Karl Fischer Moisture Titrator
(for volumetric method)

MKA-610

Operation Manual

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

Ver.01
A/N 985950485

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1. Introduction

1-1. Overview of the instrument

Your patronage of KEM product by purchasing the MKA-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 Volumetric Karl Fischer method with the following advanced features:

[Features]

1) **Two (2) measuring units can be connected (simultaneous measurements in parallel)**
   It is your option to connect two measuring units of which one, either coulometric or volumetric is your option depending on sample type or measuring range of your need.
   You can perform two measurements in parallel simultaneously.

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 solvent is standard equipment**
   The dispenser as standard equipment eliminates troublesome daily replacement of the solvent. Its suction and draining is automated with a push button by the built-in pump.

8) **No necessity of changing the electrode sensitivity and endpoint potential**
   KEM's patented unique technology of end point detection by compensating liquid resistance eliminates the necessity of adjusting the electrode sensitivity and end point potential level to the individual solvent or sample type. (Japanese Patent No. 1896338)

9) **GLP/GMP conformed**
   This model fully conforms to GLP/GMP requirements for those records of operators registered up to 50 individuals and validation results with standard substance, of updated logs on reagent factor as well as the advance notice on display prompting periodic check and reagent replacement.

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.

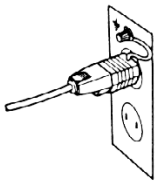
⚠ Warning This symbol means "Danger of severe injury or possible death".	This symbol means prohibition of an act.
⚠ Caution This symbol means "Danger of injury or property damage".	This symbol means mandatory.

⚠ WARNING!

You must ground earth wire of power cable.

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

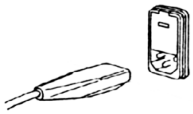
3-pin plug has earth line to ground by itself when plugged in.



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!

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.
- Waste liquid should be drained out before the Drain pot is filled with it. Otherwise, waste liquid may overflow into the stirrer unit, causing its breakdown.

Environmental condition

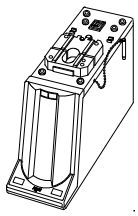
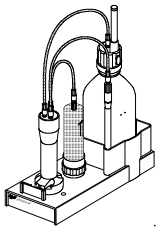
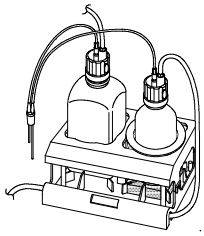
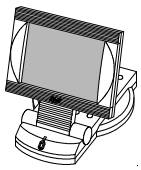
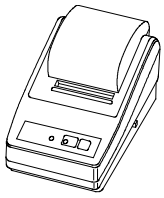
- This instrument is designed for the indoor use under the environmental conditions specified in the Section 1.4 of CE marking (LVD, 73/23/EEC, EN61010-1) and the use of the Category II of Overvoltage and the Pollution Level 2.

2. Preparations for measurement

2-1. Supplied parts

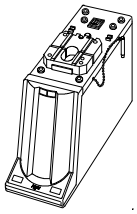
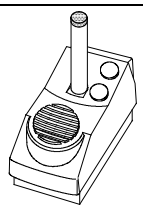
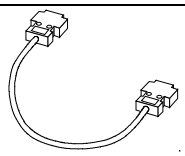
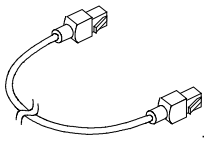
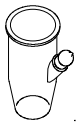
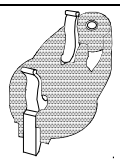
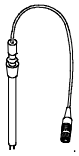
Check the supplied parts referring to the following parts list for MKA-610, Reagent Replacement Unit and MCU-610. If you should find any missing or broken parts including the main unit, accessories or manual, contact your sales representative or local dealer.

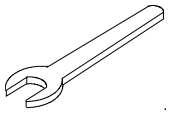
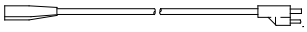
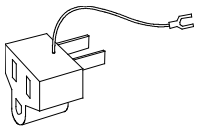
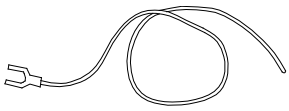
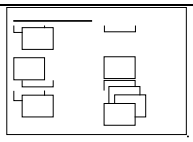
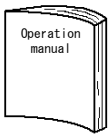
— Karl Fischer Moisture Titrator MKA-610 —

Part name	Part code	Qty	Sketch
Volumetric KF measuring unit*1	MKA-610	1 unit	
Burette unit*2	EBU-610-KF	1 unit	
Solvent change unit*3	—	1 unit	
Touch-on panel main control unit*4	MCU-610	1 unit	
Impact dot printer (option) (AC 100V) (AC 120V) (AC 230V)	IDP-100-10 -11 -12	1 unit	

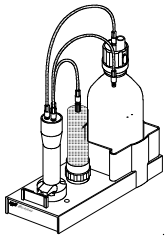
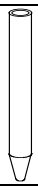
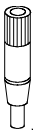
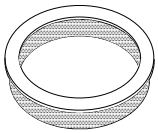
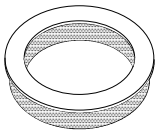
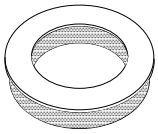
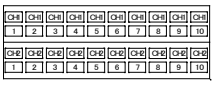
Note:
The details of components for above 1, 2, 3 and 4 are shown on the following pages.

— Components of MKA-610 —

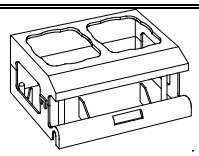
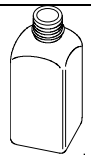
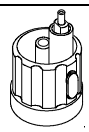
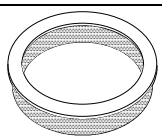
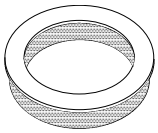
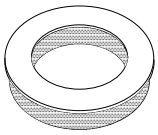
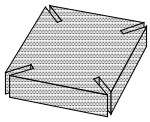
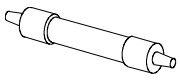
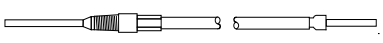
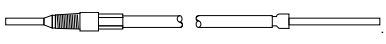
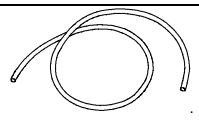
Part name	Part code	Qty	Sketch
Main unit	—	1 unit	
Magnetic stirrer	984330108	1 unit	
Stirrer cable	984280031	1 pce	
APB-APB cable	980305030	1 pce	
S-type titration vessel	987403001	1 pce	
Titration vessel stopper	984333435	1 pce	
Twin platinum electrode / KF	98103M714	1 pce	
Stirrer rotor (25mm)	(985003141)	1 pce	
Port plug (15/20)	985500074	1 pce	
KF grease (5g)	984333138	1 pce	

Part name	Part code	Qty	Sketch
Desiccant tube A	984333116	1 pce	
Piston extraction rod	985515002	1 pce	
Wrench 8mm	985143339	1 pce	
Power cord with earth wire (AC 100/120V area) (AC 220/230/240V area) (for UK) (for China)	 983203198 983203461 983204199 64000180048	1 pce	
Adapter for power connector (AC 100V only)	983203199	1 pce	
Ground wire (AC 100V only)	984333331	1 pce	
Seal	(985940010)	1 pce	
Quick reference	69000220148	1 copy	
Operation manual	985950484	1 copy	

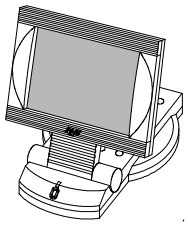
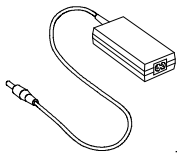
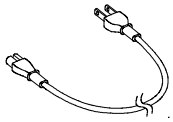
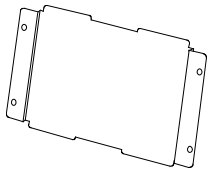
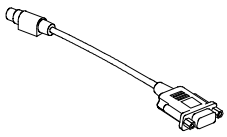
— Components of EBU-610-KF —

Part name	Part code	Qty	Sketch
Burette unit	—	1 set	
Desiccant tube A	984333116	1 pce	
Nozzle cover	(984300051)	1 pce	
Joint	985500055	1 pce	
Tip of diffusion proof nozzle/L	985210028	1 pce	
Nozzle (for ME)	985210040	1 pce	
Bottle holder 1	(985690001)	1 pce	
Bottle holder 2	(985690002)	1 pce	
Bottle holder 3	(985690003)	1 pce	
Seal	(985940010)	1 pce	

— Reagent replacement unit —

Part name	Part code	Qty	Sketch
Bottle holder	985600017	1 pce	
Reagent bottle (1L/brown)	985000035	1 pce	
Waste bottle cover	984330021	2 pcs	
Bottle holder 1	(985690001)	1 pce	
Bottle holder 2	(985690002)	1 pce	
Bottle holder 3	(985690003)	1 pce	
Bottle stand	(985690004)	1 pce	
Plug for titration flask	985503500	1 pce	
Desiccant tube	984446542	1 pce	
Injection tube	984330118	1 pce	
Drain tube	984330119	1 pce	
Silicone tube	(985210009)	3 pcs	 (L=1000mm)

— Component of MCU-610 (*4) —

Part name	Part code	Qty	Sketch
Main control unit	—	1 unit	
AC adapter	984030052	1 pce	
Power cable (AC 100V/120V area) (AC 220/230/240V area) (for UK)	 984290035 984290034 984290036	1 pce	
Protection film	(985600093)	2 pce	
Connecting cable (Mini DIN-D Sub)	984280032	1 pce	

Note:

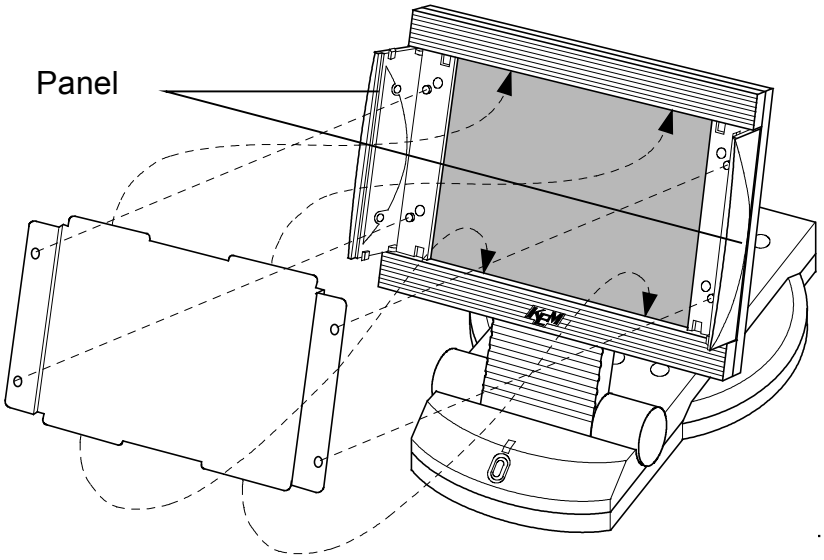
Parts with parenthesized part code have unique order units or packing forms different from others. Therefore, please refer to the section "7-1. Part list" when ordering these parts.

2-2. Installation and start-up

2-2-1. Protection film

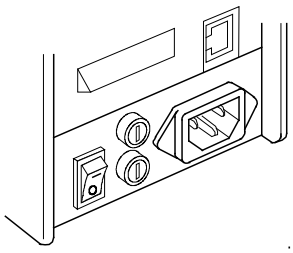
Attach the protection film on the display panel of Main control unit (MCU-610):

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.

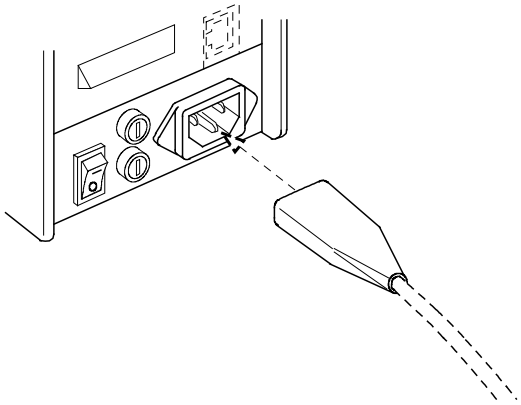


2-2-2. Power cable

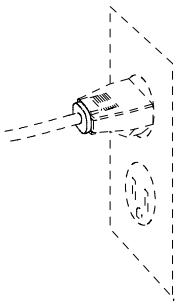
1) Make sure the power switch is in Off position.



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

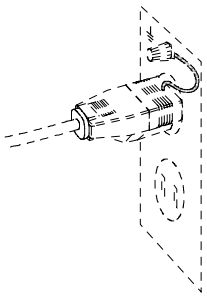


3) Connect the power cable to the power outlet.



< 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!

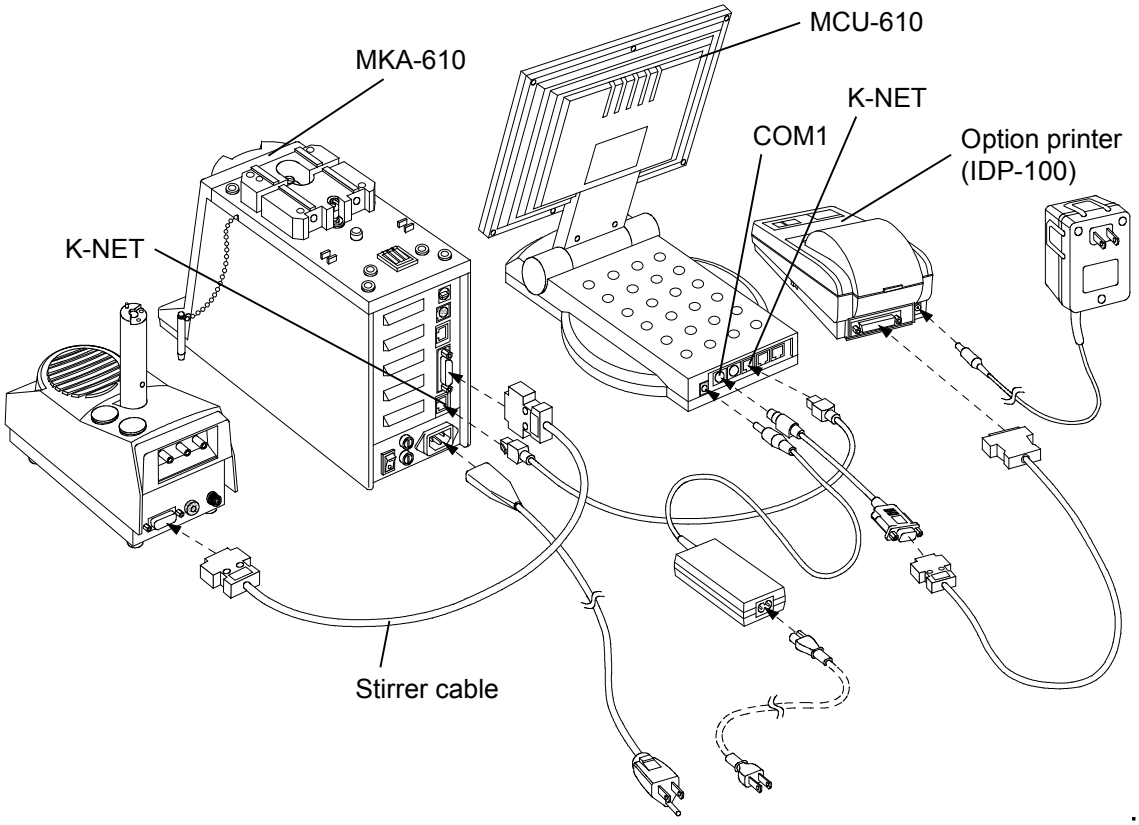
The earth wire must be grounded. If not, there exists a danger of electric shock.

2-2-3. Connecting cables

Connect the cables as shown below.

Connect MCU-610 and MKA-610 with APB-APB 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:

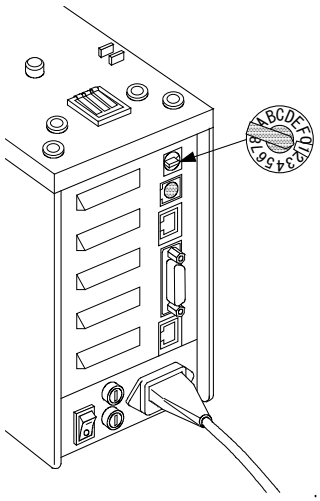
Turn on the power only after all of the cables are connected. Work on the stirrer cable only when the main power switch is off in order to avoid malfunction of the main unit.

⚠ 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.

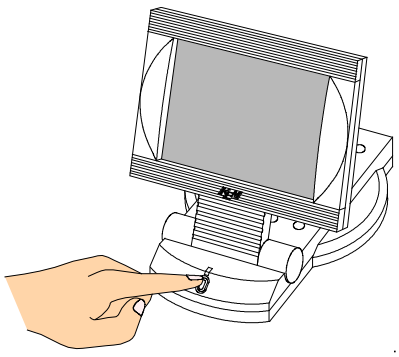
2-2-4. Set up the address for measuring unit

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

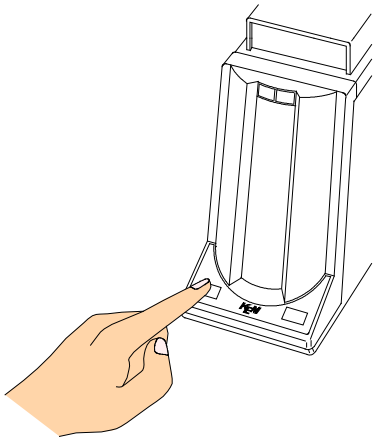


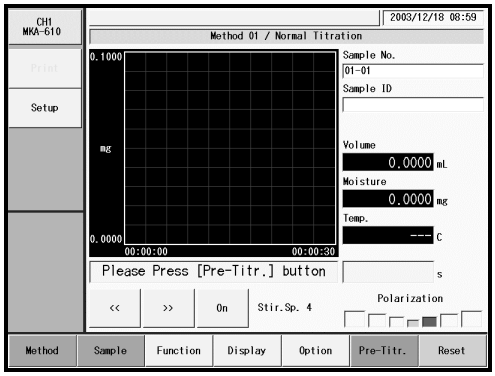
2-2-5. Start-up

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.



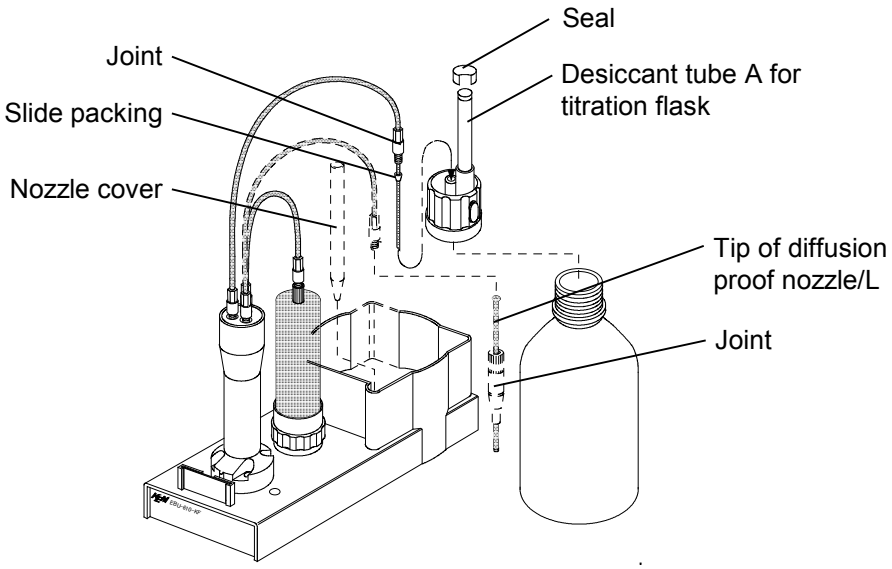
2) Turn on the power of measuring unit by turning on “Power” switch on the back of unit, and then, press [Power] button in front. The screen of Main control unit will show the below display, which will first appear from the next time on.





2-2-6. Installation of burette unit

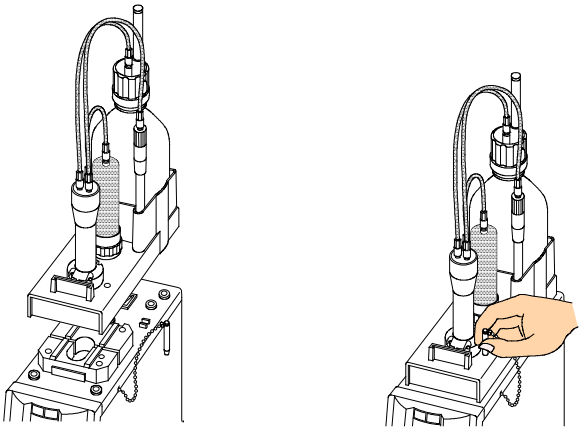
1) Remove the joint and slide packing from the reagent bottle, and insert the tube of burette unit into the reagent bottle cap, and then, put it in place as illustrated below.
2) Install the desiccant tube A onto the reagent cap. At this point, remove the seal attached to the desiccant tube A.
3) Put the nozzle cover in place.
4) Squeeze the tip of diffusion proof nozzle/L into the joint, and connect it to the tube.



Note:

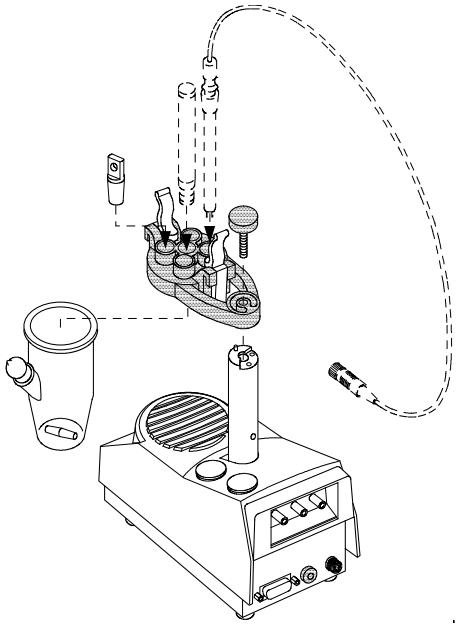
The seal on desiccant tube A must be removed first.
Reagent bottle means any Karl Fischer reagent bottle commercially sold.
For those reagent bottles in market (e.g. Merck's) of which cap is different in size, transfer the contents to the bottle supplied for trial use with this unit. If the outside diameter is smaller than burette unit, use the supplied bottle holder.

