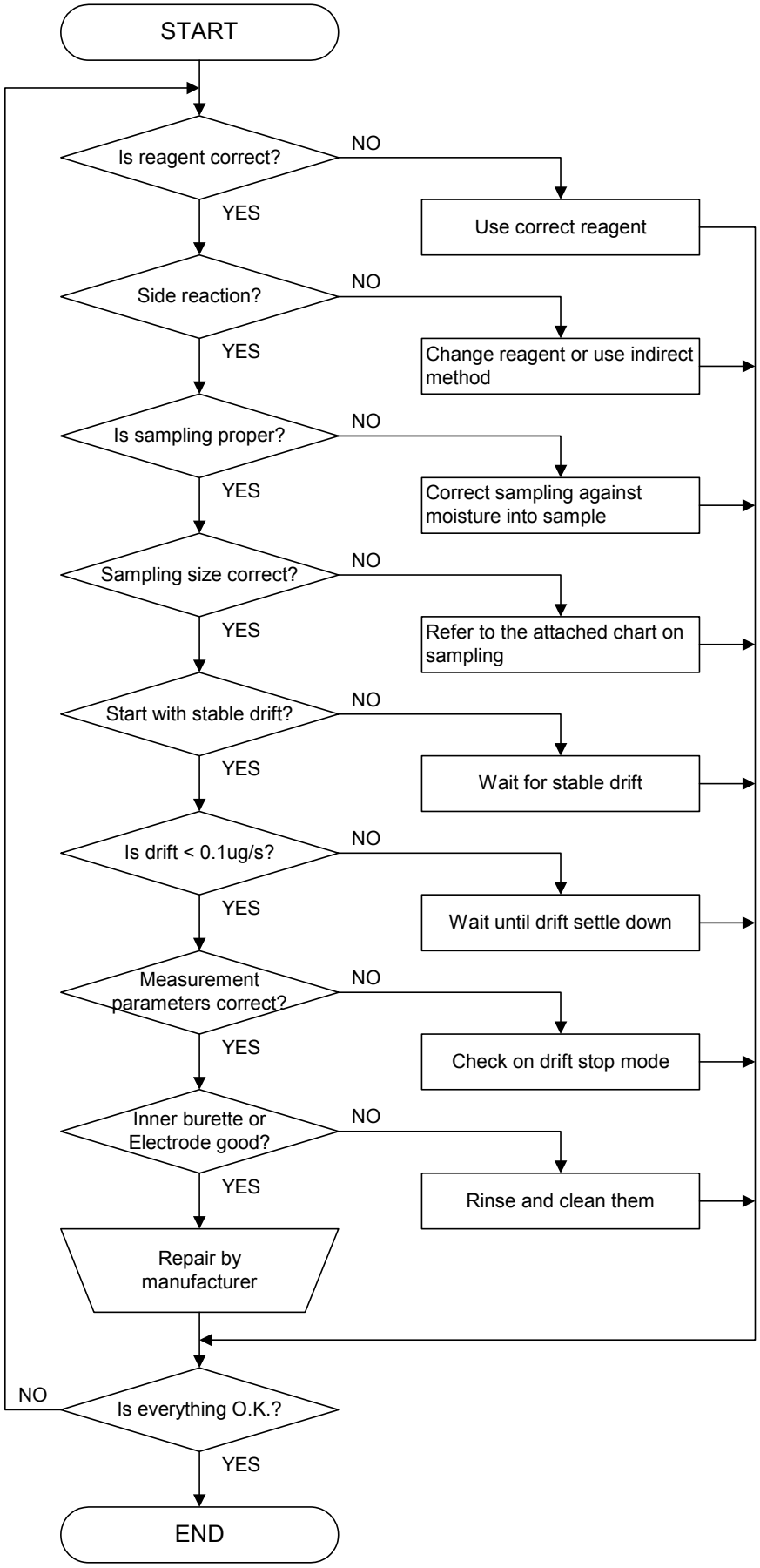
6-5. Drift level is too high



6-6. It runs into over-titration



6-7. Poor repeatability or no EP found



For reproducibility of measurement results, moisture content and sample size relations in below chart is important.

Moisture Content				Sample Size			
50	~	100	%	10			mg
10	~	50	%	10	~	20	mg
1	~	10	%	10	~	50	mg
0.1	~	1	%	10	~	100	mg
0.01	~	0.1	%	100mg	~	1.0	g
0.001	~	0.01	%	1	~	10	g
0.0001	~	0.001	%	10	~	20	g

6-8. Glass contact area jammed

If grease on the glass contact areas becomes hard and the respective parts are difficult to separate, take the following steps;

1) Discharge anolyte and catholyte.
2) Heat the glass contact areas with a hair dryer to melt the grease.