5) Place the burette unit onto the main unit, and push it towards you to set it in.
6) Insert the lock pin into the unit until it reaches the bottom.



2-2-7. Assembly of titration flask

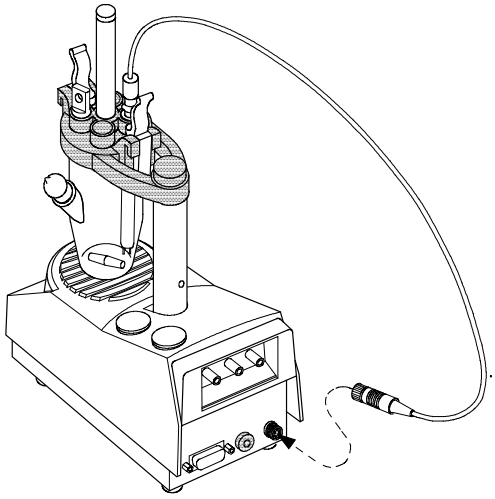
1) Fix the titration vessel stopper onto the magnetic stirrer with the screw.
2) Pull the lever on the titration vessel stopper to put the titration flask (S-type titration vessel) with a stirrer rotor in it in place. At this point, apply a small amount of KF grease on contact area between flask top and lid.
3) Install the twin platinum electrode/KF, desiccant tube A and the port plug on the lid for titration flask. The position for installation is shown below. At this point, apply a small amount of KF grease on slide contact area.



Note:

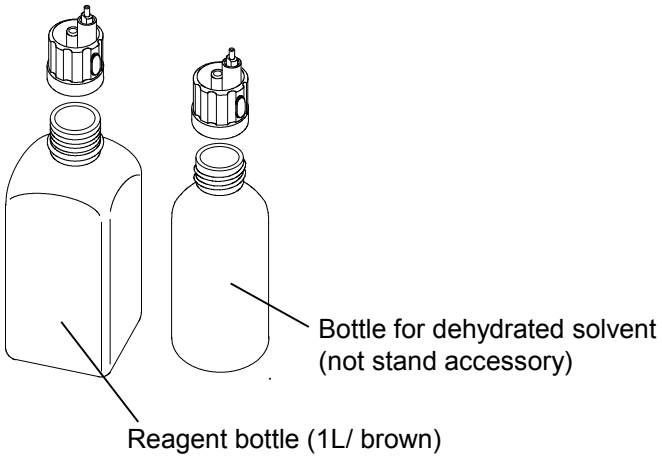
KF grease must be applied on all the slide contact areas.
The seal on desiccant tube A on titration flask must be removed before using.

4) Plug in the electrode wire into the port, and secure its connection by turning the plug screw.



2-2-8. Installation of dispenser

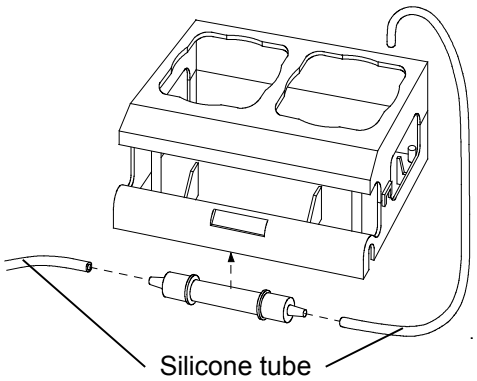
1) Fix the bottle for dehydrated solvent and reagent bottle (1L/ brown) (for waste) with the cap (waste bottle cover) respectively.



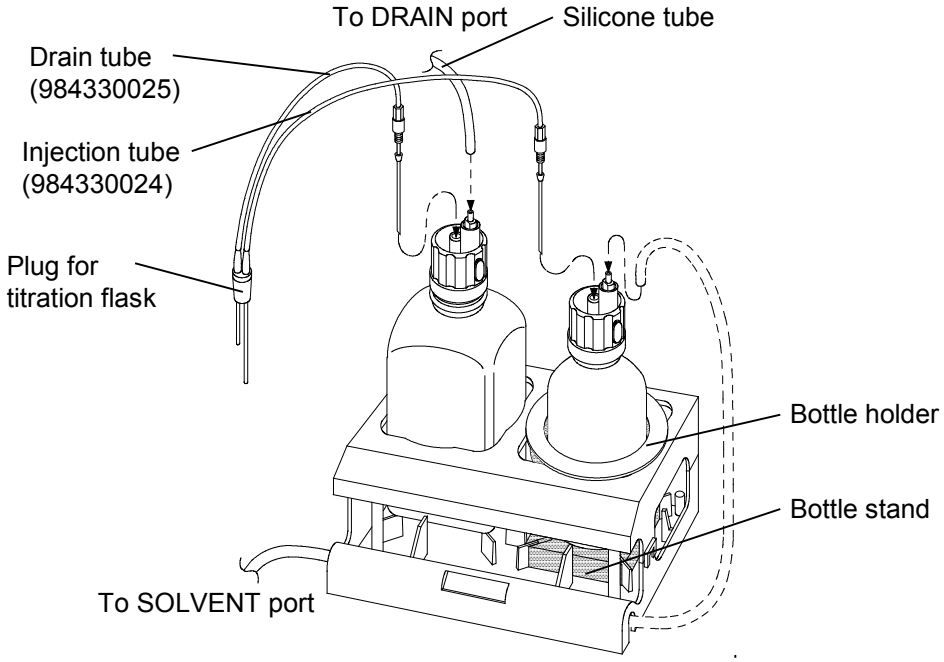
Note:

The bottle caps must be securely fixed in order to avoid air leak, which would prevent the dispenser from working properly in suction and draining.

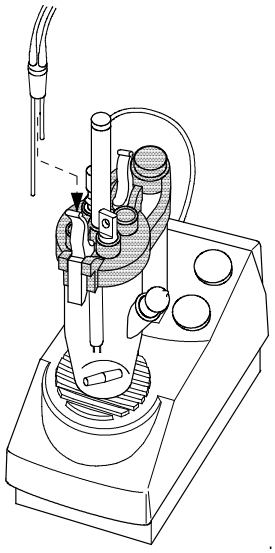
2) Connect the silicone tubes on both ends of desiccant tube, and put the tube in place as shown below.



3) Put the above 1) bottle in reagent bottle holder. If the outside diameter of solvent bottle does not match the holder, use the bottle holder and stand as shown below.
4) Connect the silicon tubes, one to the top of solvent bottle and the other to the waste bottle.
5) Connect the tubes, one for draining and the other for injection to the two bottles respectively.
6) Connect the drain tube and injection tube to the plug for titration flask.

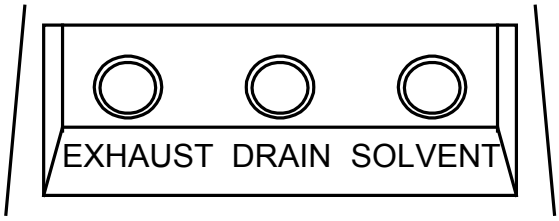


7) Insert the plug for titration flask carefully into the lid. At this point, apply a small amount of KF grease on slide contact area.



8) Connect the silicone tube connected 2) to SOLVENT port on the rear panel of magnetic stirrer, and the silicone tube connected 4) to DRAIN port.

< Rear view of magnetic stirrer >

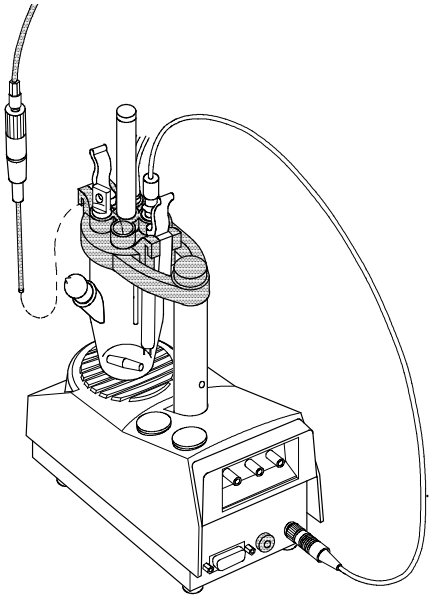


- EXHAUST : Exhaust port for dispensed solvent
- DRAIN : Connecting port for draining and suction tube
- SOLVENT : Connecting port for pressurized transfer of solvent

⚠ Warning!

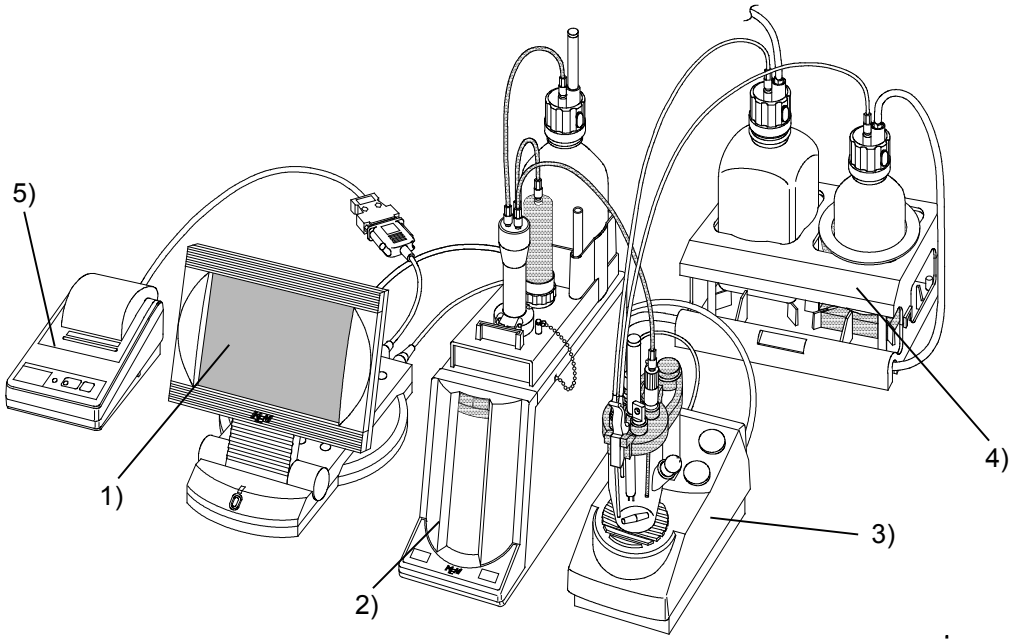
Toxic fume of dehydrated solvent and KF reagent will be exhausted from EXHAUST.
Vent it out by a tube away far enough for safety.

9) For the last step of installation, insert the titration nozzle into the position on lid. 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.

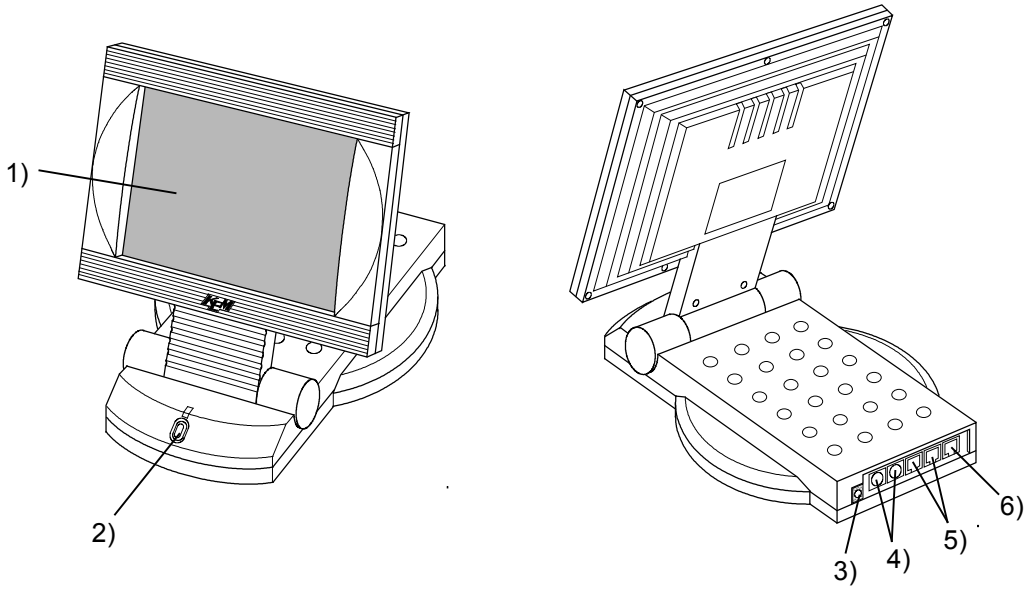
2) Measuring unit (MKA-610)
   Control unit for Karl Fischer titration.

3) Stirrer
   Measuring unit for Karl Fischer titration. A magnetic stirrer and a pump for fill-and-drain system are included.

4) 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) 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.

3) ~ LINE
   Connector for power cord.

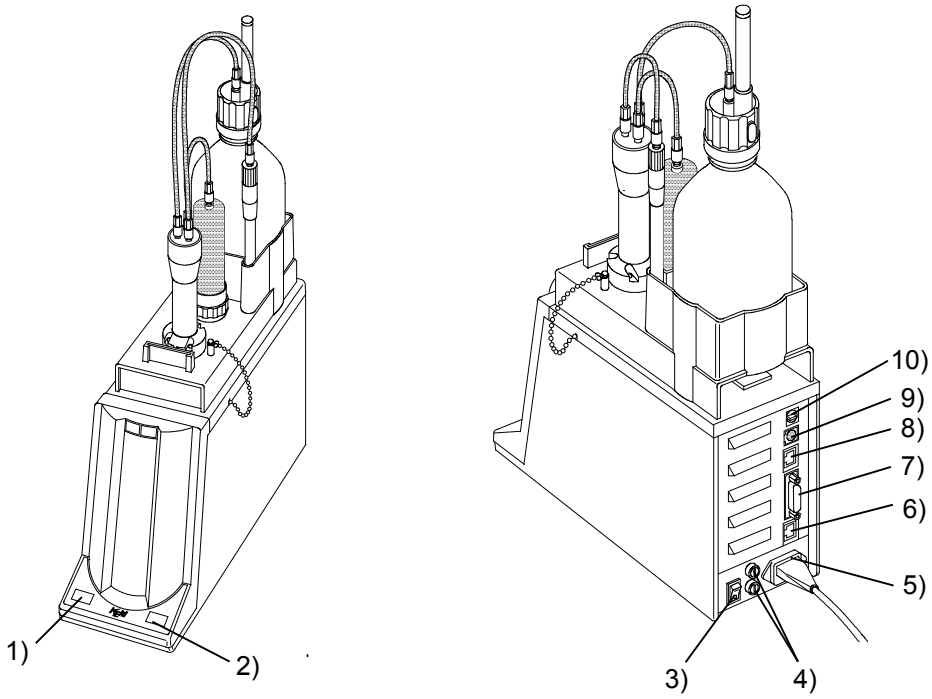
4) COM1 and COM2 port
   These ports are for connections to Printer or Balance. The printer prints out measurement results as well as selected parameters. When an electronic balance is connected, the sample weight is automatically input for measurement.

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

6) PC connector
   Personal computer is connected to this port for data acquisition using the optional software.

2-3-3. Measuring unit (MKA-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.

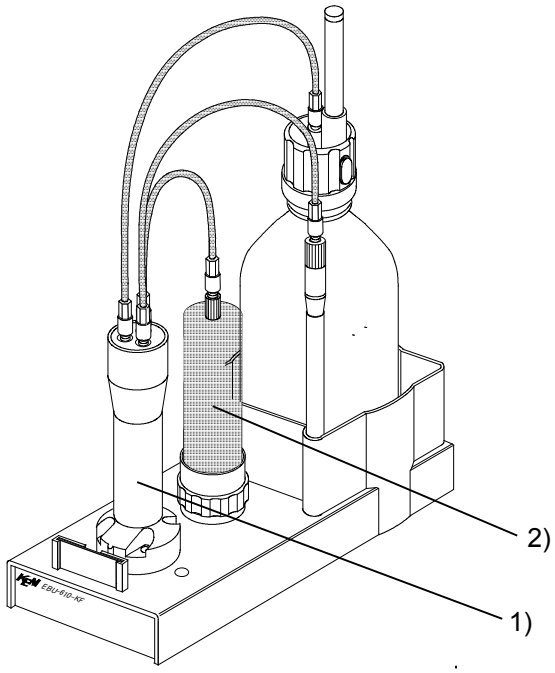
7) Stirrer port
Magnetic stirrer is connected to this port.

8) S-Bus port
The optional burette APB-600 is connected here.

9) RS-232C port
The optional oven ADP-611 is connected here.

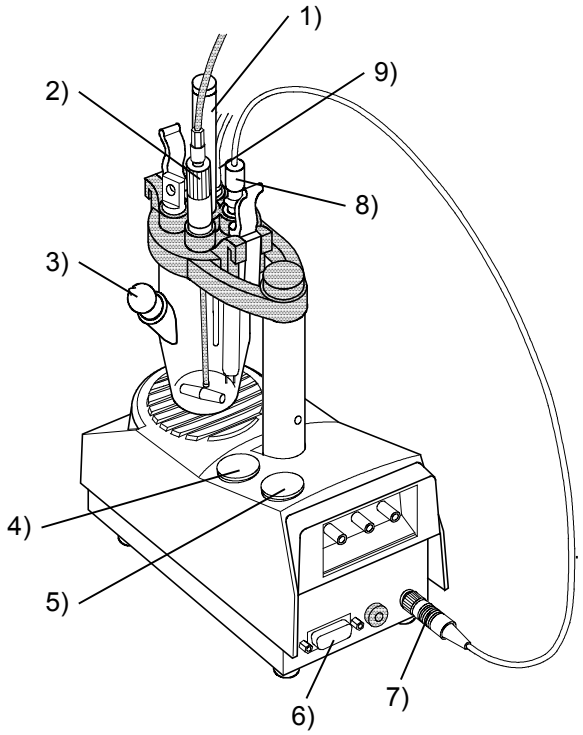
10) MCU No. switch
The main unit group number (MCU No.) connected to measuring unit is selected here.

< Burette unit >



1) Switching valve
   This valve changes the reagent line. It switches the line between Cylinder — Reagent bottle and Cylinder — Titration nozzle.
2) Cylinder
   This cylinder is made of glass filled with KF reagent.

< Stirrer unit >



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

2) Titration nozzle
   The titration regent is discharged through this nozzle.

3) Port plug
   The sample is discharged through this inlet.

4) SOLVENT button
   The solvent is discharged with this button

5) DRAIN button
   The waste liquid is drained out with this button.

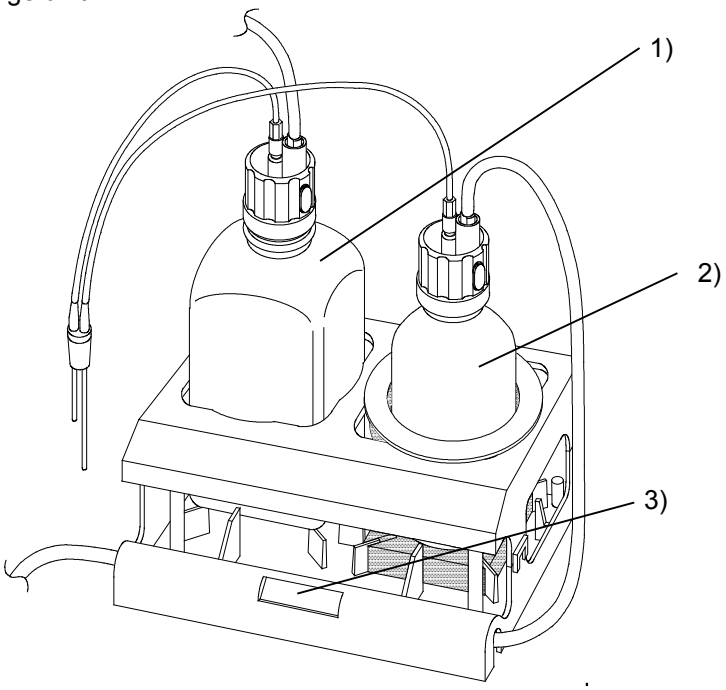
6) Stirrer port
   The connecting cable to the stirrer is plugged in here.

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

8) Twin platinum electrode/KF
   The electrode detects the potential of solvent inside the flask.

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

< Solvent change unit >



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

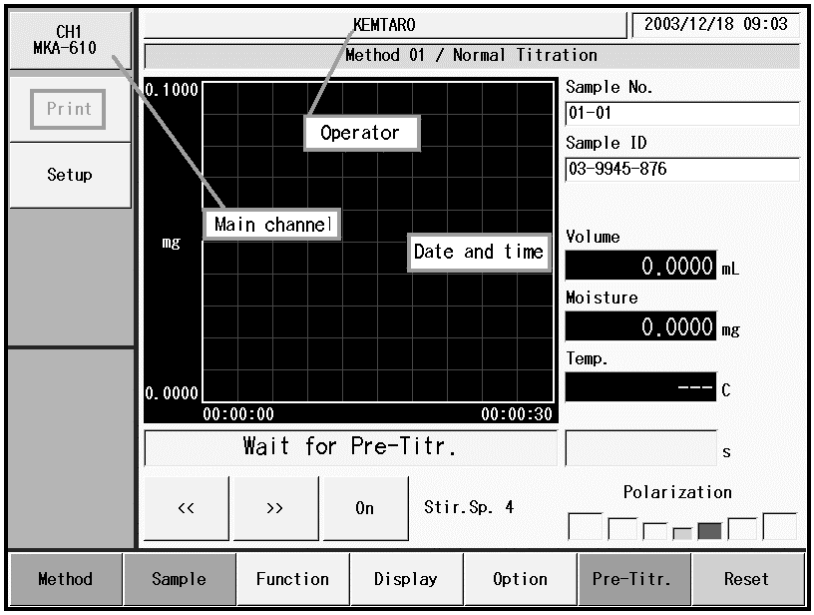
2) Reagent bottle
   Use a commercially sold solvent bottle.

3) Desiccant tube
   Absorbs moisture of solvent.

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

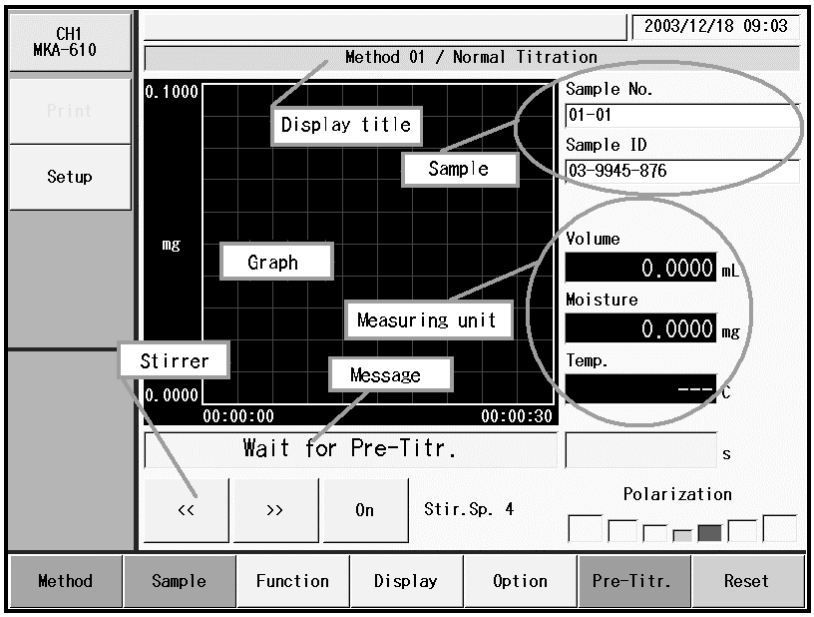
Operators name or code is changed here with the button showing currently active operator in charge.

[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
- Titrating
- Drift, 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]

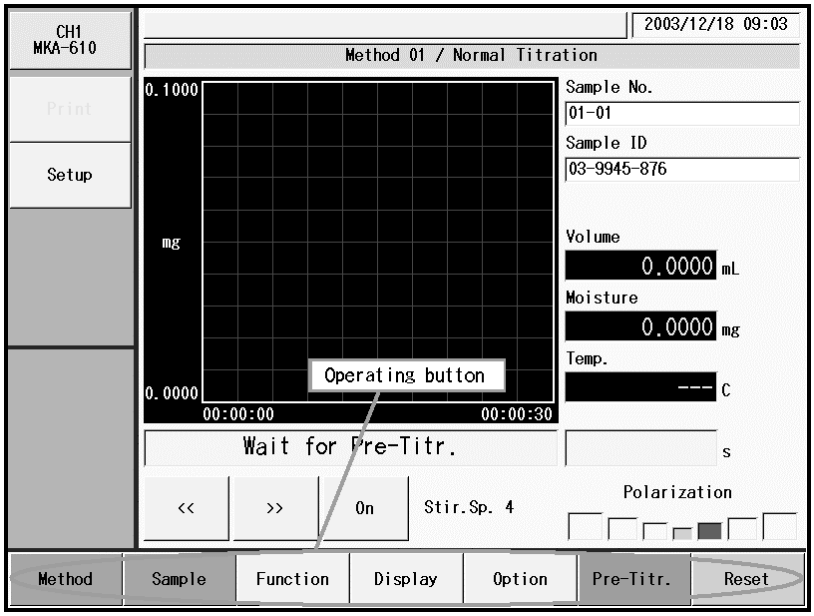
Sample number and its ID preset on sample setup are shown here.

[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 and manual operation of burette unit.

[Pre-Titr.] button or [Start] button

This button first works for pre-titration and then, switches to [Start] button.

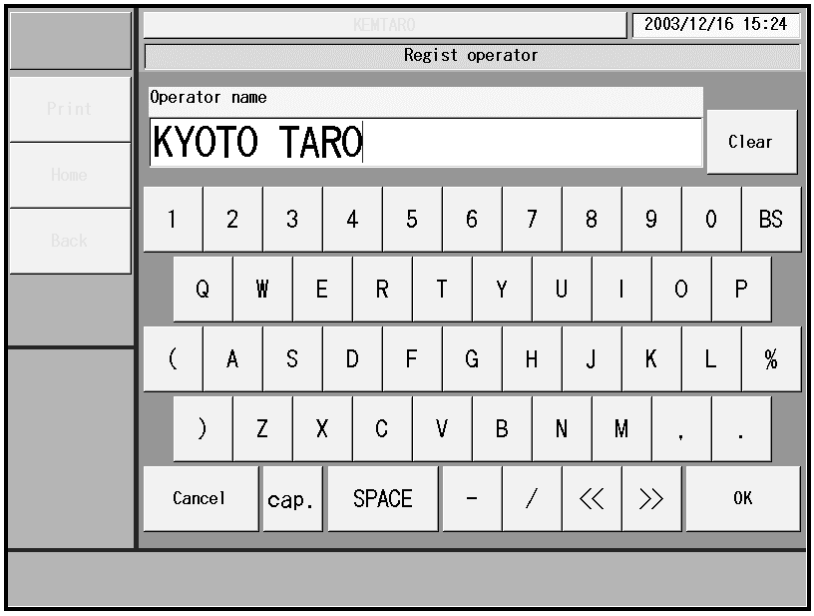
[Reset] button

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.

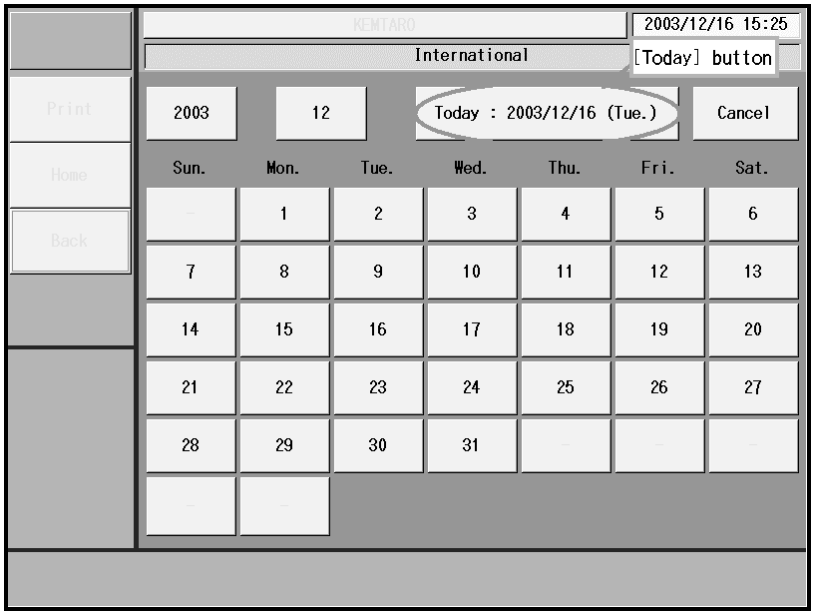
[Clear] button

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.

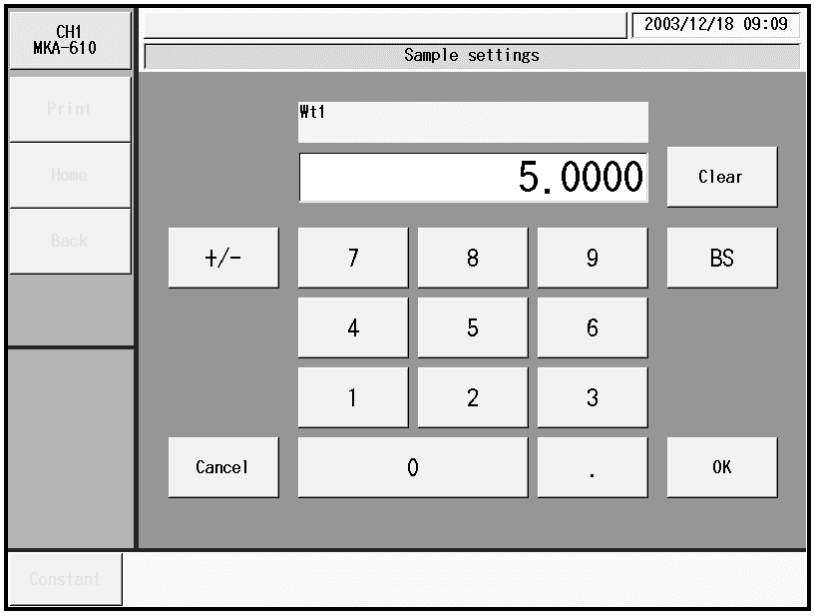
[Cancel] button

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

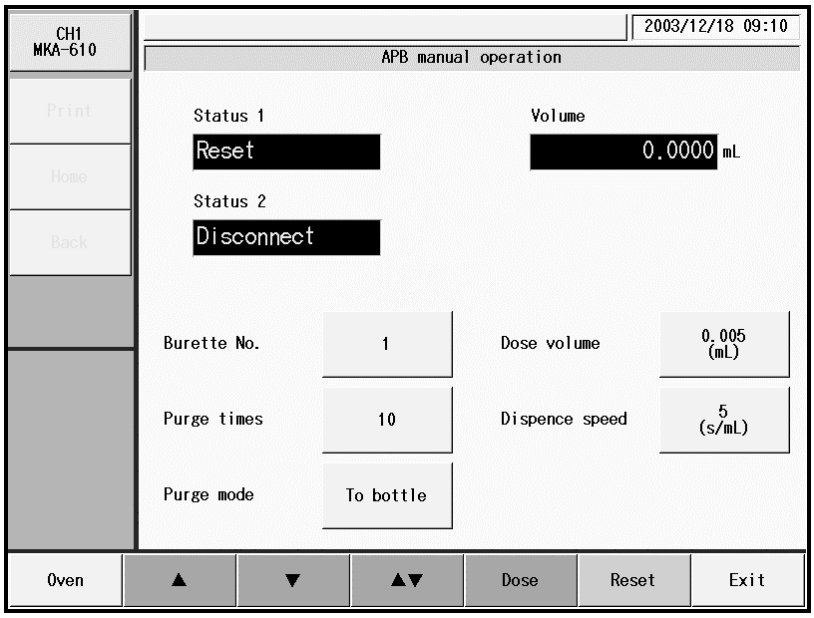
This button switches plus and minus, only significant when minus can be entered.

3. Basic procedure

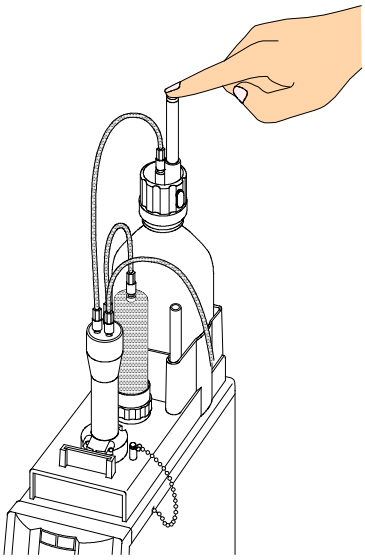
3-1. Preparation before titration

3-1-1. How to deliver the titration reagent

1) Press [Option] button on Main display.
2) Press [APB] button to show “APB manual operation” dialog box.



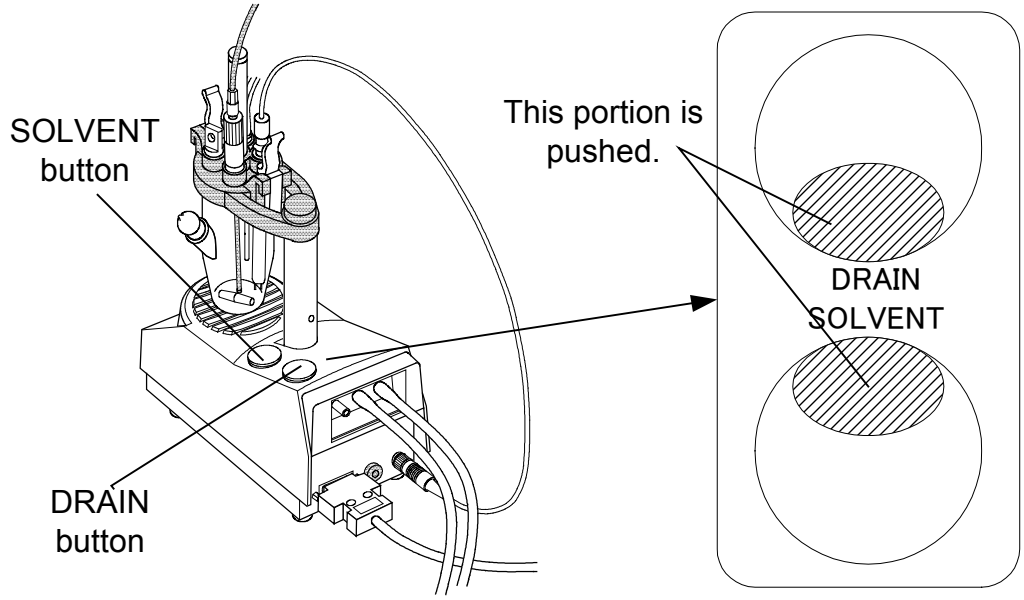
3) Select a burette number to use.
4) Set purge mode to “To nozzle”.
5) Press [▲▼] button. At this point, clog with your finger the desiccant tube top on titration reagent bottle lid in order to remove air bubbles adhered to the piston head when aspiration starts.
6) When the air inside the burette is pushed out to the titration flask and the reagent starts dripping from nozzle tip, press [▲] button to stop piston movement.



3-1-2. Discharge and drain out solvent

In order to measure water content in sample liquid by volumetric method, the water must be extracted with solvent to react effectively with Karl Fischer reagent. The solvent can be discharged into the titration flask or drained out with a push button by the built-in dispenser.

1) Press “SOLVENT” button to discharge approximately 30mL of dehydrated solvent until the electrode dips in. Discharge speed can be controlled by the button. Press it harder if you want faster speed.
2) The solvent is drained out with “DRAIN” button.



Note:

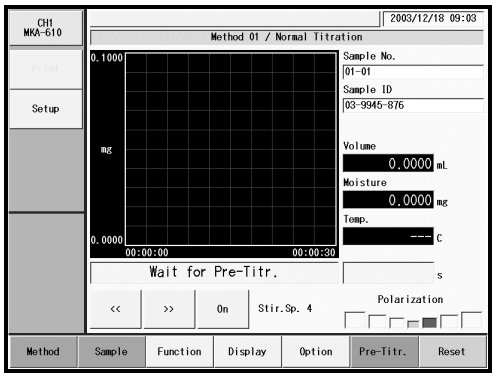
Do not use the dispenser for those samples which are hard to dissolve or insoluble in solvent in order to avoid clogging of drain tube. Such waste liquids, if spilled, after measurement may corrode the tube connecters causing the dispenser malfunction.

3-1-3. Purge the burette

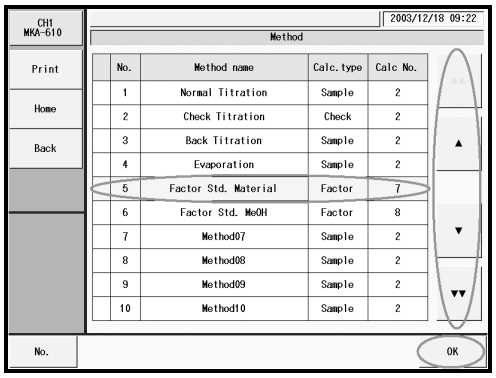
The reagent after filled in burette will gradually absorb a small amount of moisture through the joint gap and piston head. This will cause difference in concentration between the reagent in burette and in bottle. Purge is necessary to eliminate this difference.

1) Press [Option] button on Main display.
2) Press [APB] button to show “APB manual operation” dialog box.
3) Select a burette number and a number of purge cycles.
4) Turn the purge mode to “To bottle”.
5) With [▲▼] button pressed, purge starts and after purge finishes the preset number of cycles, it stops purging and sets in standby mode for titration.

3-1-4. Selection of Method (measurement parameters and conditions)

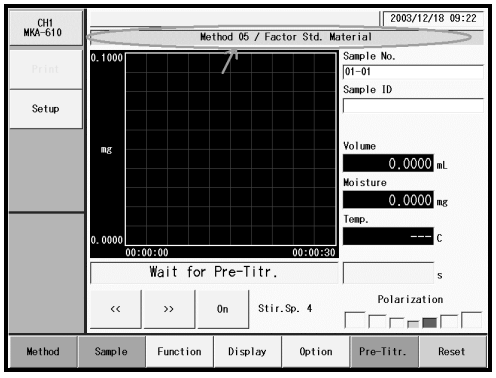


1) Press [Reset] button.
2) Make sure the message “Wait for Pre-Titr.” appears.
3) Press [Method] button.



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.

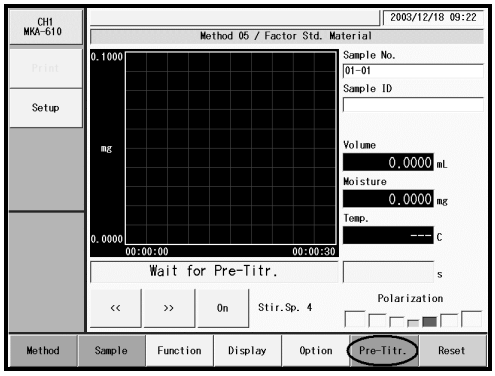
Note:

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.

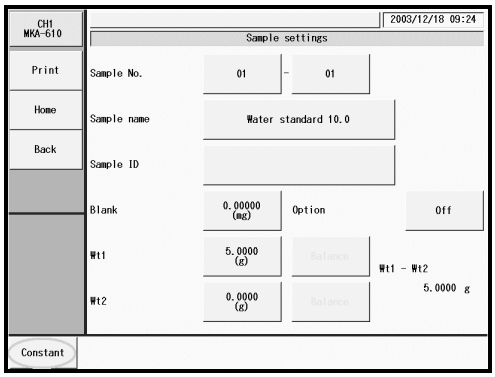
For Method configuration, refer to “3-7. About Method”.

3-1-5. Factor measurement of reagent with pure water, water standard or sodium tartrate

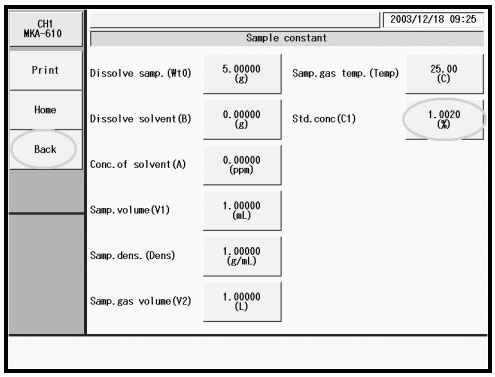
The following steps show the procedure to determine the factor (= titre) of reagent with standard substance of which water content is known (pure water, water standard or sodium tartrate, etc.):



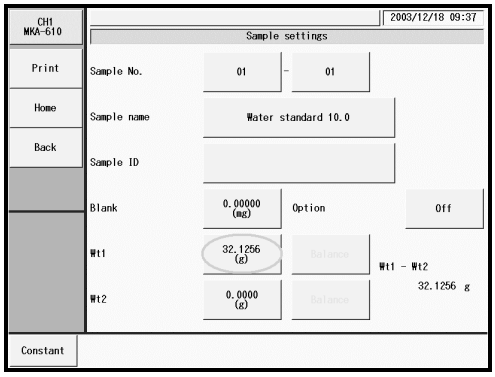
1) Press [Method] button to change the Method to No.5 default for tire determination. Make sure the calculation number on display shows “7”.
2) Press [Pre-Titr.] button to dehydrate the titration flask. When dehydrated, the message will appear prompting “Inject sample” and “Please Press [Start] button”, and the button for [Pre-Titr.] changes to [Start] button.



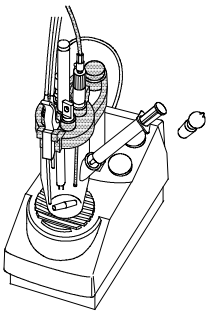
3) Press [Sample] button and press [Constant] button on “Sample settings” dialog box.



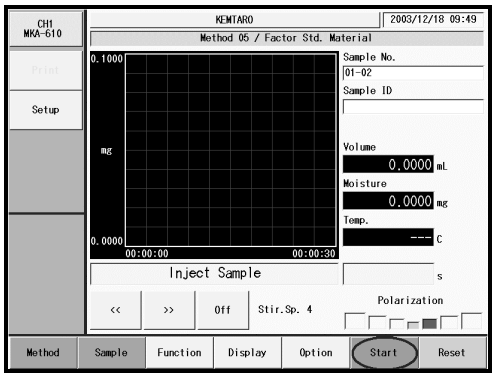
4) Press “Std. conc (C1)” button and enter the “%” concentration of the standard substance. (e.g.1.020% for 10.02mg/g of water standard.)
5) Press [Back] button to show “Sample settings” dialog box.



6) Take a sample of standard substance with syringe, and weigh it on an electronic balance.
7) Press Sample size (wt1) button, and enter the weight of the above 6) on numeric display.
8) Press [Home] button to return to Main display.

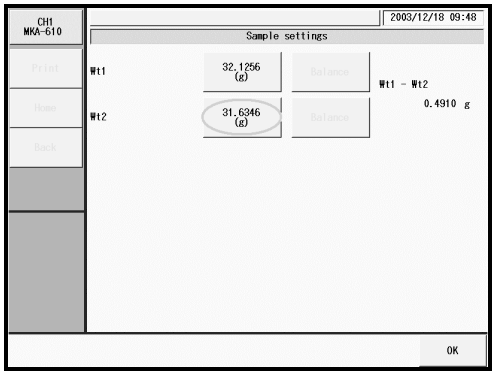


9) Discharge the standard substances into the titration flask.



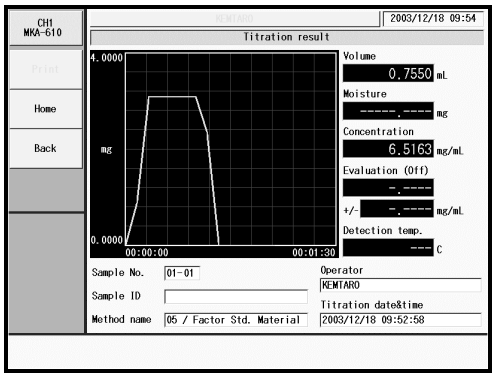
10) Weigh the syringe (or any other type of sampler if used) after sample is discharged.

11) Press [Start] button. As the titration goes on, a graphic curve will be plotted on display. To abort titration, press [Reset].



12) After titration is over, the display prompts entry of Wt2. Enter the weight of above 9), and press [OK] button on sample setup dialog box. (Wt2 can be entered with [Sample] button during titration)

If "After entry" is set to "Off" on sample mode of [Function], currently stored Wt2 will be used in calculation.



Here you will see the results of titration on display.
When a printer is connected, the results are also printed out according to the report parameter preset on Method.