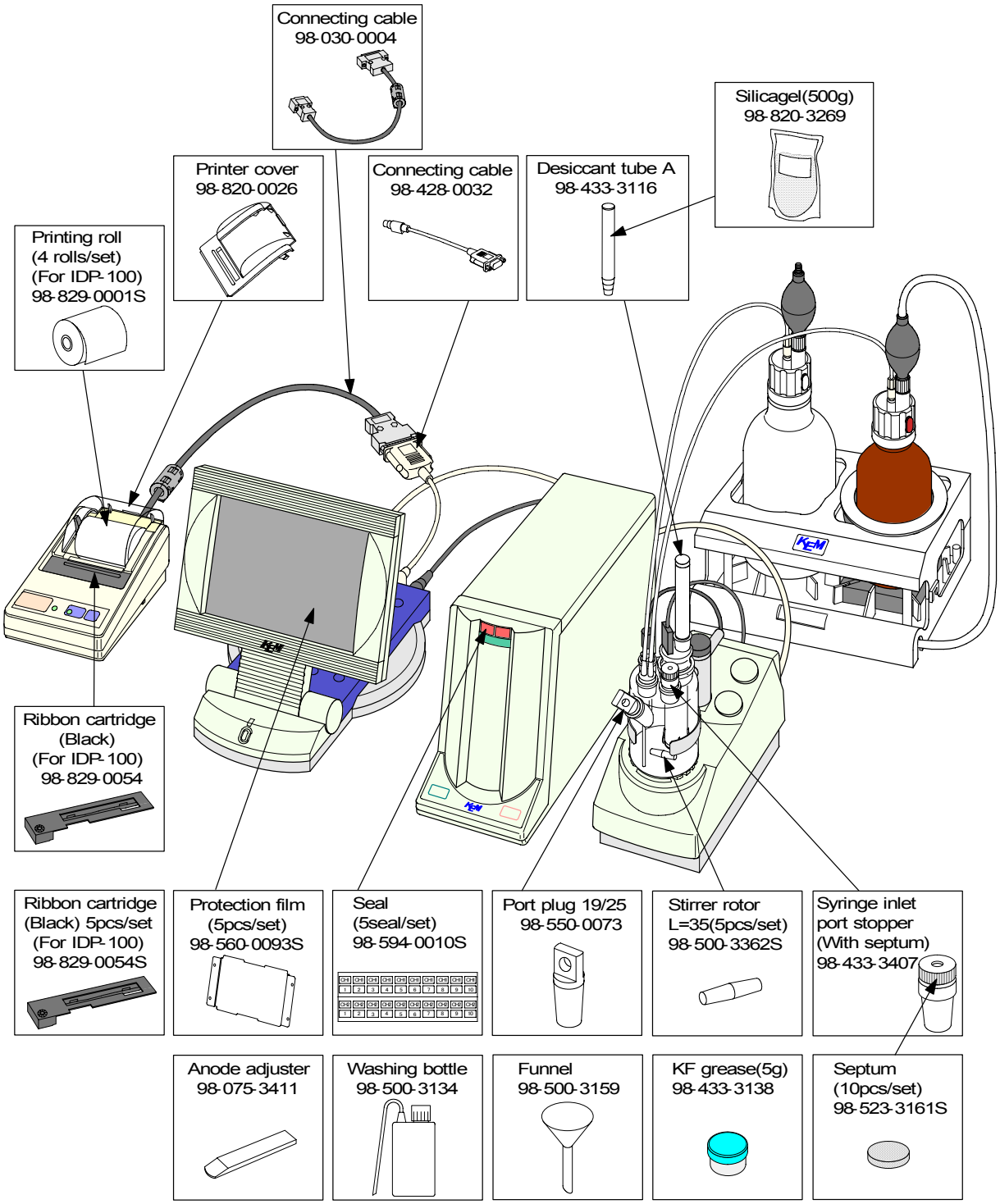
⚠ Warning!

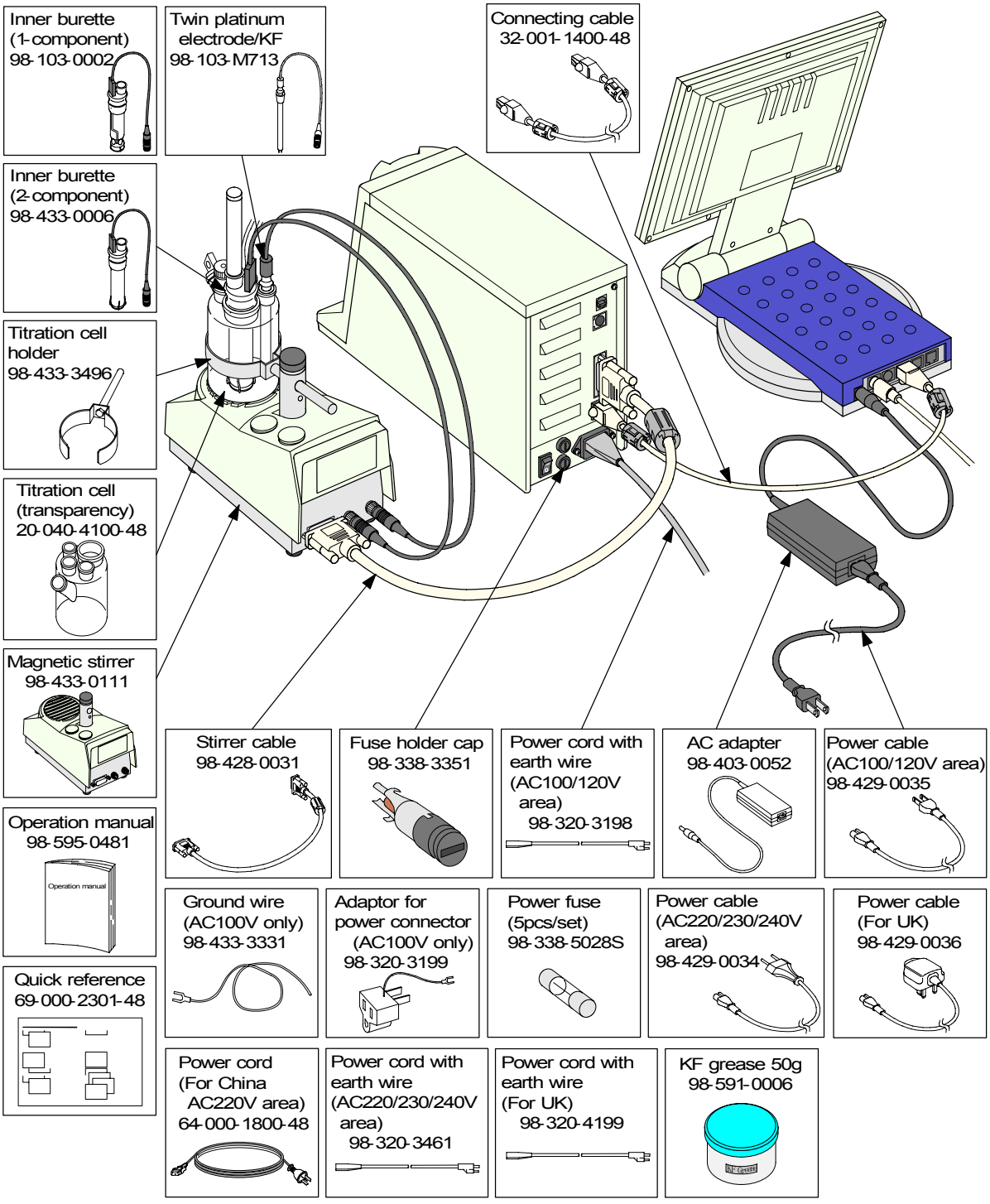
Do not try and open solidified jointed parts by force.
Glassware may break into piercing pieces for injury.