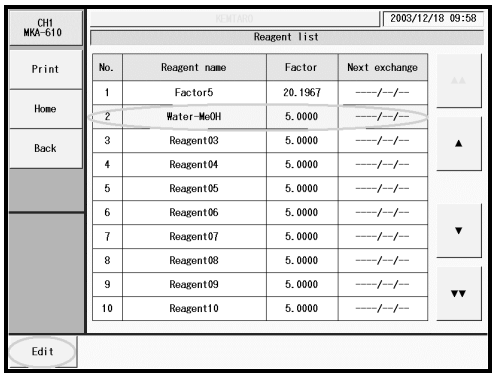
13) Repeat the above steps for a few times.
When "Auto setting, mean" is turned to "On" on [Function] – [Other settings], the mean value of the above results will be automatically stored as the factor of titration reagent used in the Method for factor measurement.

Note:

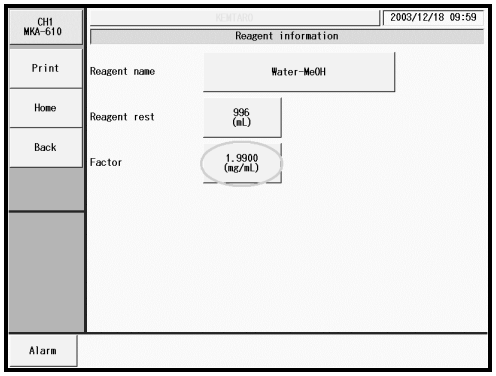
If you intend a precise measurement with a sample discharged into the flask through the inlet by removing the port plug, you need to run a blank test first, and preset the blank level.

3-1-6. Factor measurement of reagent with water·methanol standard

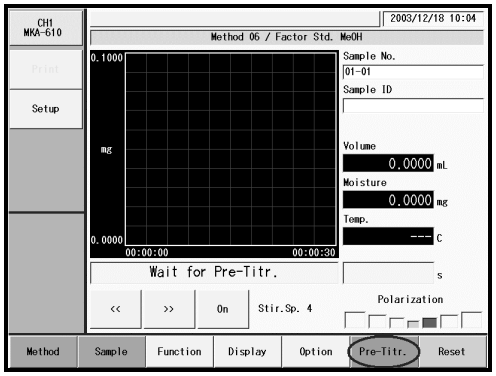
This method for factor measurement using water·methanol standard requires the optional burette APB-600 additionally added to the system. Otherwise, follow the preceding procedure for “Factor measurement of reagent with pure water, water standard or sodium tartrate”.



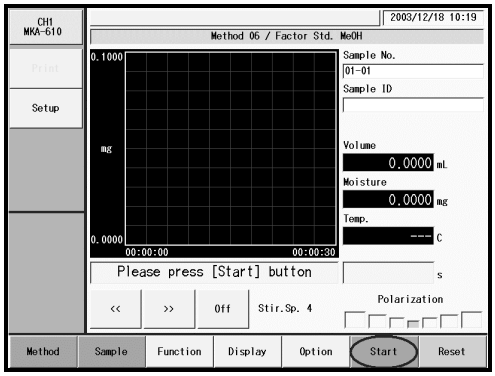
1) Press [Method] button and select Method No.6 default for factor measurement. Make sure the calculation formula number on display shows “8”.
2) Press [Function] – [Reagent information] button.
3) Select the reagent for fixed dose from [Reagent list] where it is listed as the reagent parameter for “Dose unit” on Method, and press [Edit] button.



4) Enter the factor of water·methanol standard for reagent factor.



5) Press [Pre-Titr.] button to dehydrate the titration flask. When dehydrated, the message will appear prompting “Inject sample” and “Please press [Start] button”, and the button for [Pre-Titr.] changes to [Start] button.

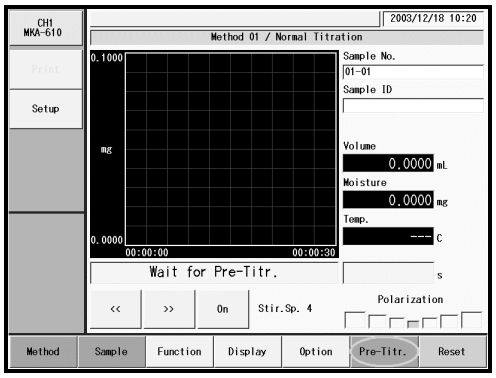


6) Press [Start] button. The burette starts dosing the water·methanol standard automatically to start titration.
7) When the titration comes to the end, the measurement results are printed out, and the second titration starts. A series of measurement runs for the present number of cycles according to the repeat parameter configured.

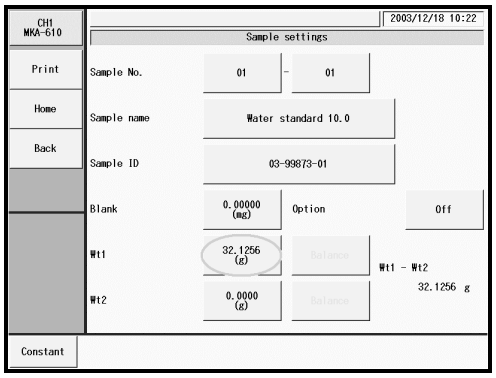
Note:

When "Auto setting, mean" is turned to "On" on [Function] – [Other settings], the mean value of the above results will be automatically stored as the factor of "Titr. unit" used in the Method for factor measurement.

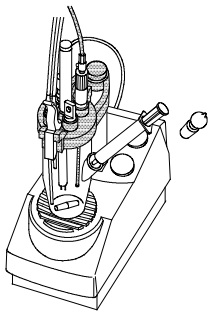
3-1-7. Operational procedures



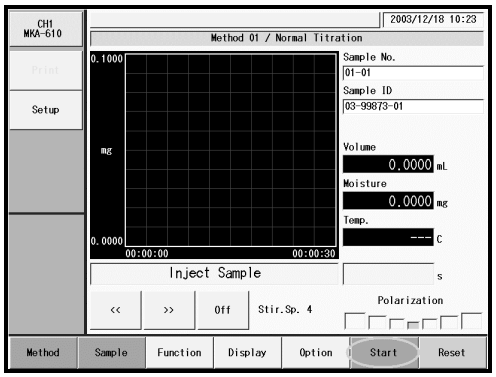
1) Press [Method] button to change it to sample measurement.
2) Press [Pre-Titr.] button to dehydrate the titration vessel. When dehydrated, the message will appear prompting “Inject sample” and “Please Press [Start] button”, and the button for [Pre-Titr.] changes to [Start] button.



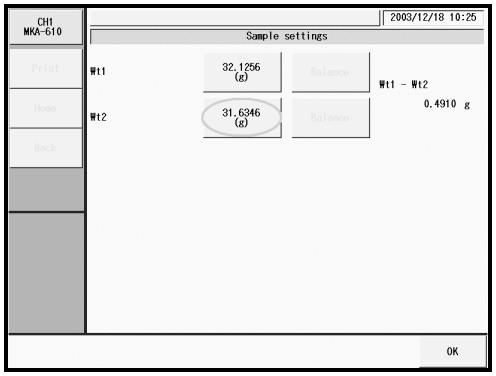
3) Take the sample with syringe, and weigh it on an electronic balance.
4) Press [Sample] button.
5) Press Sample size (wt1) button. Enter the weight of the above 4) on numeric display.
6) Press [Home] button to return to Main display.



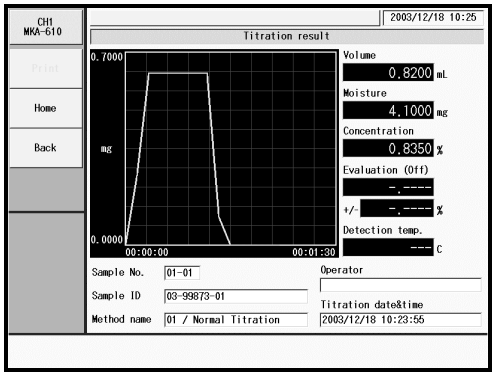
7) Discharge the standard into the titration flask.
8) Weigh the syringe (or any other type of sampler if used) after sample is discharged.



9) Press [Start] button. As the titration goes on, a graphic curve will be plotted on display. To abort titration, press [Reset].



After titration is over, the display prompts entry of Wt2. Enter the weight of above 8), and press [OK] button on “sample settings” dialog box. (Wt2 can be entered with [Sample] button during titration)
If entry of sample size after titration is set to “Off” on sample mode of [Function], currently stored Wt2 will be used in calculation.



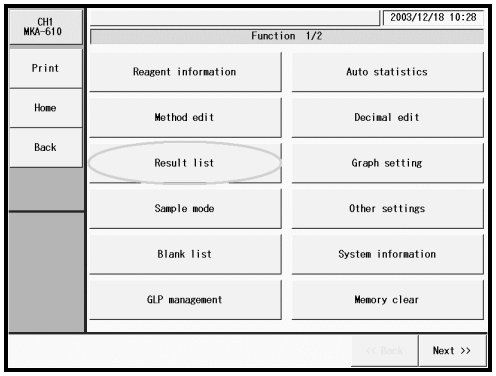
The titration results now appear on display. When a printer is connected, the results will be printed out according to printing parameters preset in Method.

Note:

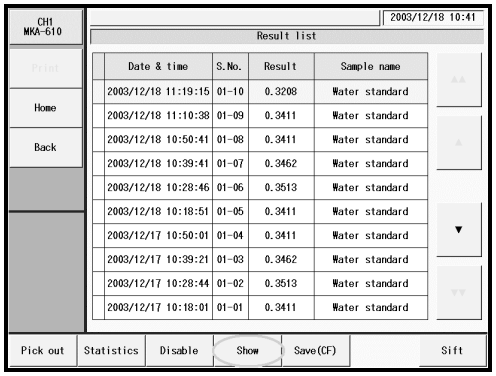
A sample must be discharged into the cell only after the screen has returned to Main screen after sample conditions are configured on sample setup dialog box first.
When [Start] button is pressed, the sample setup dialog box will appear if “Yes” is chosen on “Before entry”. Otherwise, it should be noted 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

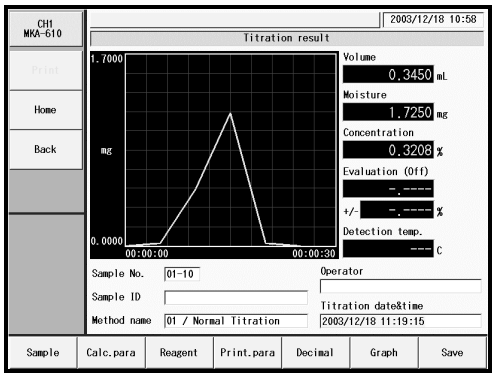
3-2-1. Re-calculate titration data



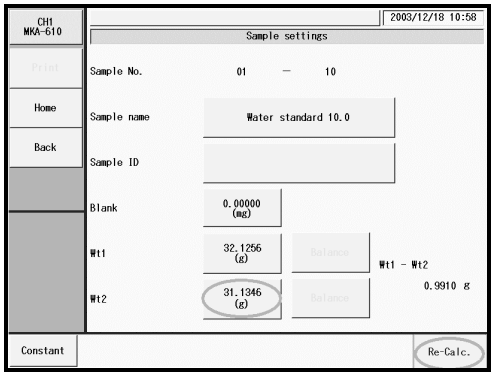
1) Press [Function] button on Main display.
2) Press [Results list] button.



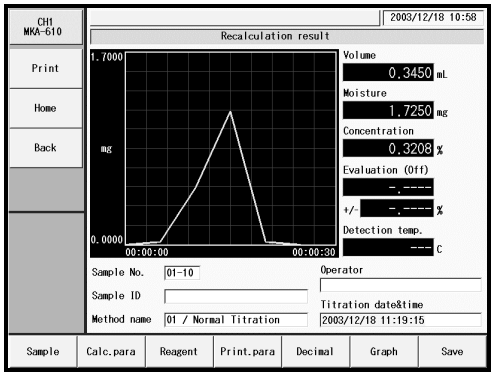
3) When “Results list” appears, point the cursor on the results data for recalculation.
   Use [▲][▼], [▲▲][▼▼] buttons to move the cursor or you can choose the desired data directly by pressing the data on list.
4) Press [Show] button.



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

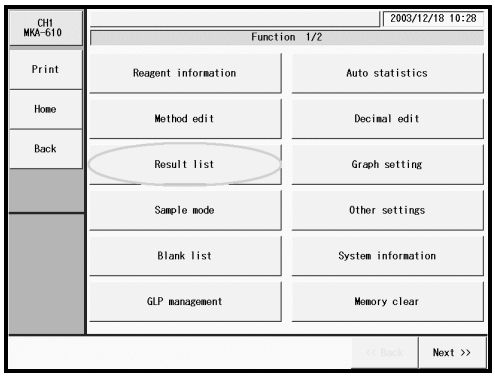


6) The screen display will turn “Sample settings” dialog box. Press Wt2 button of the weighed sample. Enter the weight.
7) Press [Re-Calc.] button.

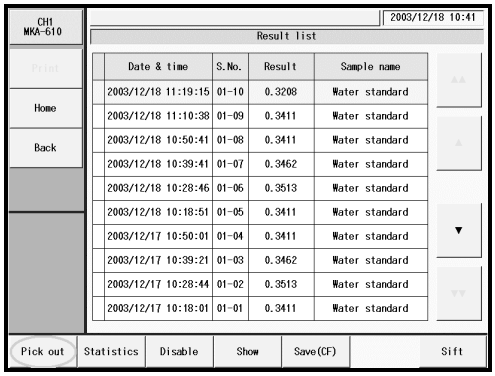


8) The screen display will turn “Recalculation result” dialog box. Then, press [Save] button.
9) The screen display will turn to the confirmation screen. Then, press [Yes] button.

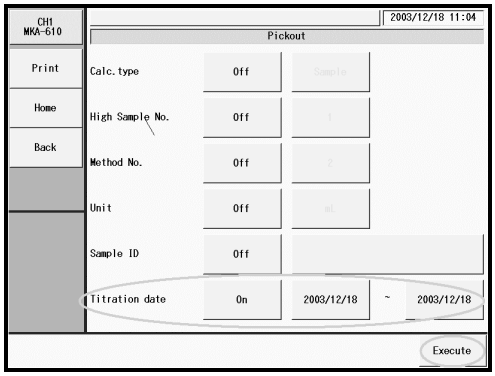
3-2-2. Batch processing of titration data



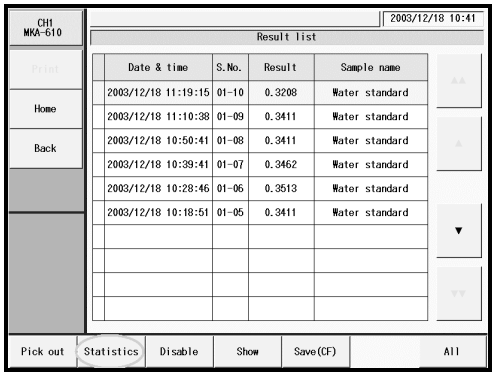
1) Press [Function] button on Main display.
2) Press [Results list] button.



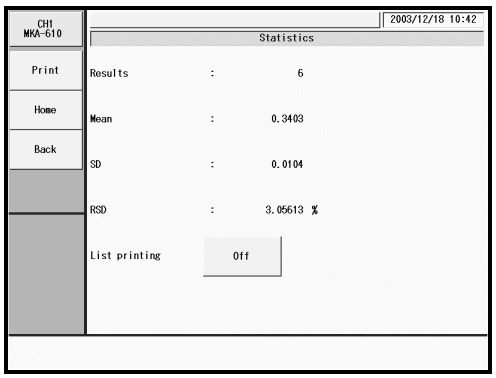
3) Press [Pick out] button. Here you sort out the data for batch calculation.



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.



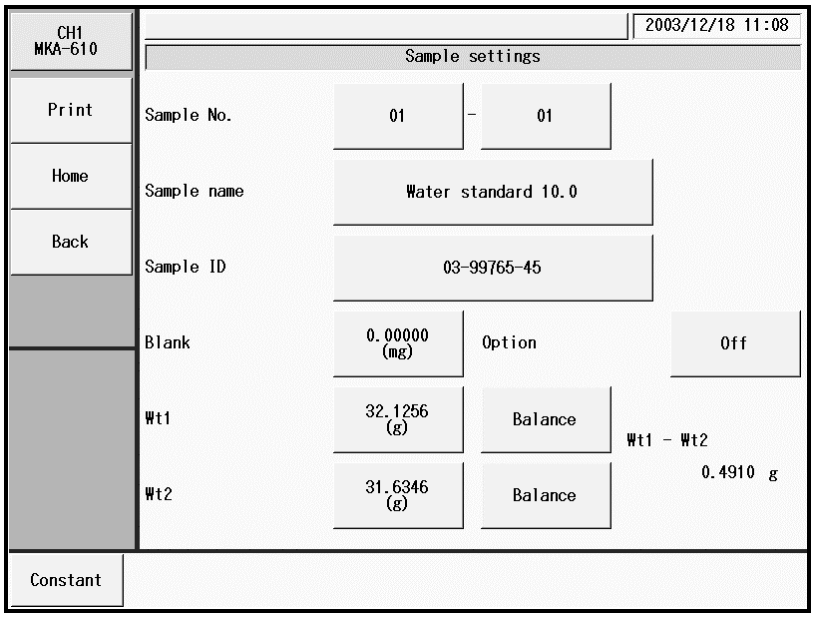
6) The screen on the left will appear. The batch calculated results will be printed out when [Print] button is pressed.
7) To return to Main display, press [Home] button.

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

3-3. About Sample settings

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.

- Off : No options to be used.
- On : Optional equipment to be used. 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.

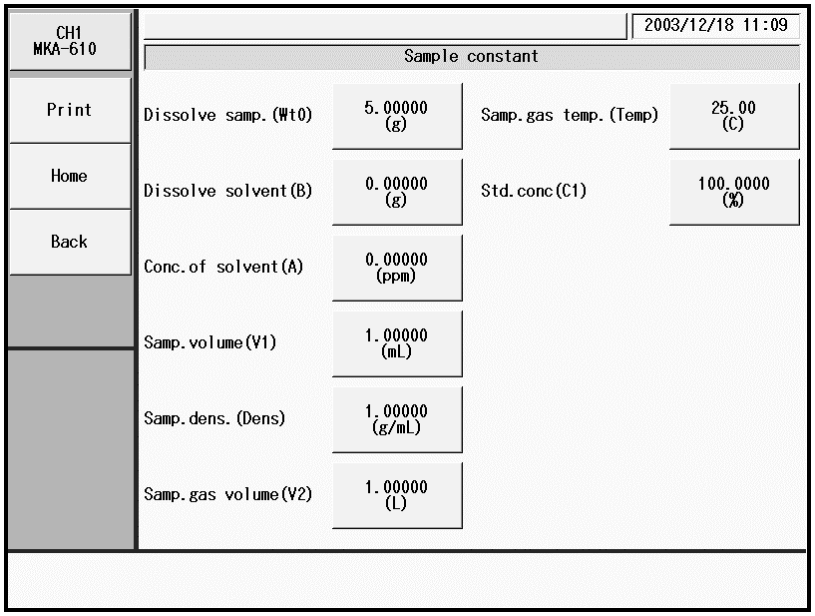
- 0.00000000 ~ 99999.99999999g

[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.



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

3-3-1. Sample File Mode

This mode is useful 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:

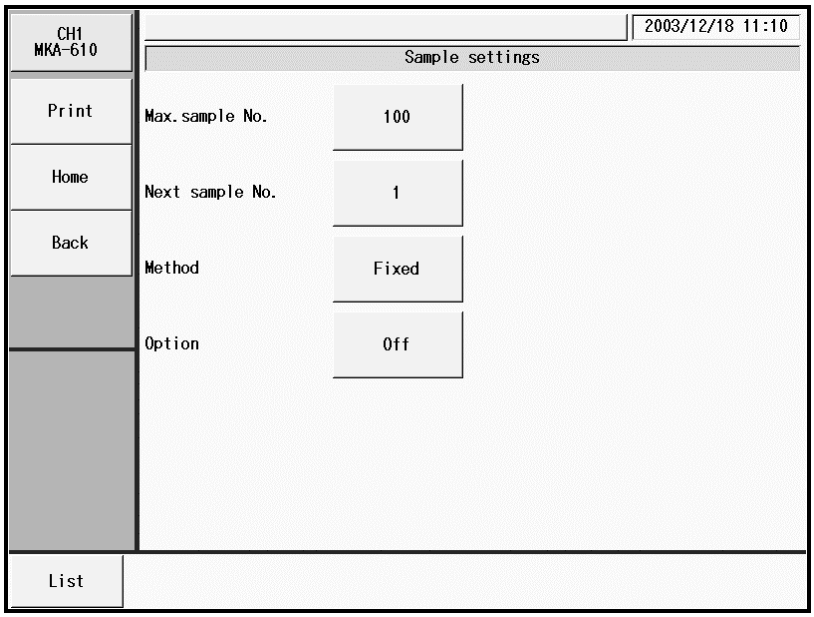
		Sample parameter						
	No.	Sample No.		Sample name	Sample ID	·····	Wt1	Wt2
	1	01	01	Blank		·····	0.0000	0.0000
	2	01	02	Blank		·····	0.0000	0.0000
Max sample No.	3	01	03	Blank		·····	0.0000	0.0000
	4	12	01	Sample A	20030501	·····	5.5213	4.5123
Next sample No.->	5	12	02	Sample A	20030501	·····	5.5312	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.

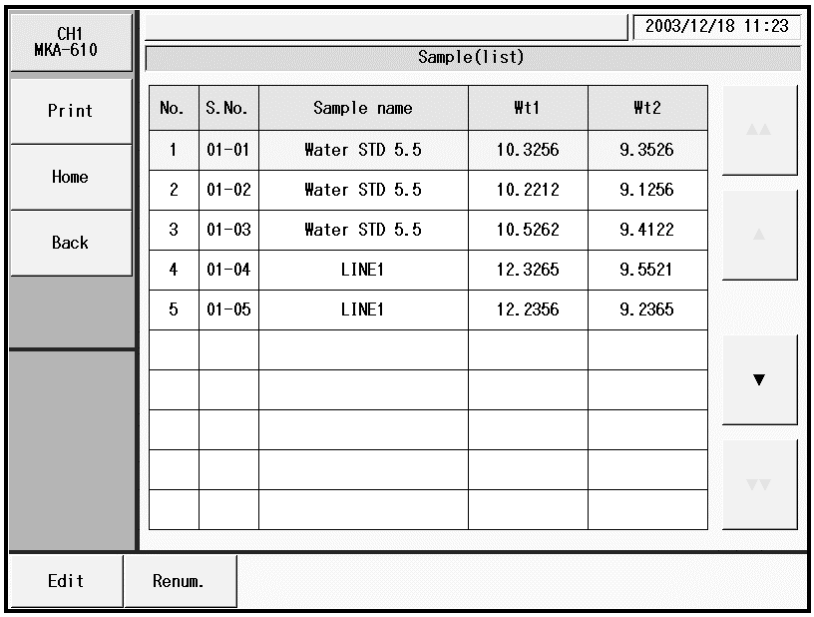
- Off : No options to be used.
- On : Optional equipment to be used. Such device will work to the parameters preset on Method.