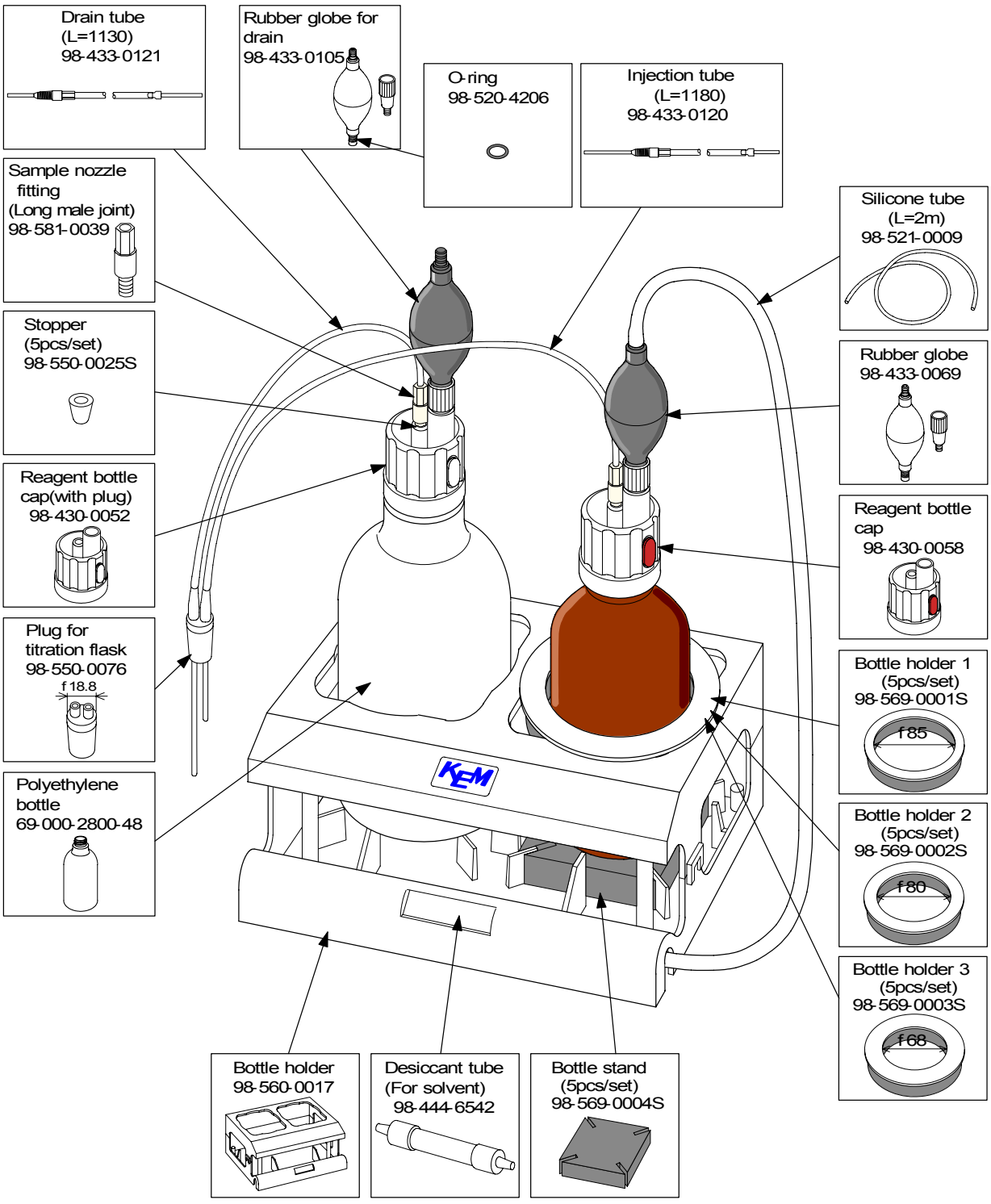
7. Others

7-1. Part list

7-1-1. Consumable parts · Maintenance parts

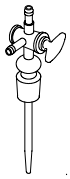
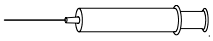
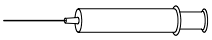



Inner burette (1-component) 98-103-0002
Twin platinum electrode/KF 98-103-M713
Connecting cable 32-001-1400-48
Inner burette (2-component) 98-433-0006
Titration cell holder 98-433-3496
Titration cell (transparency) 20-040-4100-48
Magnetic stirrer 98-433-0111
Operation manual 98-595-0481
Operation manual
Quick reference 69-000-2301-48
Stirrer cable 98-428-0031
Fuse holder cap 98-338-3351
Power cord with earth wire (AC100/120V area) 98-320-3198
AC adapter 98-403-0052
Power cable (AC100/120V area) 98-429-0035
Ground wire (AC100V only) 98-433-3331
Adaptor for power connector (AC100V only) 98-320-3199
Power fuse (5pcs/set) 98-338-5028S
Power cable (AC220/230/240V area) 98-429-0034
Power cable (For UK) 98-429-0036
Power cord (For China AC220V area) 64-000-1800-48
Power cord with earth wire (AC220/230/240V area) 98-320-3461
Power cord with earth wire (For UK) 98-320-4199
KF grease 50g 98-591-0006

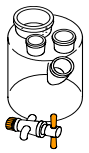
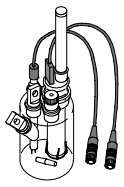
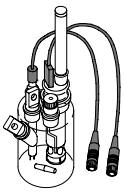

Drain tube
(L=1130)
98-433-0121
Rubber globe for drain
98-433-0105
O-ring
98-520-4206
Injection tube
(L=1180)
98-433-0120
Sample nozzle fitting
(Long male joint)
98-581-0039
Silicone tube
(L=2m)
98-521-0009
Stopper
(5pcs/set)
98-550-0025S
Rubber globe
98-433-0069
Reagent bottle cap(with plug)
98-430-0052
Reagent bottle cap
98-430-0058
Plug for titration flask
98-550-0076
f 18.8
Bottle holder 1
(5pcs/set)
98-569-0001S
f 85
Polyethylene bottle
69-000-2800-48
Bottle holder 2
(5pcs/set)
98-569-0002S
f 80
Bottle holder 3
(5pcs/set)
98-569-0003S
f 68
Bottle holder
98-560-0017
Desiccant tube
(For solvent)
98-444-6542
Bottle stand
(5pcs/set)
98-569-0004S

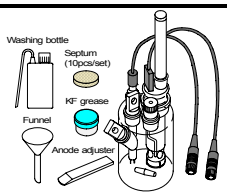
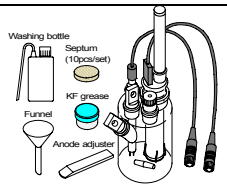
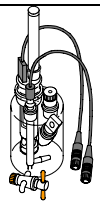
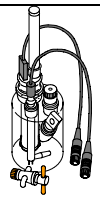
7-1-2. Option

< Sampler >

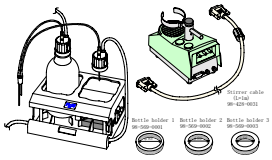
Part code	Part name	Remarks	Sketch
98-433-0117	Sampling set	For powders	
98-433-3389	Liquefied gas sampler		
98-433-3393	Adapter for gas	Bubbler for integrating flow meter	
98-500-3160	Syringe2mL W/Needle	2 mL	
98-523-3227S	Silicon rubber	5pcs/set	
98-500-3225	Syringe 20mL		

< Titration cell >

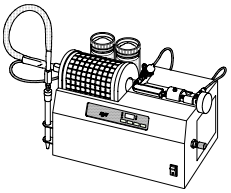
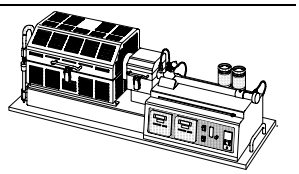
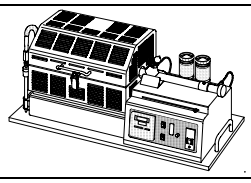
Part code	Part name	Remarks	Sketch
20-040-4200-48	Titration cell	Transparent cell with a drain cock	
12-006-6100-48	Titration cell unit (two solution)	Transparent cell with a drain cock Two-component cell Twin platinum electrode / KF and other attachment	
12-006-6200-48	Titration cell unit (single solution)	Transparent cell with a drain cock One-component cell Twin platinum electrode / KF and other attachment	

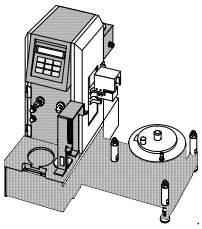
Part code	Part name	Remarks	Sketch
12-006-7300-48	Titration cell unit (single solution) set	Transparent cell One-component cell Twin platinum electrode / KF and other attachment	
12-006-7400-48	Titration cell unit (two solution) set	Transparent cell Two-component cell Twin platinum electrode / KF and other attachment	
12-006-6400-48	Titration cell unit (single solution) set (with a cock)	Transparent cell Two-component cell Twin platinum electrode / KF and other attachment	
12-006-6300-48	Titration cell unit (two solution) set (with a cock)	Transparent cell with a drain cock Two-component cell Twin platinum electrode / KF and other attachment	

< Stirrer unit >

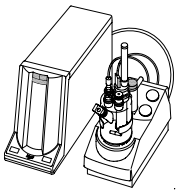
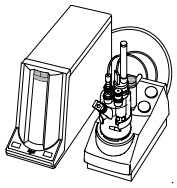
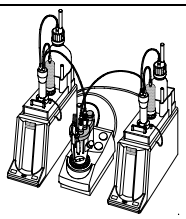
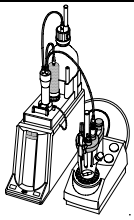
Part code	Part name	Remarks	Sketch
98-433-0135	Automatic absorb and drain unit	With an electric reagent supply-and-drain system	

< Evaporator >

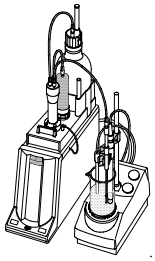
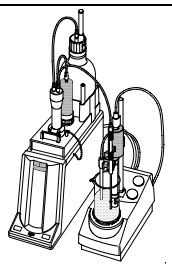
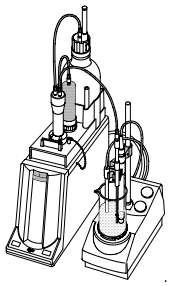
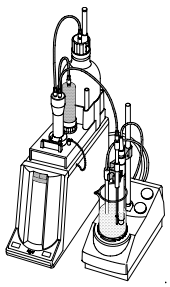
Part code	Part name	Remarks	Sketch
ADP-611	Evaporator		
ADP-512	Evaporator for ores		
ADP-512S	Evaporator for high temperature		

Part code	Part name	Remarks	Sketch
ADP-513	Evaporator for oil sample		
CHK-501	Multiple Sample Changer		

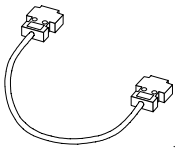
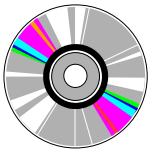
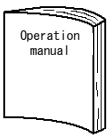
< Additional unit (Karl Fisher Moisture Titrator) >

Part code	Part name	Remarks	Sketch
MKC-610-D/2ND	Karl Fisher Moisture Titrator for Coulometric Method	Two-component cell type	
MKC-610-N/2ND	Karl Fisher Moisture Titrator for Coulometric Method	One-component cell type	
MKA-610-T/2ND	Karl Fisher Moisture Titrator for Volumetric Method	Twin burette type	
MKA-610-S/2ND	Karl Fisher Moisture Titrator for Volumetric Method	Single burette type	

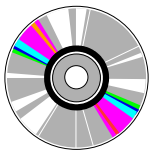
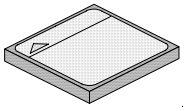
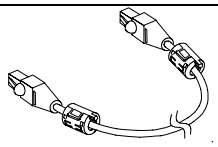
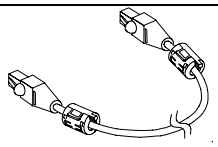
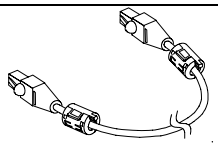
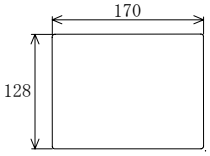
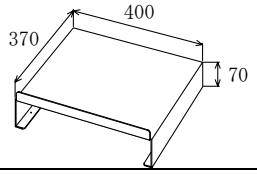
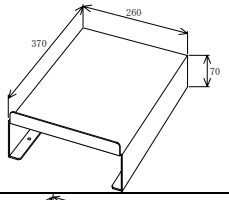
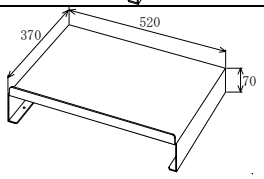
< Additional unit (Automatic Potentiometric Titrator) >

Part code	Part name	Remarks	Sketch
AT-610-S/2ND AT-610-T/2ND	Titration Unit	Standard For pH dual input	
AT-610-P/2ND	Titration Unit	For photometric titration Including photo sensor, connection cable, interference filters (530 nm & 630 nm) and shutter	
AT-610-O/2ND	Titration Unit	For polarization titration Including Twin platinum electrode (P/N: 98-100-M511)	
AT-610-C/2ND	Titration Unit	For conductometric titration Including conductivity cell (P/N: 98-101-K321)	