[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.



[▲], [▼]

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]

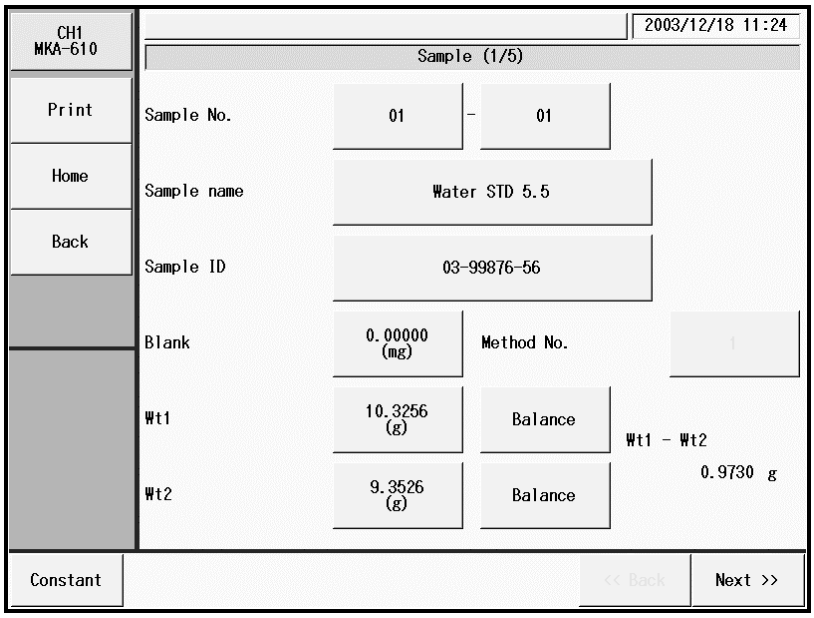
Here you can edit sample parameters. Point the cursor on the number where you want to edit the list. The display will change to “Sample” with this button.

[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.

Note:

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

[Next >>]

The next of sample setup display appears with this button.

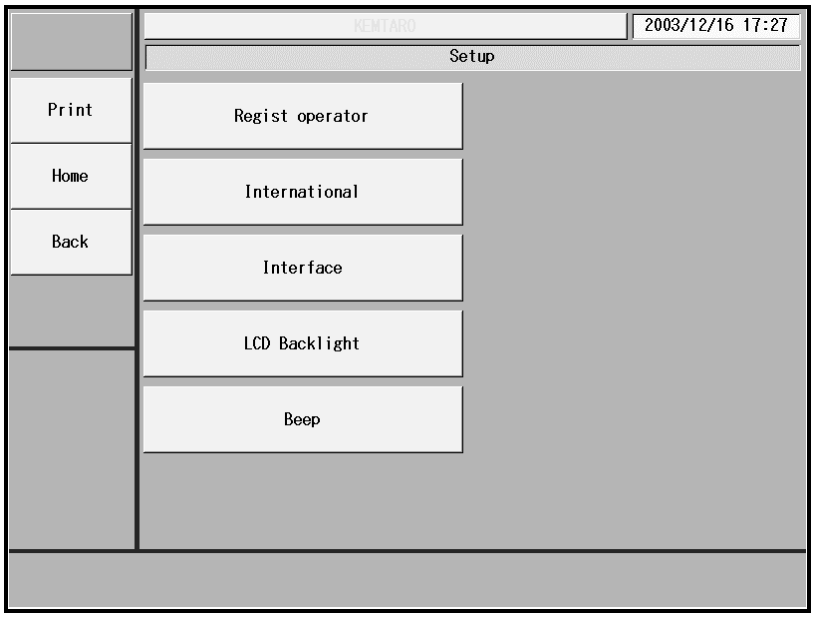
[<< Back]

The preceding page appears with this button when pressed.

3-4. 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.

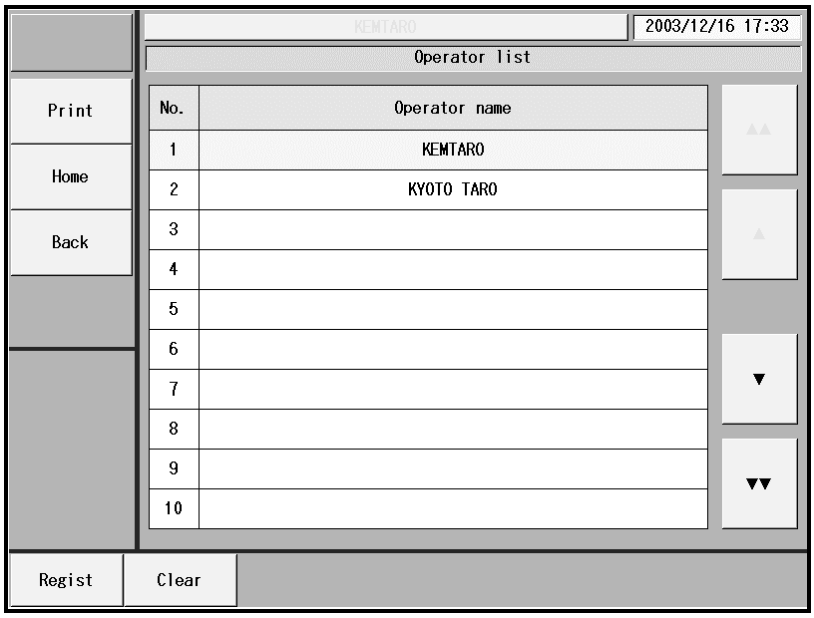
[Beep]

Beep tone for alarm can be selected on this display.

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]

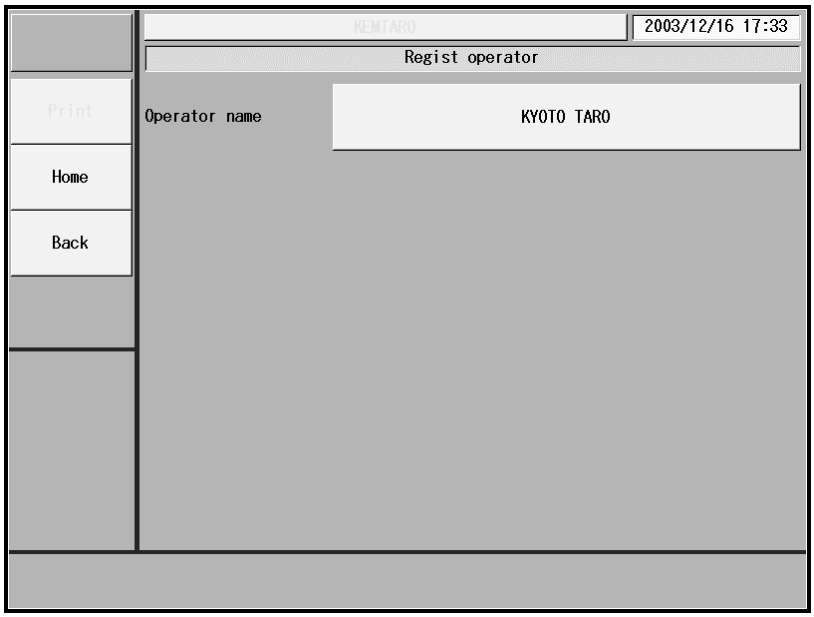
Here the operator is registered. The display for “Regist operator” will appear with this button after pointing the cursor on the operator’s number on the list.

[Clear]

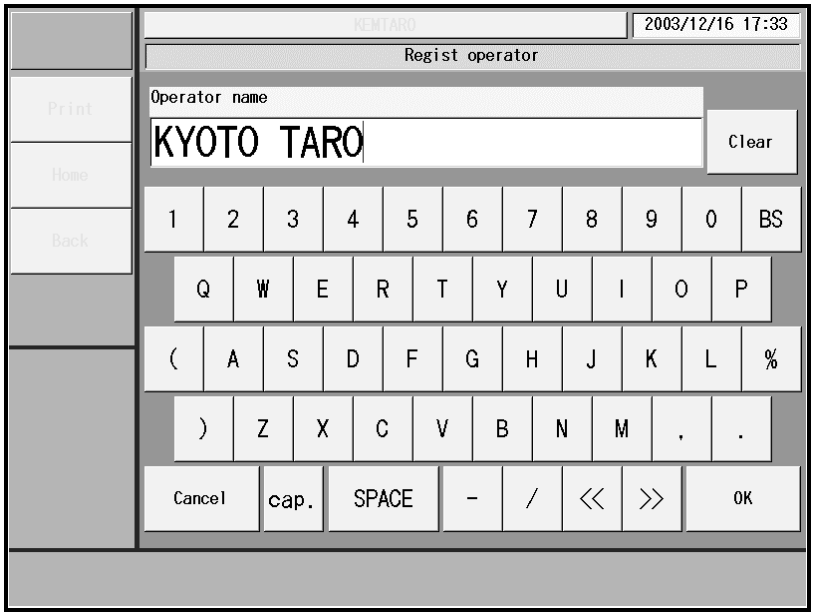
With the cursor pointed on the number you wish to clear, the display will appear to prompt your confirmation.

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

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



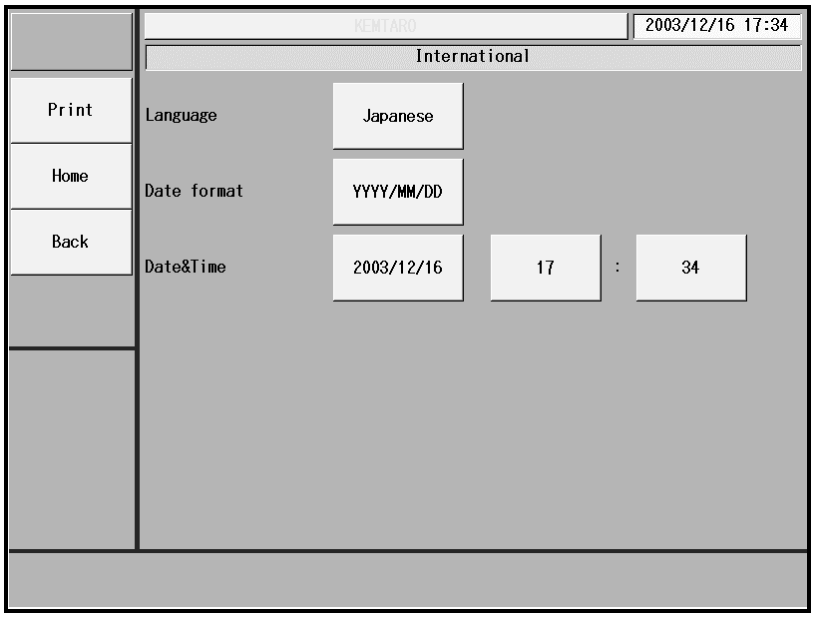
Press the area of operator name. Enter the operator’s name in below display, and press [OK] button.
Press [CAP.] button to use capital letter and [cap.] button for small letter.



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

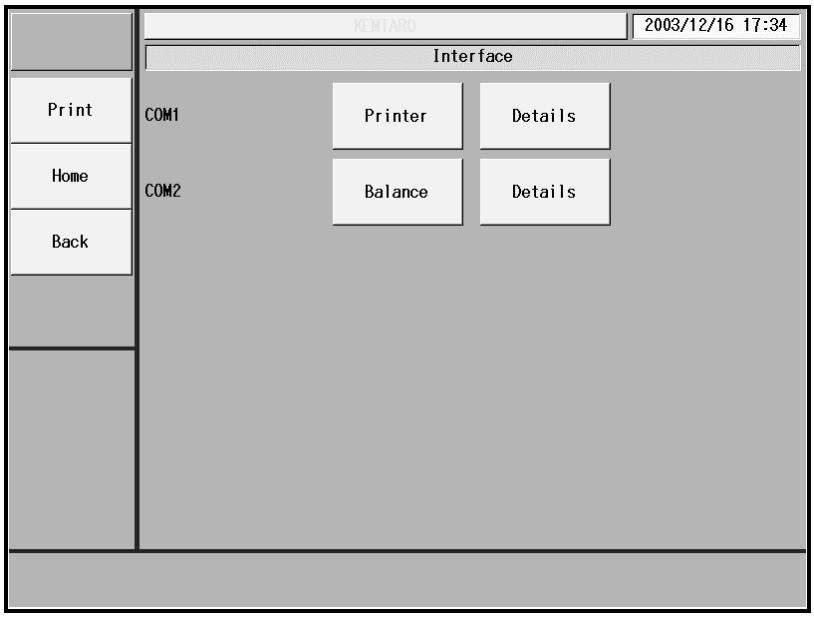
[Date&Time]

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:

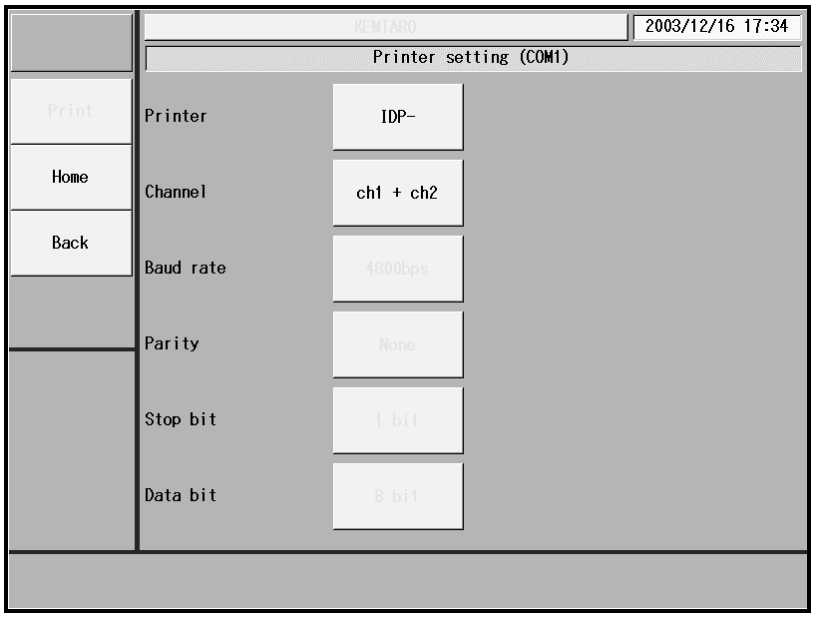
For details on printer or balance setting, refer to "3-4-3-1. Printer setting" or "3-4-3-2. Balance setting".

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

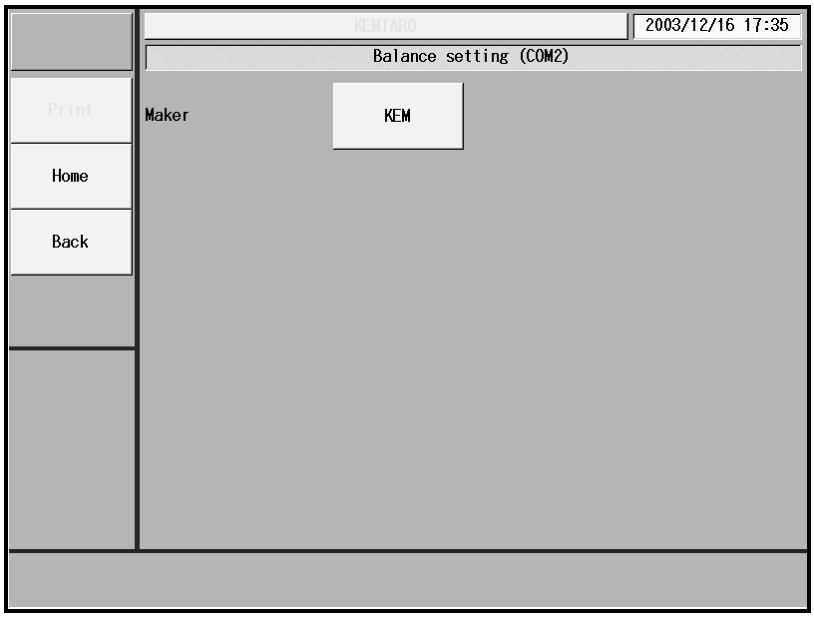
[Data bit]

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:

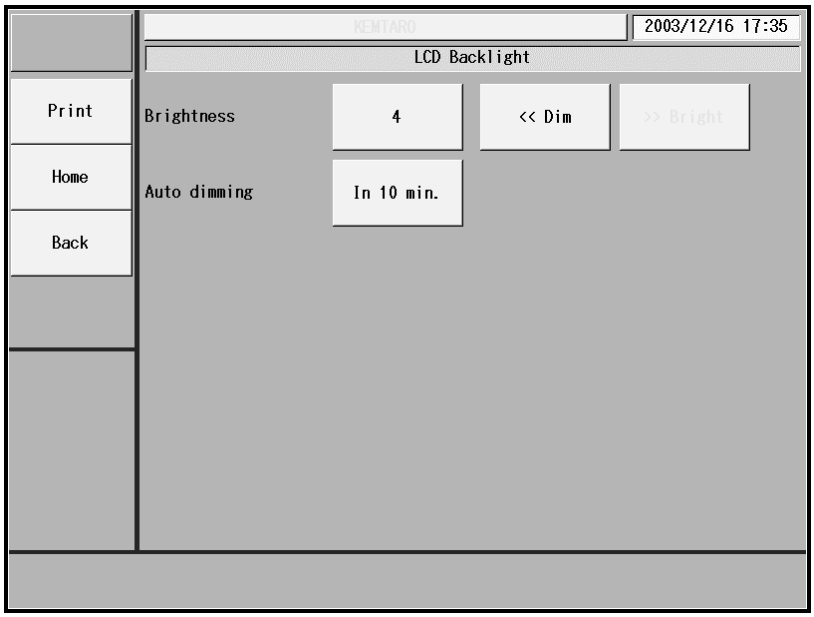
- KEM
- Mettler
- A&D
- Shimadzu
- Sartorius

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

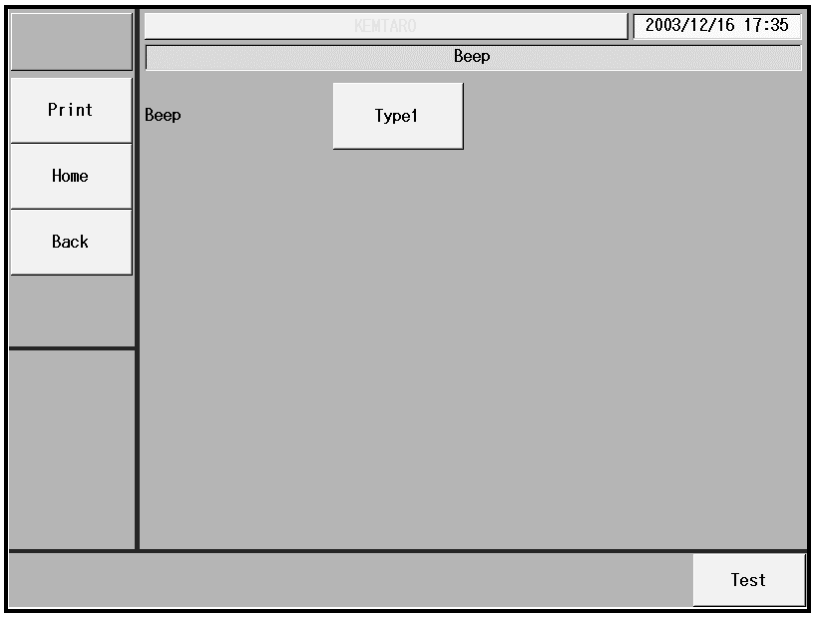
Note:

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:

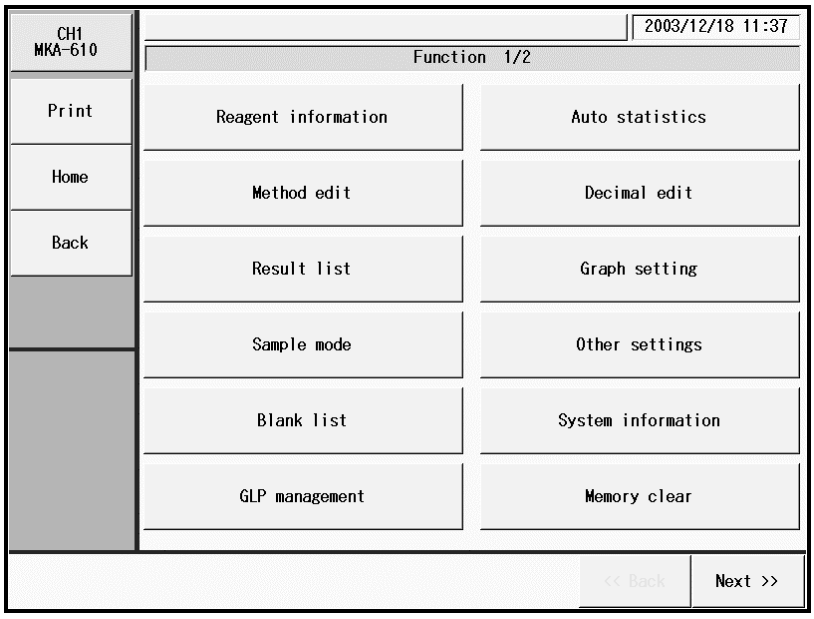
- Off : Setting of beep sound is cancelled. Beep sound is muted even for key operations.
- Type 1 : Beep sound lasts for about two seconds: “pi, pea-pea-pea-pea”
- Type 2 : Beep sound lasts for about four seconds: “pi-pi-pi-pi-pi-pi”
- Type 3 : Beep sound lasts for about ten seconds: “pi, pea-pea-pea-pea”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

3-5. Function

Press “Function” button on Main display.



[Reagent information]

Here you set in the information on reagents including their names, reagent factor, 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, periodic factor, 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]

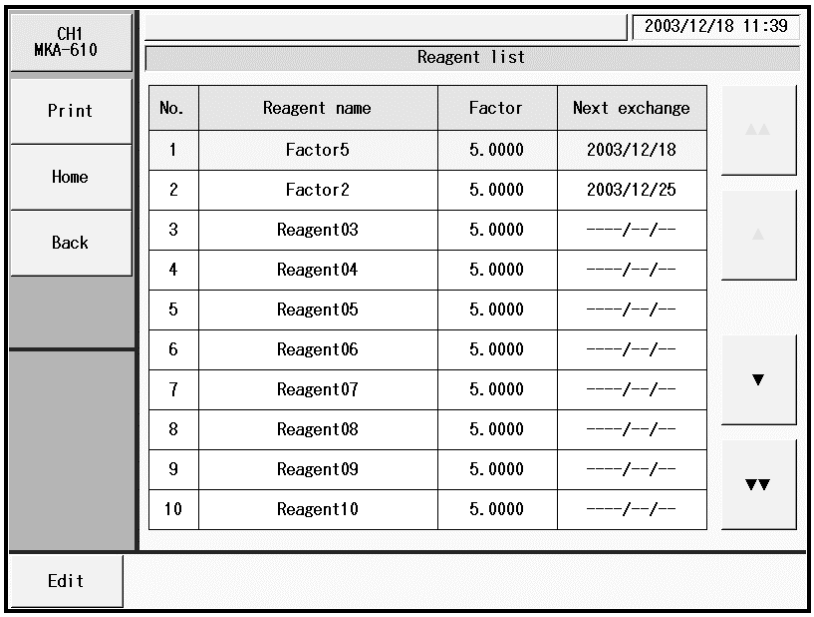
With this function, you can erase measurement results, methods or sample parameters selectively by individual sample.

[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.



[▲], [▼]

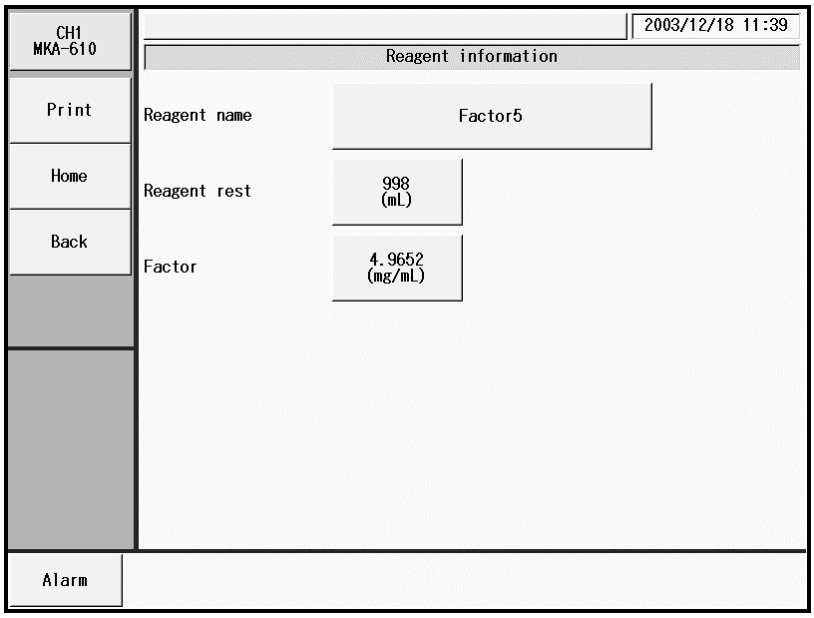
Moves the cursor on the list.

[▲▲], [▼▼]

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

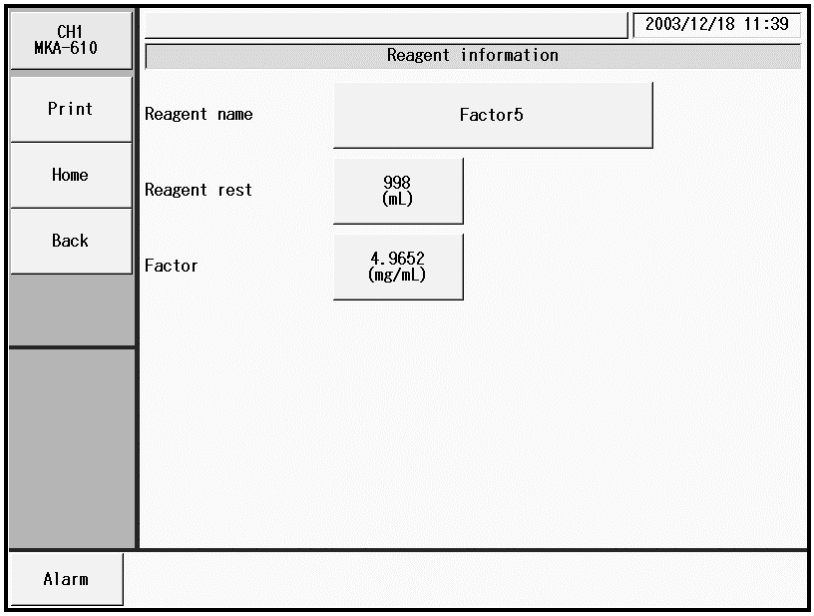
[Edit]

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, reagent factor, 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.

[Reagent rest]

Enter the amount of remaining reagent at the present time.

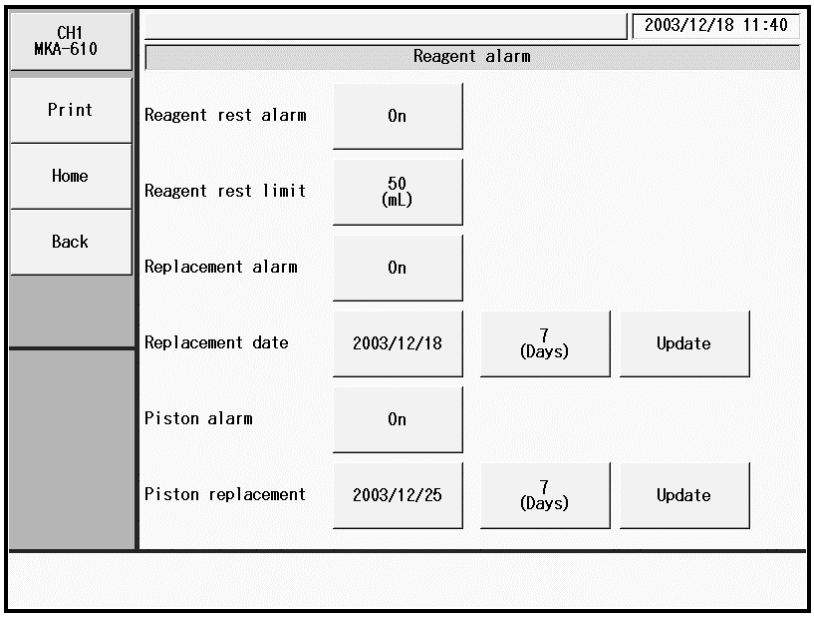
[Factor]

Enter the factor of reagent.

- 0.0000 ~ 99.9999mg/mL

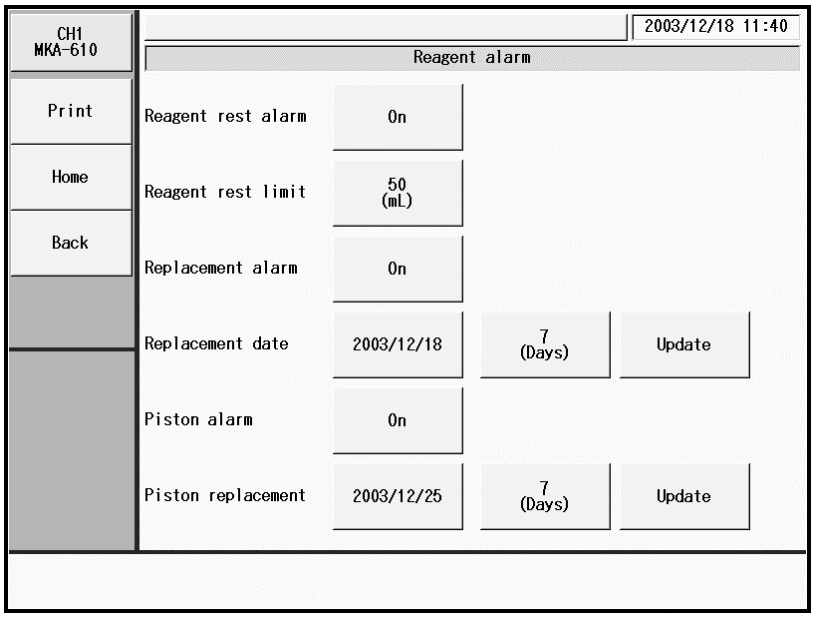
[Alarm]

Select the alarm type with this button. When pressed, it shows currently significant alarms.



3-5-1-2. [Edit] – [Reagent alarm]

Press [Alarm] button on “Reagent information” to show “Reagent Alarm” dialog box.



[Reagent rest alarm]

Select to activate this alarm or not.

- Off : No alarm
- On : Alarm is on

[Reagent rest limit]

Select the alarm of lower limit of remaining reagent.

- 0 ~ 9999mL

[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

[Piston alarm]

Select the alarm about the date for changing the burette piston or not.

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

[Piston replacement]

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

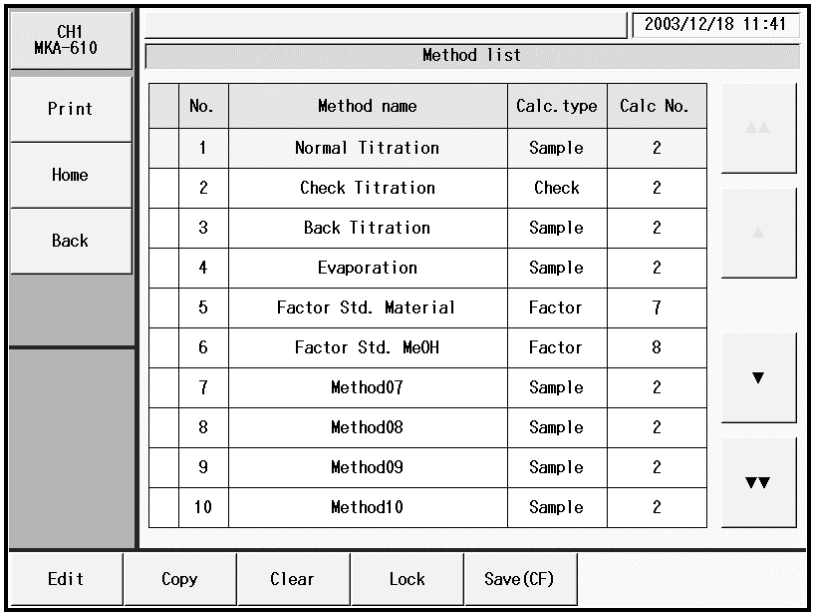
- [xx (Days)] : Set a time interval by a number of days
- [Update] : Set the next date for replacement as preset intervals

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)]

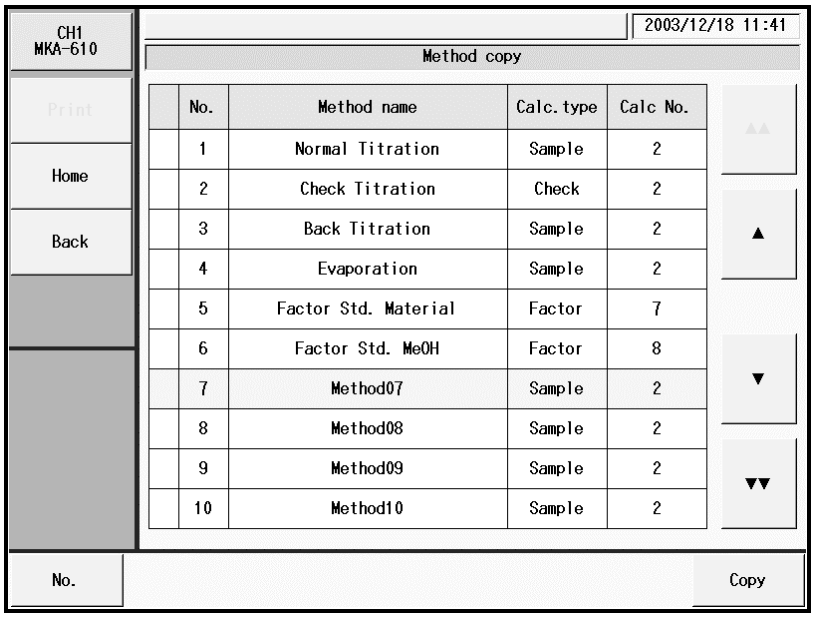
Save the method data into CF card. "Save method" will be displayed on the screen.

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.

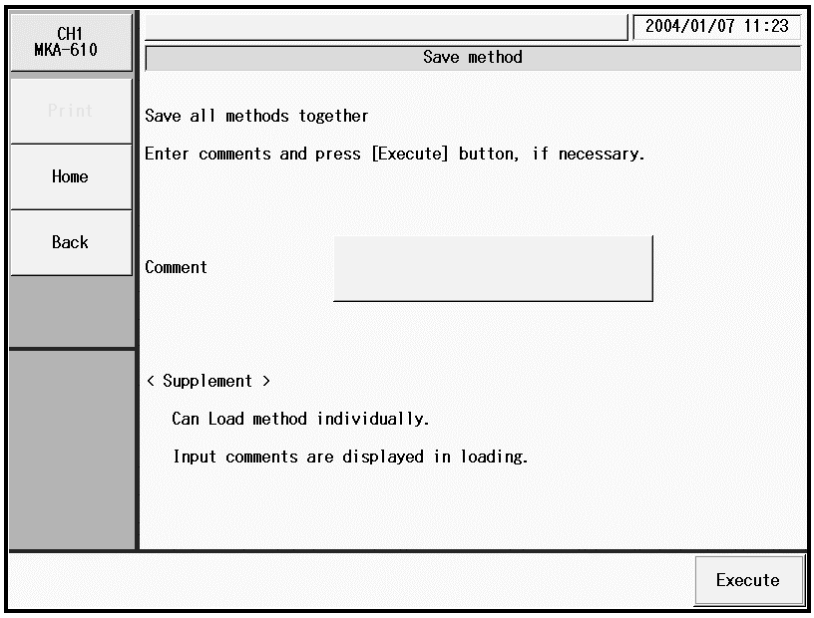
Note:

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

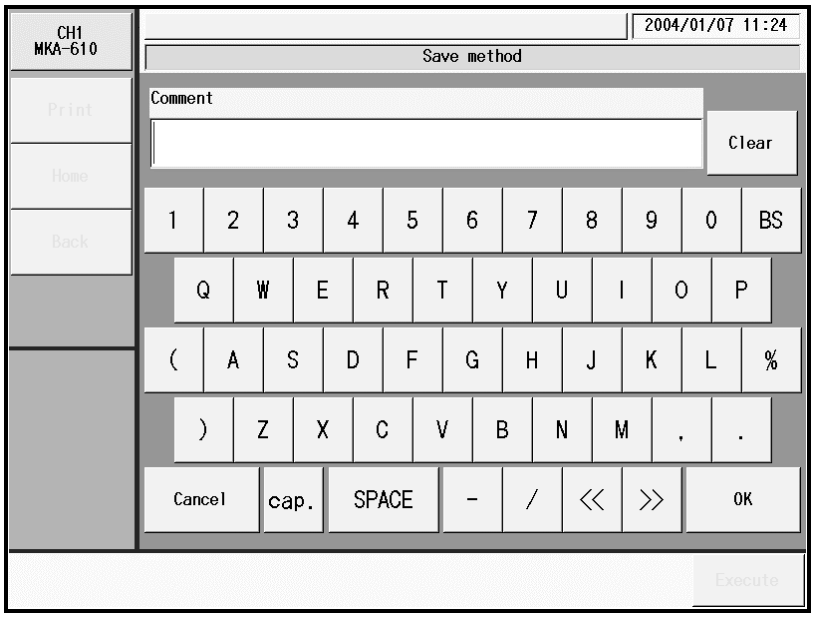
3-5-2-2. [Save (CF)] (Method data)

Save all methods into CF Card together.

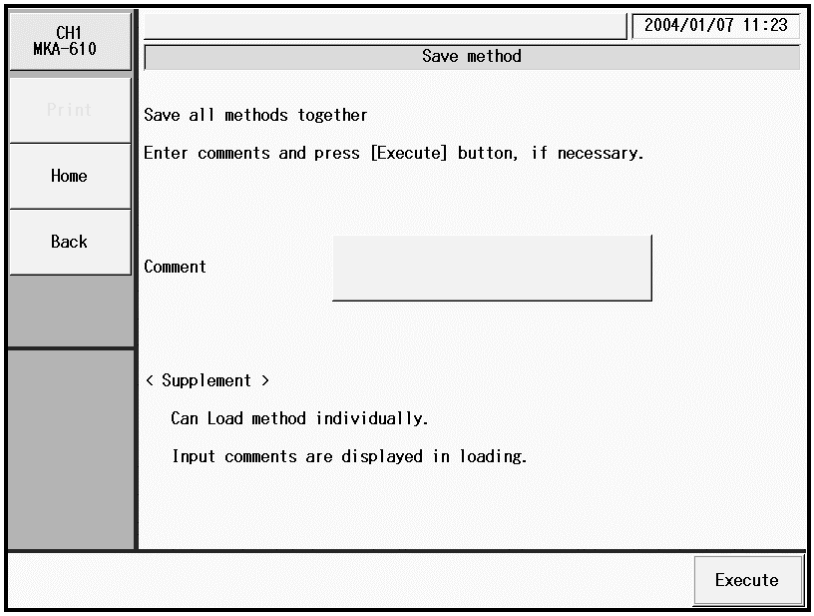
1) Press [Save (CF)] button on the “Method list” screen display. Then, “Save method” will be displayed on it.



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:

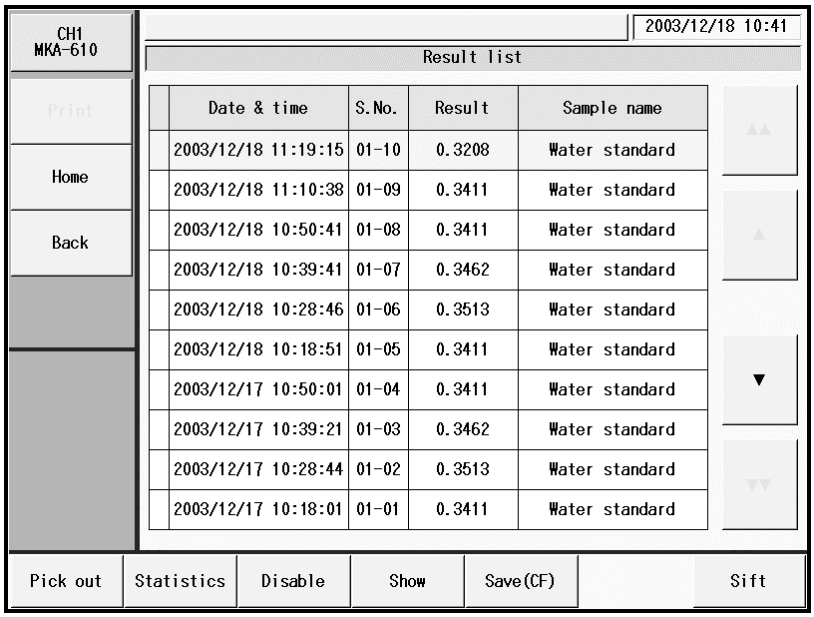
If only method data are saved into CF card, the memory storage is occupied in about 2.5M bytes. The number of files of method data to be saved in CF card is 100 in maximum. When measurement results are saved in CF card, the number of files saved will decrease depending on the memory capacity of CF card.

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.

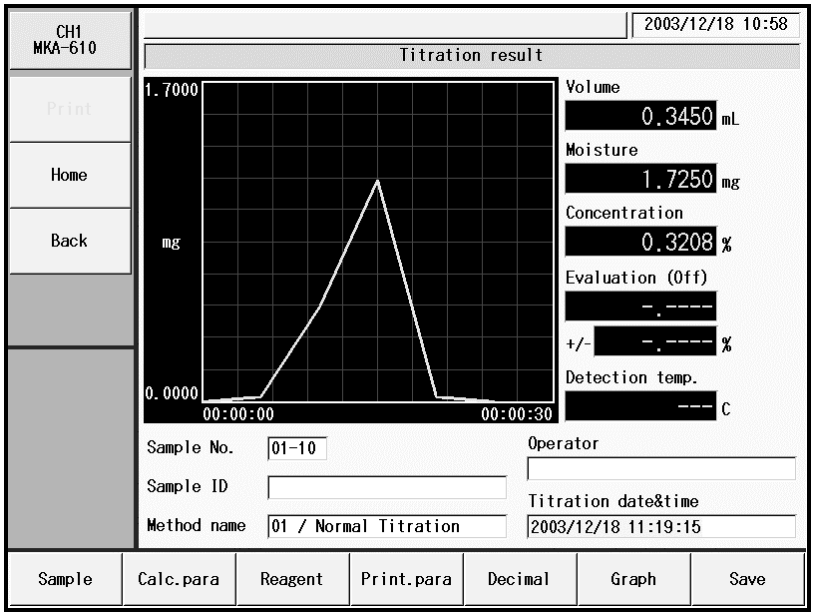
Note:
For details of Statistics, refer to “3-5-3-2. [Statistics]”.

[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)".