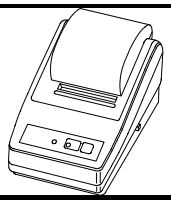
< PC connection >

Part code	Part name	Remarks	Sketch
98-030-0002	Connecting cable	9pin-9pin	
SOFT-CAPE	Data capture software		
69-000-2303-48	Operation manual	RS-232C	

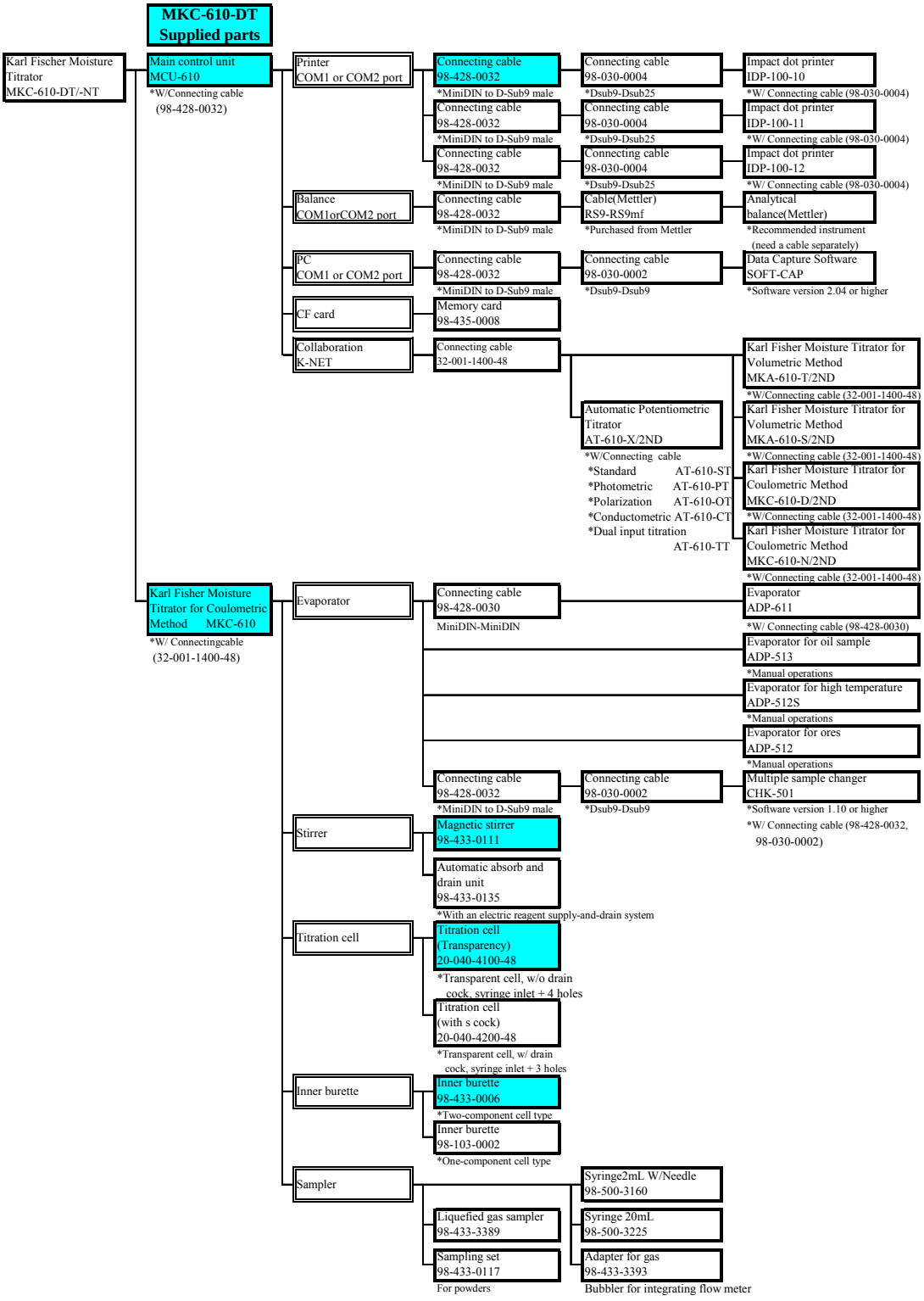
< Others >

Part code	Part name	Remarks	Sketch
TVIEW6	Analysis software for Titration Results		
98-435-0008	Memory card	32MB	
32-001-1401-48	Connecting cable	3m	
32-001-1402-48	Connecting cable	5m	
32-001-1403-48	Connecting cable	10m	
20-024-5400-48	Protection film	Luster type	
98-433-0123	System table (1)		
98-433-0124	System table (2)		
98-433-0126	System table (3)		

< Printer >

Part code	Part name	Remarks	Sketch
IDP-100-10 -11 -12	Impact dot printer (AC 100V) (AC 120V) (AC 230V)		

7-2. System Configuration



7-3. Specification

Specification	Contents	
Type and model	Model MKC-610 Karl Fischer Moisture Titrator	
	MKC-610-DT	MKC-610-NT
Measuring method	Karl Fischer Coulometric titration	
Measuring range	Water content : 10ug ~ 100mg	
Measurement cell	2-Component	1-Component
Precision	1) Relative standard deviation : less than 0.3% (n=10) 2) Display resolution : 0.1ug	
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	
Key operation	Direct input on Touch-on panel	
Displays	1) 8-inch LCD in 256 colors 800 × 600 dots 2) Selective English or Japanese on display 3) Real time evaporation curve on display	
Calculation	Concentration of water content, statistics data processing (mean, SD and RSD) and automatic averaging of blank value	
Data storage	On-board memory : 300 samples Memory card (Compact Flash) : ca. 1000 samples	
Additional features	1) Automatic adjustment of drift level 2) Auto start by sensing sample discharged in titration cell 3) Stores up to 10 blank values	
User control	Up to 50 operators can be registered.	
GLP conformance	Validation check with standard substance : advance notice of check date and recording the results. Reagent life control : alarm due life and advance notice of date for changing reagent	
Titration cell	100mL (max 150mL)	
External control	COM port × 2 channels for printer/electronic balance/ Data Capture Software (SOFT-CAP)	
Ambient condition	1) Temperature : 5 ~ 35°C 2) Humidity : less than 85%RH	
Power source	100 ~120/200 ~ 240VAC±10%, 50/60Hz	
Power consumption	1) Touch-on panel control : 20W 2) Measuring unit and stirrer : 60W	
Dimensions	1) Touch-on panel controller : 230(W) × 280(D) × 255(H) mm 2) Titration unit : 120(W) × 363(D) × 200(H) mm 3) Stirrer : 118(W) × 225(D) × 332(H) mm 4) Solvent change unit : 240(W) × 170(D) × 405(H) mm	
Weight	1) Touch-on panel controller : Aprox.2.0kg 2) Titration unit : Aprox.3.5kg 3) Stirrer : Aprox.1.5kg 4) Solvent change unit : Aprox.0.5kg	
CE marking	EMC : EN61326 LVD : EN61010-1 conformed	