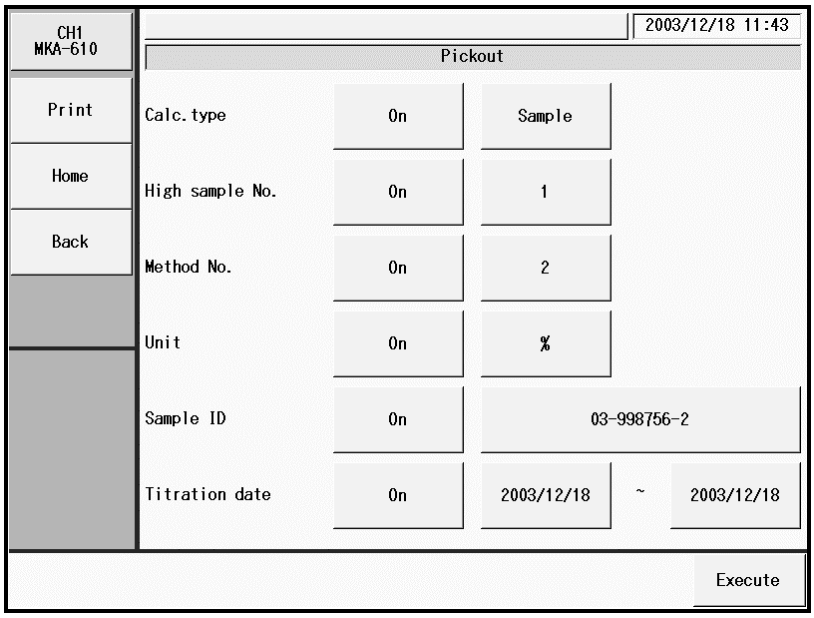
[All] or [Sift]

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:

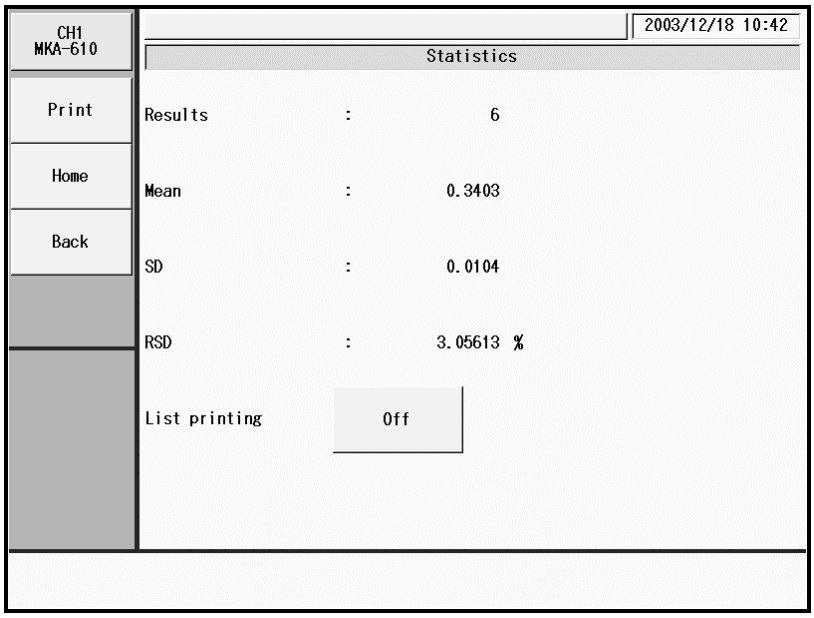
Calc. type	: The titration parameters preset on Calculation Parameter.
High sample No.	: The high order number for grouping the samples
Method No.	: The number of Method particular to it
Unit	: The unit used in calculation results
Sample ID	: The identification code particular to the sample
Titration 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 $$\overline{X} = \frac{(X_1 + X_2 + \Lambda + X_n)}{n}$$

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]

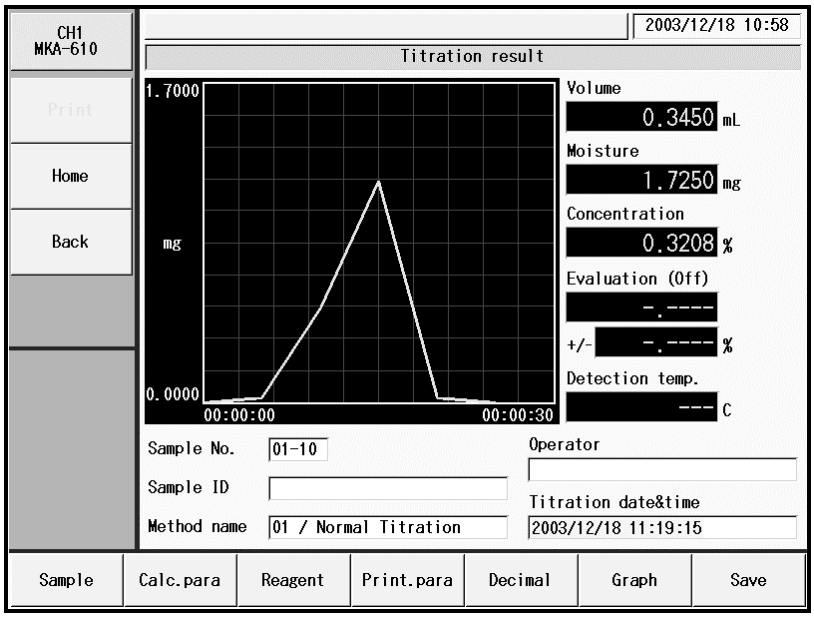
You can choose from Yes or No to print the statistical data:

- Yes : Print the results list
- No : No printout

Note:

If the mean value is zero “0”, RSD will appear on display and be printed out as “– –” symbols not as zero “0”.

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.

[Reagent]

You can change information on a reagent used in titration or dose on this setup display. 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.

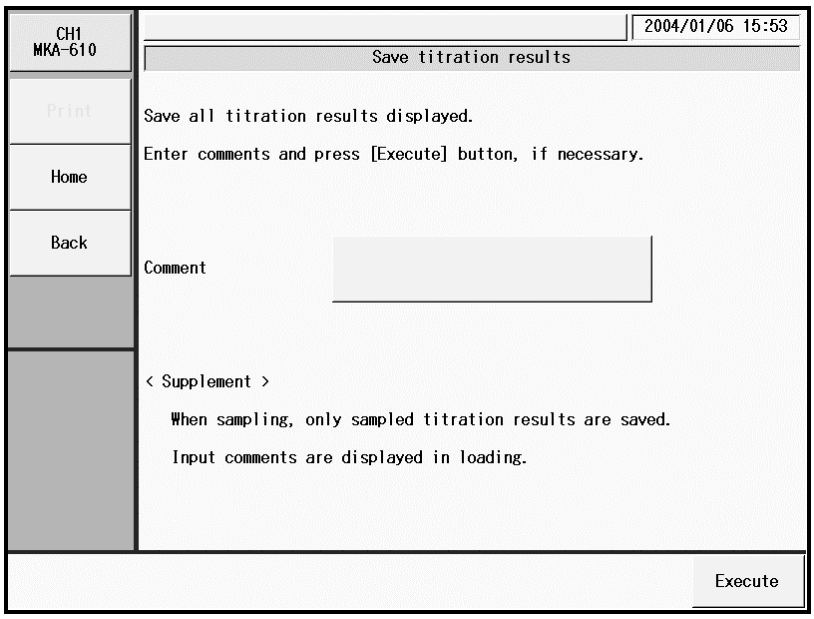
[Save]

Those changes that have been made are saved in memory.

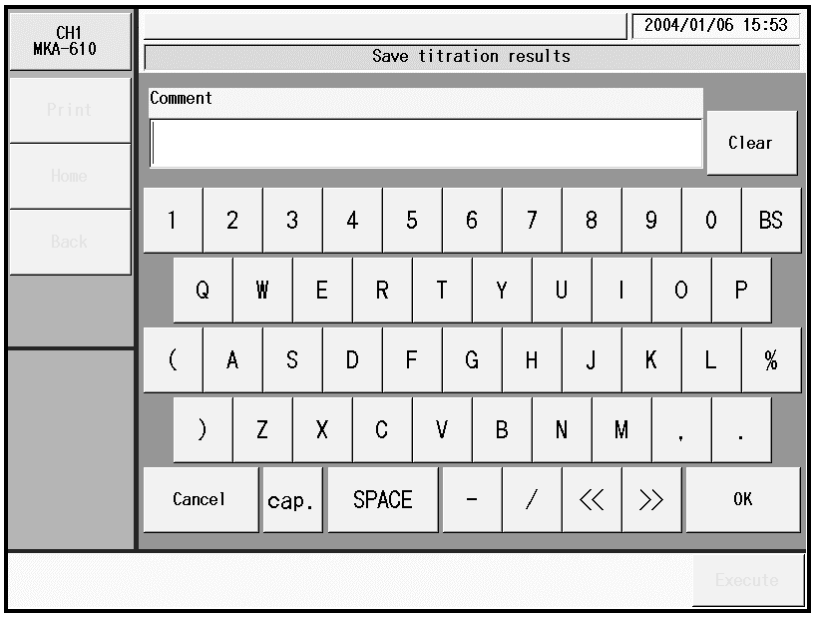
3-5-3-4. [Save (CF)] (Titration results)

Save the titration results on CF card.

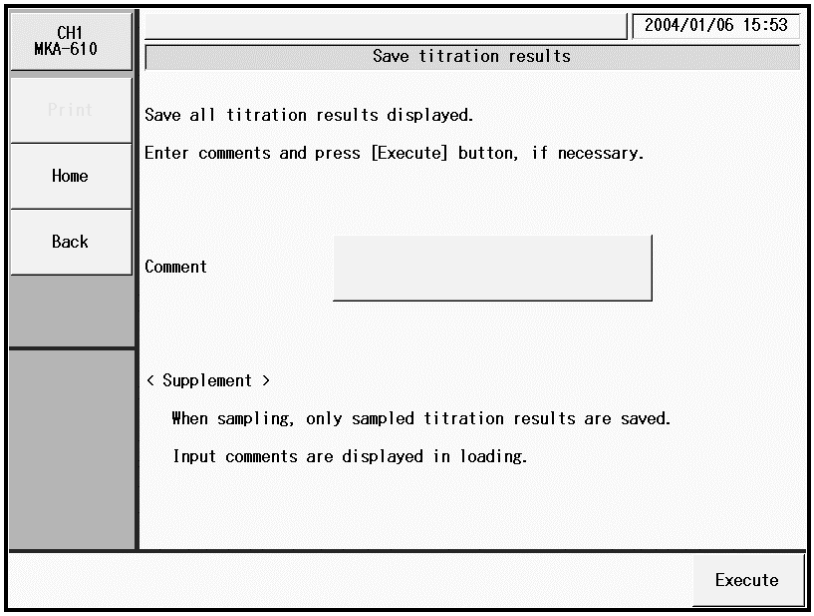
1) Narrow data to be saved according to the section “3-5-3-1 [Pickout]”.
2) Press [Save (CF)] button on the “Result list” screen display. “Save titration results” screen will be displayed.



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:

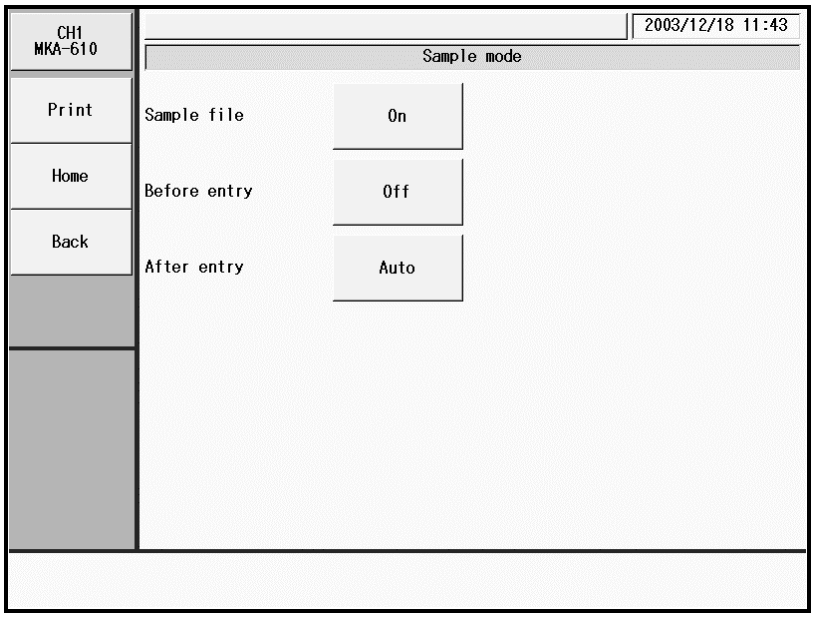
When 300 titration results are saved on CF card, about 7M bytes of storage will be used. In addition, the maximum file number to be stored on CF card is 100. When method data are stored on CF card, the number of file to be stored on CF card will decrease depending on the remaining memory capacity on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

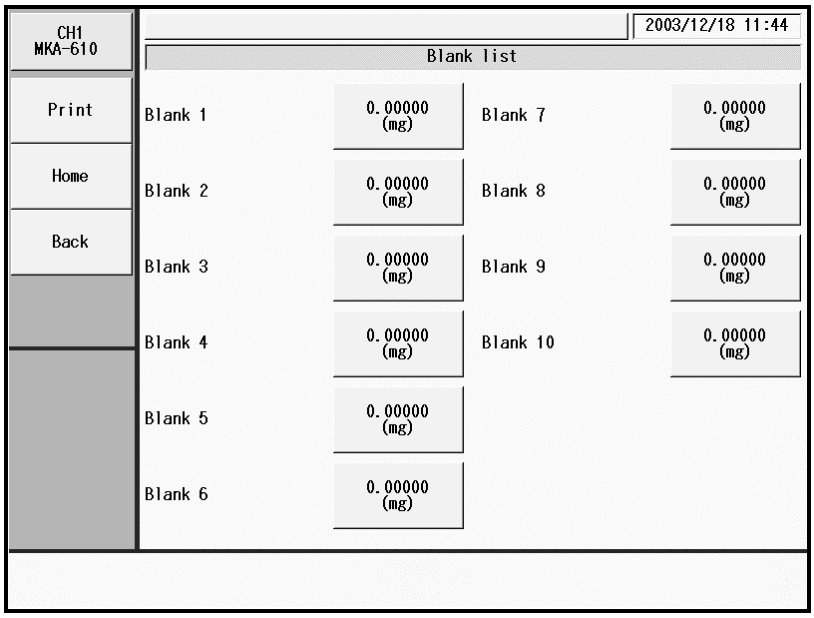
Here you select sample size entry mode after titration is over:

- 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”.

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]

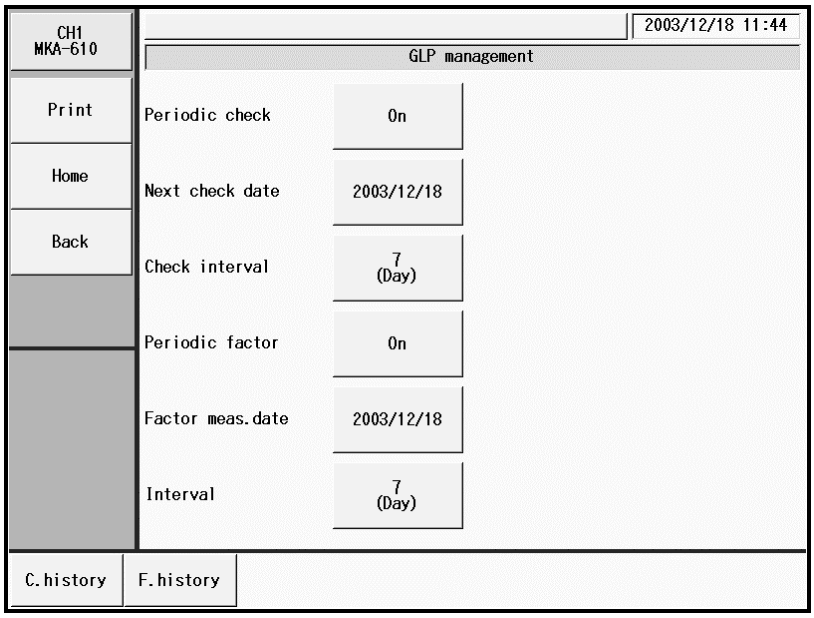
Here you enter blank values. Such numbered blank values can be selected and used in concentration calculation on Method parameter for calculation parameter. You can also enter “Blank” level on Sample Setup.

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.

[Check Interval]

The next check day is updated automatically at preset intervals.

[Periodic factor]

Here you select or not to activate the alarm about the date for factor measurement at selected intervals;

- On : When the day comes due for factor measurement, the message on display prompts to measure the reagent factor. The measurement results can be reviewed with [Factor record] button.
- Off : No alarm about the date for factor update

[Factor meas. date]

Here you select a next due date for factor measurement.

[Interval]

Here you select a number of days when the factor is measured at intervals.

The next day for factor measurement is automatically updated at the selected intervals.

[C.histry]

You can view the periodic check record.

[F.histry]

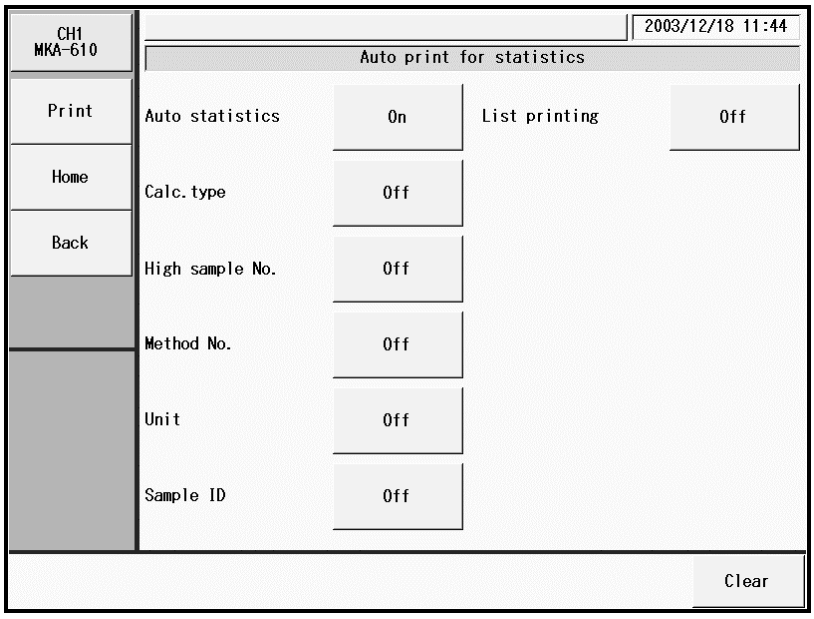
You can view the periodic factor measurements record.

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]

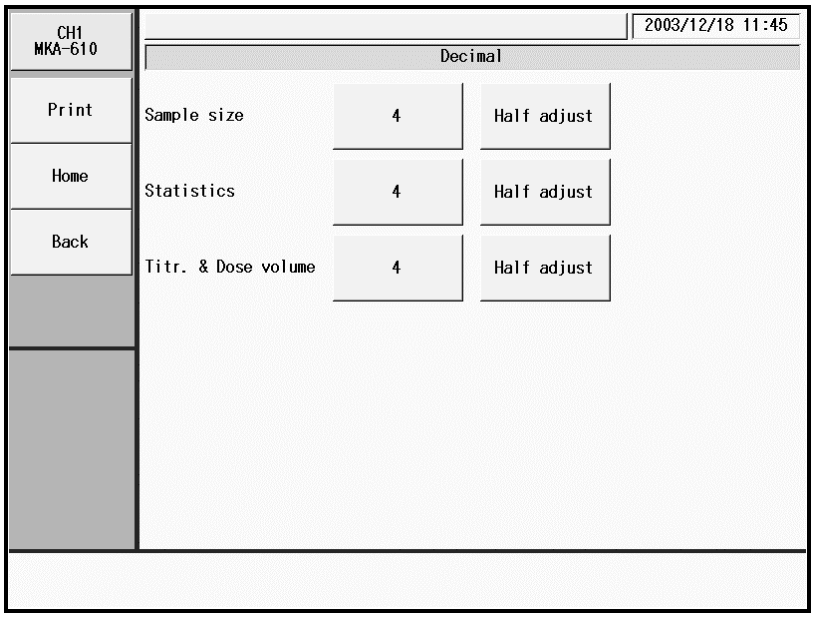
You can erase the statistical data.

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

[Titr. & Dose volume]

Here you select a number of decimal places and fraction rounding for titration or dose volume as follows:

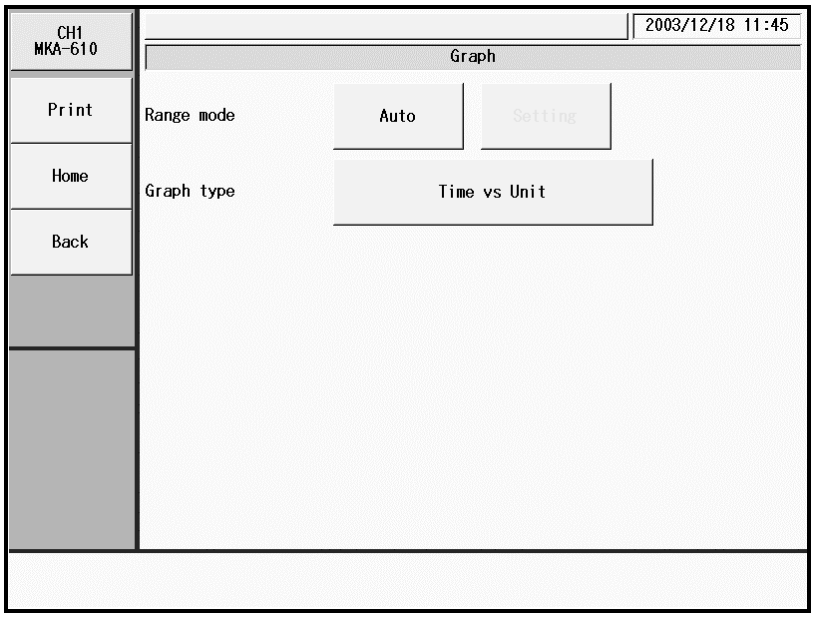
- Half adjust : rounded to nearest preset number of digits after decimal edit
- Round off : rounded down to ·nearest preset number of digits after decimal edit
- Round up : rounded up to nearest preset number of digits after decimal edit

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.

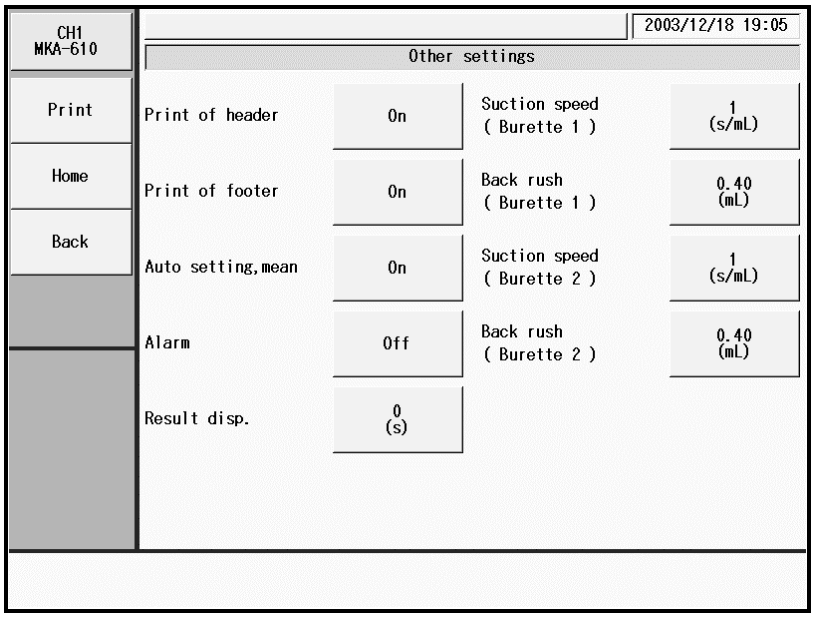
[Graph type]

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 or factor that have been measured will be automatically set into the blank value to be used in sample setup or the factor value to be used in reagent information respectively.