7-4. Reference

7-4-1. Principle of measurement

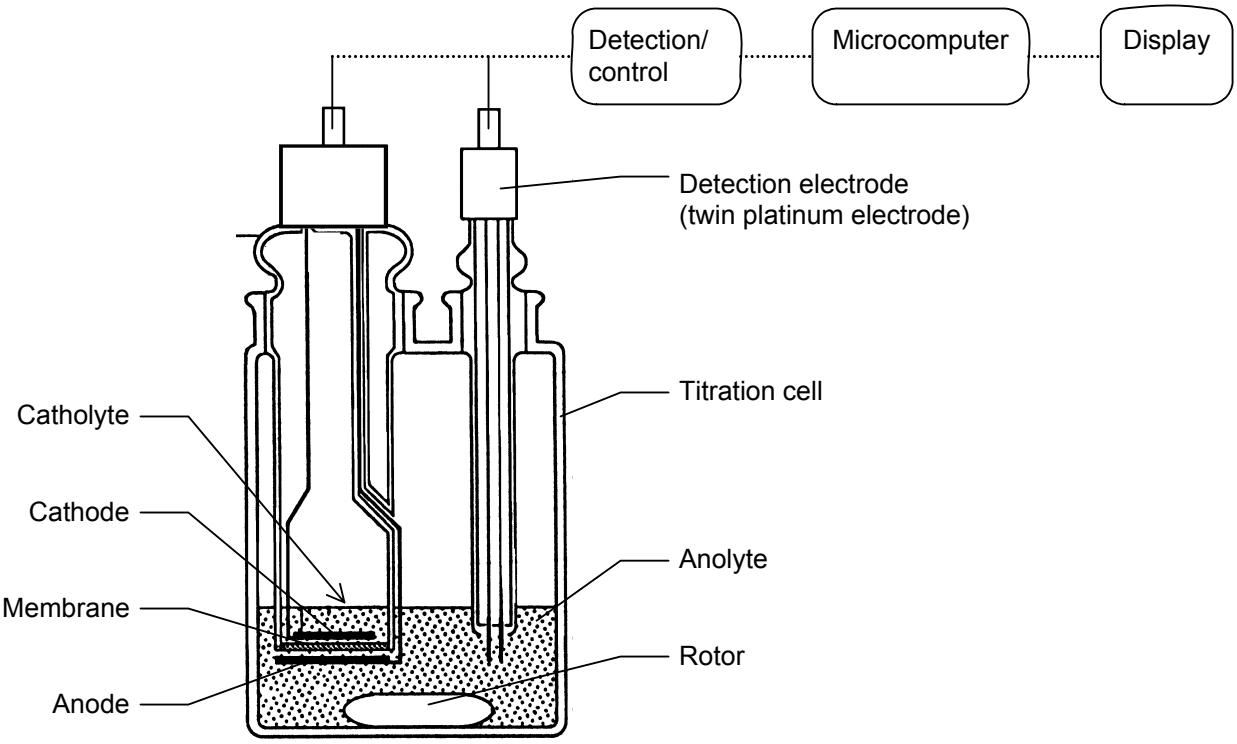
In the Karl Fisher moisture content measurement, water reacts with iodine and sulfur dioxide in the presence of base and alcohol.

$$H_2O + I_2 + SO_2 + CH_3OH + 3RN \rightarrow [RNH]SO_4CH_3 + 2[RNH]I \quad \text{.....(1)}$$

In the volumetric titration, iodine is added as a titrant. In the coulometric technique, iodine is electrolytically generated in the anolyte, which contains iodide.

$$2I^- \rightarrow I2 + 2e^- \quad \text{.....(2)}$$

As long as water is present in the titration cell the generated iodine reacts according to (1).
As soon as all the water reacts, excess of iodine appears in the anolyte. This iodine is detected by the platinum electrode and the iodine production is stopped. According to Faraday's law, the quantity of iodine produced is proportional to the current generated. In equation (1), I_2 and H_2O react with each other in proportion 1:1.
Therefore a mole of water (18 g) is equivalent to 2 × 96500 coulombs, or 10.72 coulombs/ 1 mg H_2O. The total amount of moisture can thus be determined by measuring the total consumption of electricity.



7-4-2. Karl Fischer reagent

For Karl Fischer titration, appropriate reagent must be selected to the sample that you are going to analyze. Below chart shows the type of sample and its corresponding reagents available on the market.

Karl Fischer reagent / Corresponding sample	Coulomat (Riedel-de Haën)	Aquamicron (MITSUBISHI)	Remarks
General titration Alcohols Hydrocarbons Ethers Esters	Coulomat AG* Coulomat CG Coulomat AD**	Aquamicron AX Aquamicron CXU Aquamicron AS Aquamicron CXU	Coulomat AG/CG, Aquamicron AX/CXU are non-organic chlorines.
Ketones	Coulomat AK* Coulomat CG-K Coulomat AK* Coulomat CK	 Aquamicron AKX Aquamicron CXU	Formaldehyde can only be titrated among other aldehydes. Coulomat CG-K Aquamicron CXU are non-organic chlorines.
Gases	Coulomat AG Oven* Coulomat CG Coulomat AG*, Blended solution with Ethylene glycol (Blend ratio/ AG: Ethylene glycol=3:1) Coulomat CG Coulomat AD**	Aquamicron AX Aquamicron CXU Aquamicron AX Aquamicron CX	
Fats and Oils	Coulomat AG-H* Coulomat CG	Aquamicron AX Aquamicron CXU Aquamicron AS Aquamicron CXU	Coulomat AG-H/CG, Aquamicron AX/CXU are non-organic chlorines.
Amines	Coulomat AG Coulomat CG Coulomat AD** To use Coulomat AG, Add acetic acid, Salicylate or benzoic Acid to 20% of 100mL of Coulomat AG.	Aquamicron AX Aquamicron CXU To use Aquamicron AX, add 10g salicylate acid to 100mL Aquamicron AX.	To add, neutralize a basic amine with an acid.

Note) ** possible to use for only single component cell

* possible to use for 2-compoonent cell or 1-component cell

7-4-3. Parameter list

7-4-3-1. Setup parameters

[Regist operator]

Parameter and default			Printout	
Item	Default	Selection range	Item	Printing
Operator name	—	Within 64 characters A-Z,a-z,+,-,/,*,(,),.,,%	User name	As displayed

[Display setup]

Parameter and default			Printout	
Item	Default	Selection range	Item	Printing
Language	Japanese	Japanese/English	Language	As displayed
Date format	YYYY/MM/DD	YYYY/MM/DD MM/DD/YYYY	Date format	As displayed
Date&time	Present date and time	2001/01/01 00:00 ~2099/12/31 23:59	Date & time	As displayed

[Interface]

Parameter and default			Printout	
Item	Default	Selection range	Item	Printing
COM1	Off	Off/Printer/Balance/PC	COM1	None/Printer/Balance/PC
Printer	IDP-	IDP-/DP-/other	Printer	IDP-/DP-/other
Channel	ch1+ch2	ch1/ch2/ch1+ch2	Channel	As displayed
Baud rate	4800bps	600bps/1200bps/2400bps /4800bps/9600bps	Baud rate	As displayed
Parity	None	None/Even/Odd	Parity	None/Even/Odd
Stop bit	1bit	1bit/1.5bit/2bit	Stop bit	As displayed
Data bit	8bit	7bit/8bit	Data bit	As displayed
Balance	KEM	KEM/Mettler/A&D /Shimadzu/Sartorius	Balance	As displayed
COM2	Off	Off/Printer/Balance/PC	COM2	None/Printer/Balance/PC

[LCD backlight]

Parameter and default			Printout	
Item	Default	Selection range	Item	Printing
Brightness	4	1/2/3/4	Brightness	As displayed
Auto dimming	In 10 min.	Off/In 10 min. /In 20min./In 30min. /In one hour /In two hours	A.dmming	Off/10min/20min /30min/1hour/2hours

[Beep]

Parameter and default			Printout	
Item	Default	Selection range	Item	Printing
Beep	Type 1	Off/Type1/Type2 /Type3/Type4/Type5	Beep	Off/Type1/Type2 /Type3/Type4/Type5

7-4-3-2. Function parameters

[Sample mode]

Parameter and default			Printout	
Item	Default	Selection range	Item	Printing
Sample file	Off	Off/On	Sample file	Off/On
Before entry	Off	Off/On	Before entry	Off/On
After entry	Auto	Off/On/Auto	After entry	Off/On/Auto

[Blank list]

Parameter and default			Printout	
Item	Default	Selection range	Item	Printing
Blank 1-10	0.00000	0.00000-99999.99999	Blank No.1	As displayed

[GLP management]

Parameter and default			Printout	
Item	Default	Selection range	Item	Printing
Periodic check	Off	Off/On	Periodic check	Off/On
Next check date	—	Day intervals	Next check	As displayed
Interval	7	1-999 days	Interval	As displayed

[Auto statistics]

Parameter and default			Printout	
Item	Default	Selection range	Item	Printing
Auto statistics	Off	Off /On	Auto statis.	Off/On
Calc. type	(Off)	Off /On	Calc.type	Off/On
High sample No.	(On)	Off /On	Hi No.	Off/On
Method No.	(Off)	Off /On	Method No.	Off/On
Unit	(Off)	Off /On	Unit	Off/On
Sample ID	(Off)	Off /On	Sample ID	Off/On
List printing	(Off)	Off /On	List printing	Off/On

[Decimal place setup]

Parameter and default			Printout	
Item	Default	Selection range	Item	Printing
Sample size	4	0-8	Sample size	As displayed
	Half adjust	Round up/Half adjust /Round down	—	Round up/Half adjust /Round down
Statistics	4	0-8	Statistcs	As displayed
	Half adjust	Round up/Half adjust /Round down	—	Round up/Half adjust /Round down

[Graph setting]

Parameter and default			Printout	
Item	Default	Selection range	Item	Printing
Range mode	Auto	Auto/Set	Range mode	Auto/Set
Graph type	Time vs Unit&Total	Time vs Unit /time vs Total /time vs Unit&Total	Graph type	Unit only/Total only /Unit&Total

[Other setup]

Parameter and default			Printout	
Item	Default	Selection range	Item	Printing
Print of header	On	Off/On	Header	Off/On
Print of footer	On	Off/On	Footer	Off/On
Auto setting, mean	On	Off/On	A.set mean	Off/On
Alarm	Off	Off/On	Alarm	Off/On
Result disp.	0s	0–3600s	Disp.time	As displayed
Constant properties				
Dissolve samp. (Wt0)	Sample	Sample/Method	Wt0	As displayed
Dissolve solvent (B)	Sample	Sample/Method	B	As displayed
Conc. of solvent (A)	Sample	Sample/Method	A	As displayed
Samp. volume (V1)	Sample	Sample/Method	V1	As displayed
Samp. dens. (Dens)	Sample	Sample/Method	Dens	As displayed
Samp. Gas volume (V2)	Sample	Sample/Method	V2	As displayed
Samp gas temp. (Temp)	Sample	Sample/Method	Temp.	As displayed
Dilution coef. (D)	Sample	Sample/Method	D	As displayed
Revision coef. (FA)	Sample	Sample/Method	FA	As displayed

7-4-3-3. Method parameter

Default Method parameters

Method No.	01	02	03	04	05	06-50
Method name	Sample	Check	Evaporator (Blank)	Evaporator (Sample)	Bromine Index	Method xx
[Titration parameter]						
Titration mode	H2O	H2O	H2O	H2O	Br2	H2O
t(stir)	0s	0s	0s	0s	0s	0s
t(wait)	15s	15s	15s	15s	15s	15s
t(max)	0s	0s	1200s	1200s	0s	0s
Drift stop	Rel.	Rel.	Off	Off	Rel.	Rel.
Rel.	0.10ug/s	0.10ug/s	(0.10ug/s)	(0.10ug/s)	1.00ug/s	0.10ug/s
Abs.	(0.10ug/s)	(0.10ug/s)	(0.10ug/s)	(0.10ug/s)	(1.00ug/s)	(0.10ug/s)
[Control parameter]						
Cell type	2 –Comp.	2 –Comp.	2 –Comp.	2 –Comp.	2 –Comp.	2 –Comp.
Stable	0.1ug/min	0.1ug/min	0.1ug/min	0.1ug/min	0.5ug/min	0.1ug/min
Control gain	5.0	5.0	5.0	5.0	5.0	5.0
Electrolysis speed	Standard	Standard	Standard	Standard	Standard	Standard
Start mode	Manual	Manual	Auto	Auto	Manual	Manual
End level	200mV	200mV	200mV	200mV	300mV	200mV
Data sampling time	5s	5s	10s	10s	5s	5s
Stirrer speed	3	3	3	3	3	3
[Calculation parameter]						
Calc. type	Sample	Check	Blank	Sample	Sample	Sample
Blank No.	1	1	1	1	1	1
Calc. No.	2	2	1	2	7	2
Unit	%	%	ug	%	mg/100g	%
Decimal	4	4	1	4	4	4
Fraction	Half adjust	Half adjust	Half adjust	Half adjust	Half adjust	Half adjust
Drift comp.	Auto	Auto	Auto	Auto	Auto	Auto
Drift	(0.00 ug/min)	(0.00 ug/min)	(0.00 ug/min)	(0.00 ug/min)	(0.00 ug/min)	(0.00 ug/min)
Evaluation	Off	Off	Off	Off	Off	Off
Standard value	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Permit. error	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
[Report parameter]						
Report format	Short	Short	Short	Short	Short	Short
Graph printing	Off	Off	Off	Off	Off	Off
Data list printing	Off	Off	Off	Off	Off	Off
[Reagent parameter]						
Anolyte	Anolyte	Anolyte	Anolyte	Anolyte	Anolyte	Anolyte
Catholyte	Catholyte	Catholyte	Catholyte	Catholyte	Catholyte	Catholyte

Method No.	01	02	03	04	05	06-50
[Option parameter]						
Pre treat	2	2	2	2	2	2
Cell purge	120s	120s	120s	120s	120s	120s
Back purge	180s	180s	180s	180s	180s	180s
Sample purge	(180s)	(180s)	(180s)	(180s)	(180s)	(180s)
Heating mode	Set	Set	Set	Set	Set	Set
Oven temp.	150C	150C	150C	150C	150C	150C
Heating speed	(20s/C)	(20s/C)	(20s/C)	(20s/C)	(20s/C)	(20s/C)
Start temp.	(70C)	(70C)	(70C)	(70C)	(70C)	(70C)
End temp.	(300C)	(300C)	(300C)	(300C)	(300C)	(300C)

Selection of Method parameters and printout

[Titration parameter]

Displays		Printout	
Item	Selection	Item	Printing
Titration mode	H2O/Br2	Titr.mode	H2O/Br2
t(stir)	0-99999s	t(stir)	As displayed
t(wait)	15-99999s	t(wait)	As displayed
t(max)	0-99999s	t(max)	As displayed
Drift stop	Off / Rel. /Abs.	Drift stop	Off/ Rel./ Abs.
Rel.	0.00-9.99ug/s	Drift	As displayed
Abs.	0.00-9.99ug/s	Drift	As displayed

[Control parameter]

Displays		Printout	
Item	Selection	Item	Printing
Cell type	2-Comp. /1-Comp.	Cell type	2-Comp. /1-Comp.
Stable	0.0-99.9ug/min	Stable	As displayed
Control gain	1.0-9.9	Ctrl.gain	As displayed
Electrolysis speed	Standard /Fast	E.speed	Standard/Fast
Start mode	Manual /Auto	Start mode	Manual/Auto
End level	200-1000mV	End level	As displayed
Data sampling time	1-99999s	Samp. time	As displayed
Stirrer speed	0-9	Stir.speed	As displayed

[Calculation parameter]

Displays		Printout	
Item	Selection	Item	Printing
Calc. type	Sample/Blank/Check	Calc.type	Sample/Blank/Check
Blank No.	1-10	Blank No.	As displayed
Calc. No.	1-6/7-8	Calc.No.	As displayed
Unit	%,ppm,g/100g,mg/100g	Unit	As displayed
Decimal	0-8	Decimal	As displayed
Fraction	Round off /Half adjust / Round up	Fraction	Round up/Half adjust /Round off
Drift comp.	Off /Manual /Auto	Drift comp.	Off/Manual/Auto
Evaluation	Off /On	Evaluation	Off/On
Standard value	0.00000000-99999.99999999	Std.value	As displayed
Permit. error	0.00000000-99999.99999999	Permit.err.	As displayed

[Report parameter]

Displays		Printout	
Item	Selection	Item	Printing
Report format	Off/GLP/Short/Variable	Report format	Off/GLP/Short/Variable
Graph printing	Off /On	Graph	Off/On
Data list printing	Off /On	Data list	Off/On

[Reagent parameter]

Displays		Printout	
Item	Selection	Item	Printing
Anolyte	As selected	Anolyte	As displayed
Catholyte	As selected	Catholyte	As displayed

[Option parameter]

Displays		Printout	
Item	Selection	Item	Printing
Pre treat	1/2/3	Pretreat	1/2/3
Cell purge	0-99999s	Cell purge	0-99999s
Back purge	0-99999s	Back purge	0-99999s
Sample purge	0-99999s	Samp.purge	0-99999s
Heating mode	Set / Scan	Heat.mode	Set/Scan
Oven temp.	0-300C	Oven temp.	As displayed
Heating speed	1-99999s/C	Heat.speed	As displayed
Start temp.	0-300C	Start temp.	As displayed
End temp.	0-300C	End temp.	As displayed

7-5. Warranty and After-Sale Service

1. The product you have purchased passed factory inspection and testing prior to shipment, and its quality is guaranteed by free of charge replacement during warranty period except consumable parts provided the instrument has been under normal use and operation, however, depending on operational and environmental condition under which the instrument has been in use may require chargeable service work.

2. For service during and after warranty period, please contact your local dealer or distributor.

3. Read the manual thoroughly before you decide to call for service.
   When you should need servicing, please provide with the following information:

   Production number of unit
   Description of the trouble
   Person to contact

4. Parts and spares can be purchased separately and will be available for seven (7) years after termination of production of the model.

5. This warranty does not cover claims due to any of the following conditions:

   1) Any modification or specification change by an unauthorized person
   2) Damage by splashed water (the instrument is not water-proof)
   3) Use in range or condition other than specified
   4) Operated in other way than specified in the manual or negligence of maintenance
   5) Physical force given to the instrument during transportation or move
   6) Use of parts or reagent other than specified
   7) Caused by use under extreme ambient or environmental condition
   8) By fire, riots, earthquake, lightning, or Act of God in any form or manner

6. Escape clause
   Under no circumstances will Manufacturer be liable for any damage, whether incidental, consequential or other, or for any other remedy arising from any loss, damage, expenses or inquiry in connection with use of the article.

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