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

Note:

The average is calculated only with the data after the results of reagent factor in preset range (0 ~ 9.9999mg/mL). Data out of range will not be applied.

[Alarm]

This gives the alarm about reagent factor measurement, 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

[Suction speed (Burette 1)]

The speed of filling the burette with reagent can be adjusted. Slow down its speed when air bubbles may permeate inside burette through the piston head when it is deteriorating in the course of time.

- 1 ~ 999s/mL

[Back rush (Burette 1)]

For precise measurement, it is necessary to remove the air bubble permeating into the burette through piston head or tube joints deteriorating in the course of time. Backlash pushes out such air right after the burette is filled with reagent. You can select the amount of backlash:

- 0.08 ~ 12.00mL

Note:

The more reagent backlashes, the less reagent is discharged in one cycle of reciprocating piston.

[Suction speed (Burette 2)]

The speed of filling the burette with reagent can be adjusted. Slow down its speed when air bubbles may permeate inside burette through the piston head when it is deteriorating in the course of time.

- 1 ~ 999s/mL

[Back rush (Burette 2)]

Just like for burette 1, you can select the amount of backlash for additionally installed burette 2:

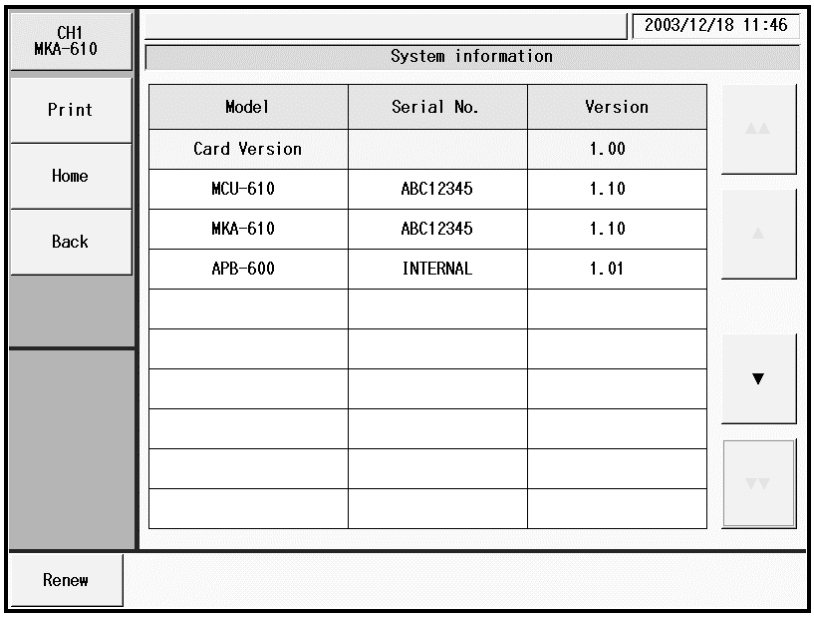
- 0.08 ~ 12.00mL

Note:

The more reagent backlashes, the less reagent is discharged in one cycle of reciprocating piston.

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.

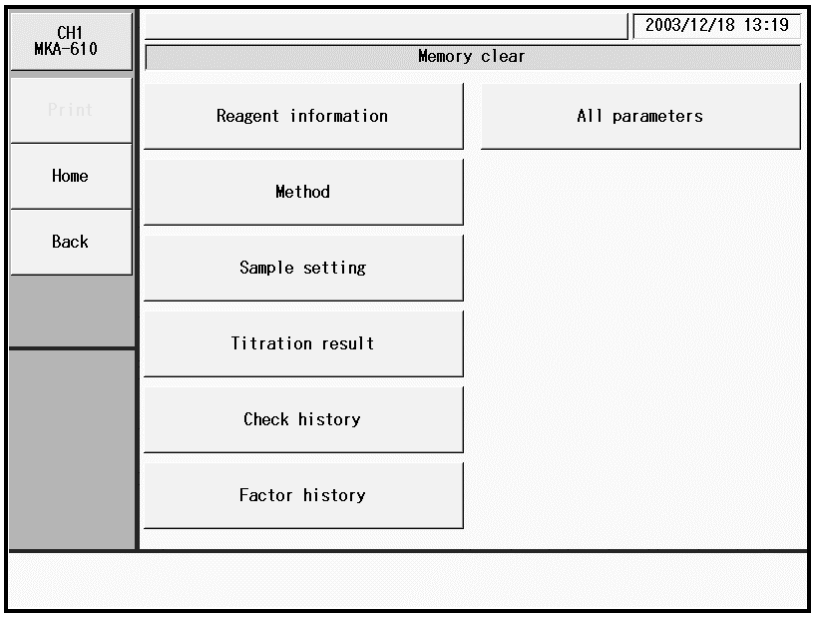
Note:

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.

[Factor history]

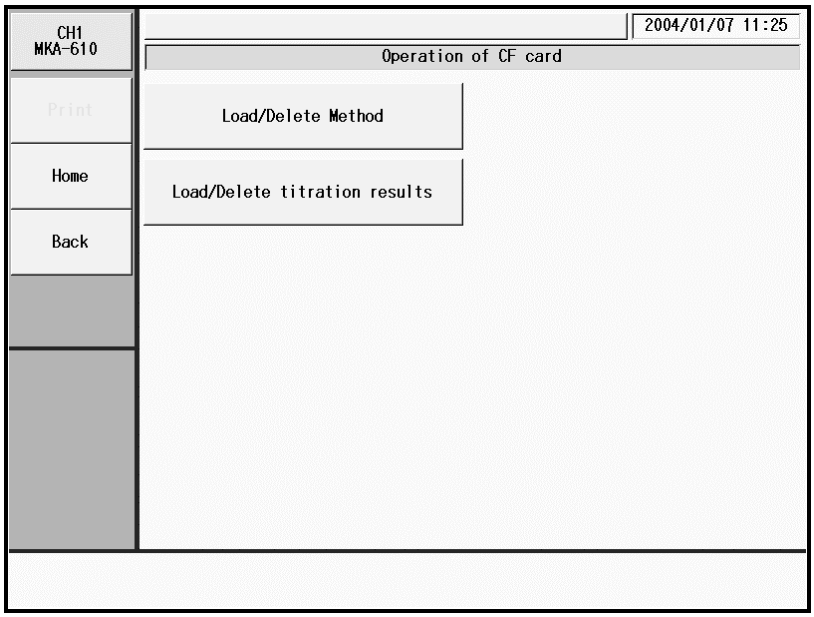
All the factor records are erased.

[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”.

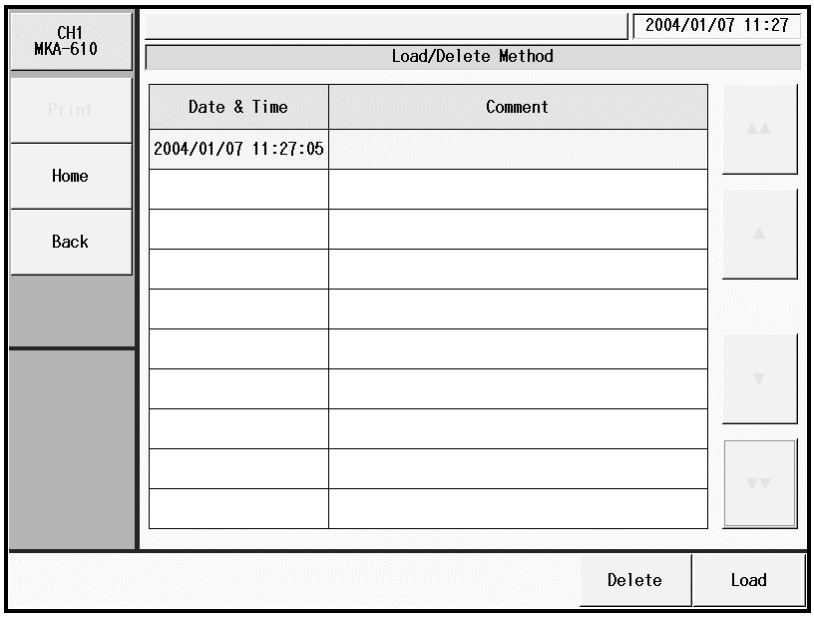
[Load/Delete titration results]

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”.

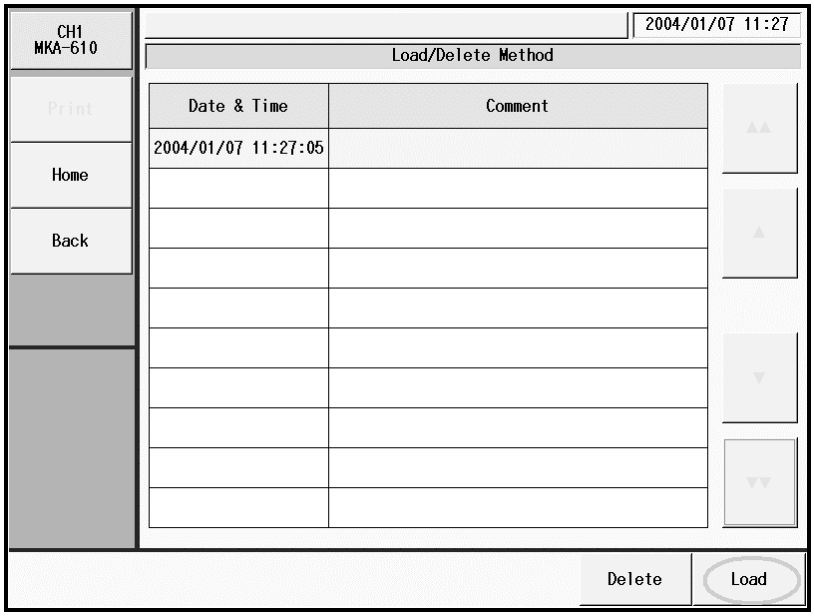
3-5-13-1. [Load/Delete Method]

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

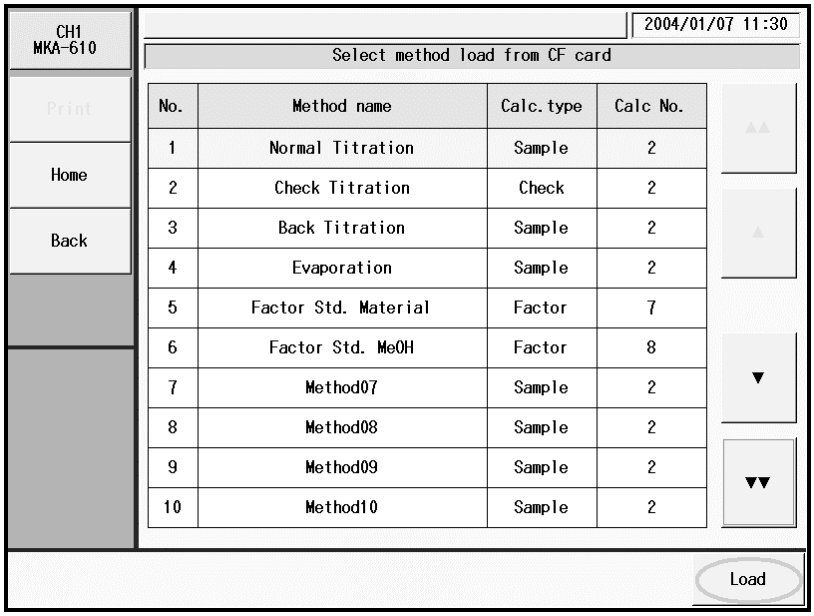


< How to load method >

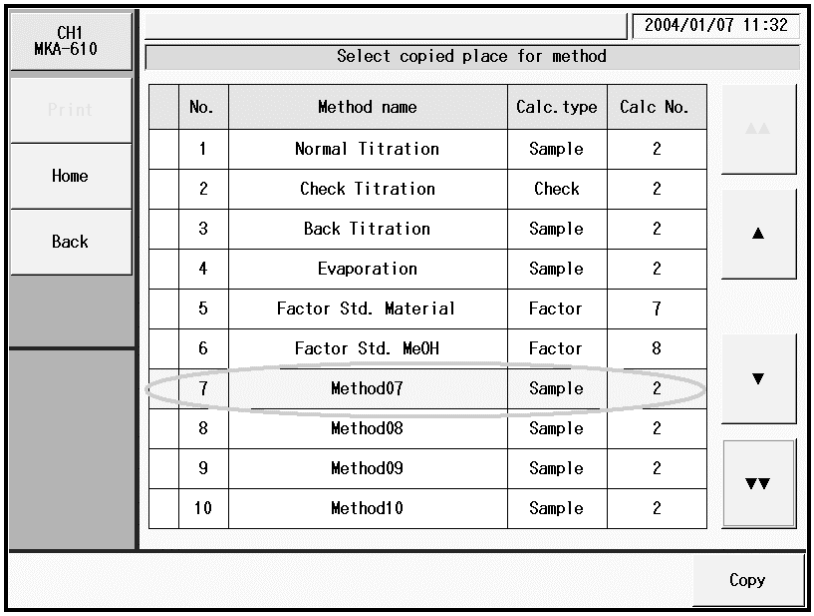
1) Select the method file to be loaded into the measuring unit on the “Load/Delete Method” screen display and then press [Load] button.



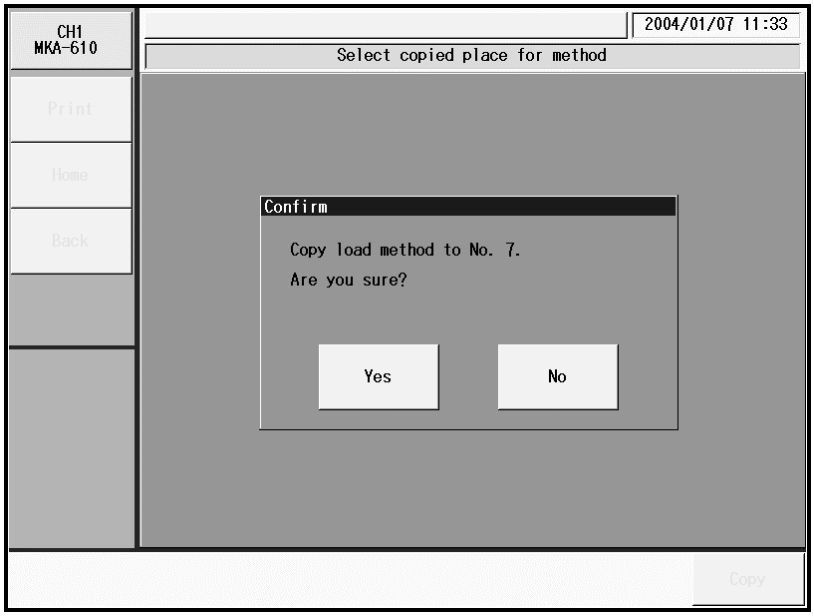
2) The screen of “Select method loaded from CF card” will be displayed. Then, select the method to be loaded into the measuring unit and press [Load] button.



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



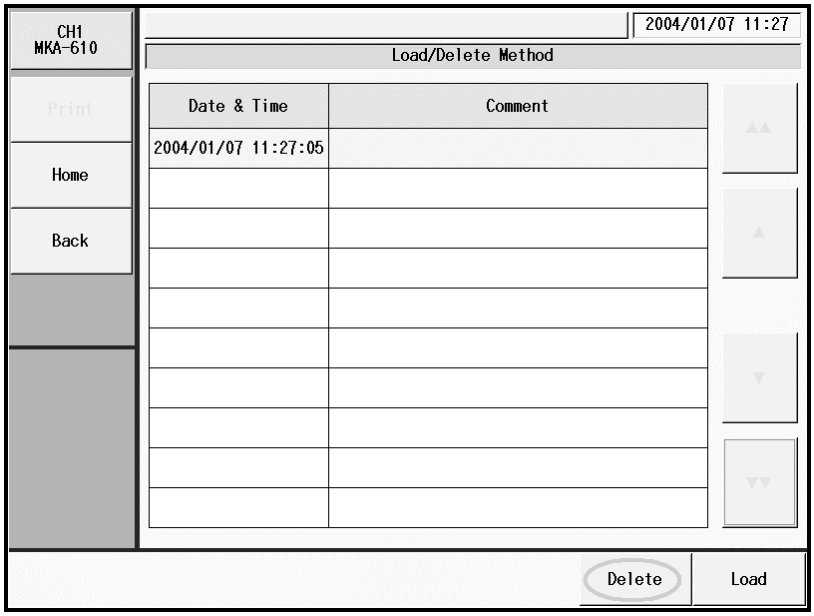
4) When the confirmation screen is displayed, press [Yes] button.



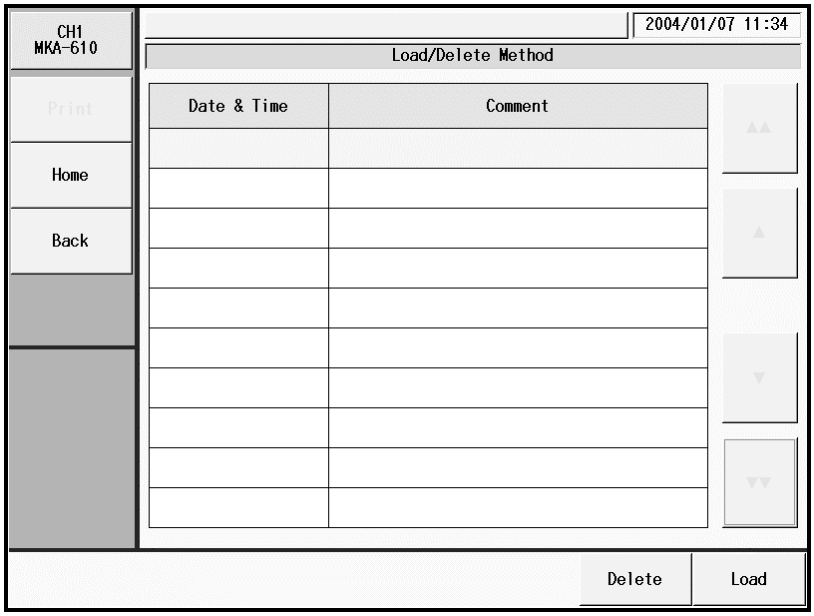
5) The method will be copied onto the method selected in the method list and the screen display will return to “Select method loaded from CF card”. When loading further methods, repeat the above steps 2) through 4).

< 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.

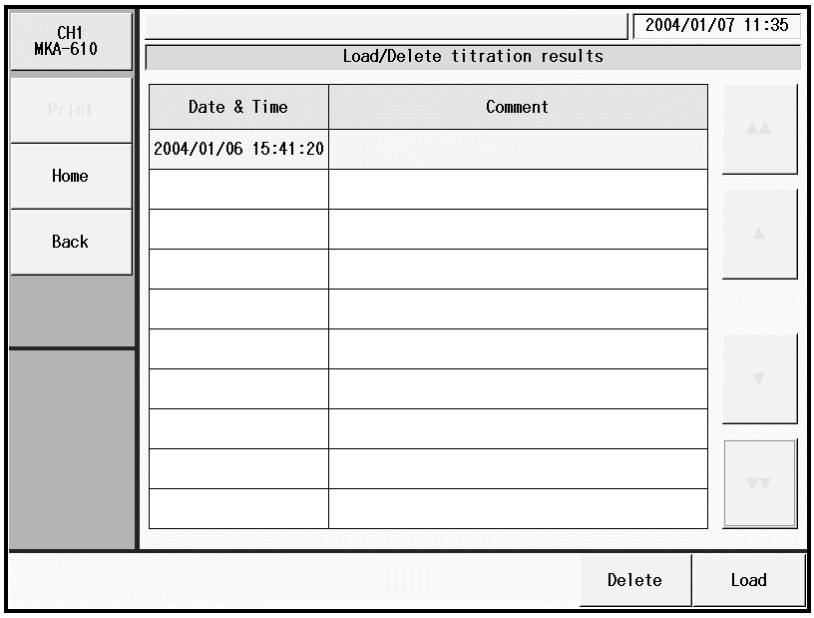


2) The method file selected on CF card will be deleted and the screen display will return to “Load/Delete Method”. When deleting further method files, repeat the above steps 1).



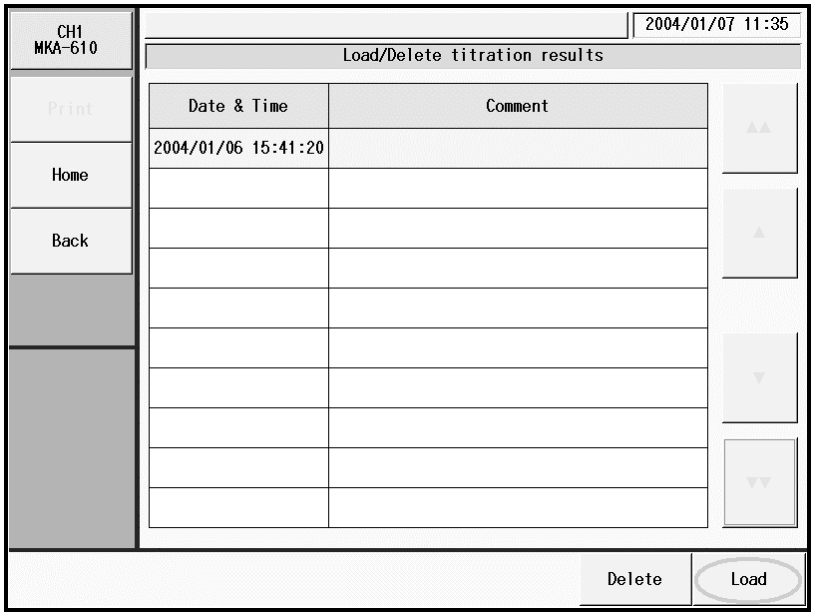
3-5-13-2. [Load/Delete titration results]

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

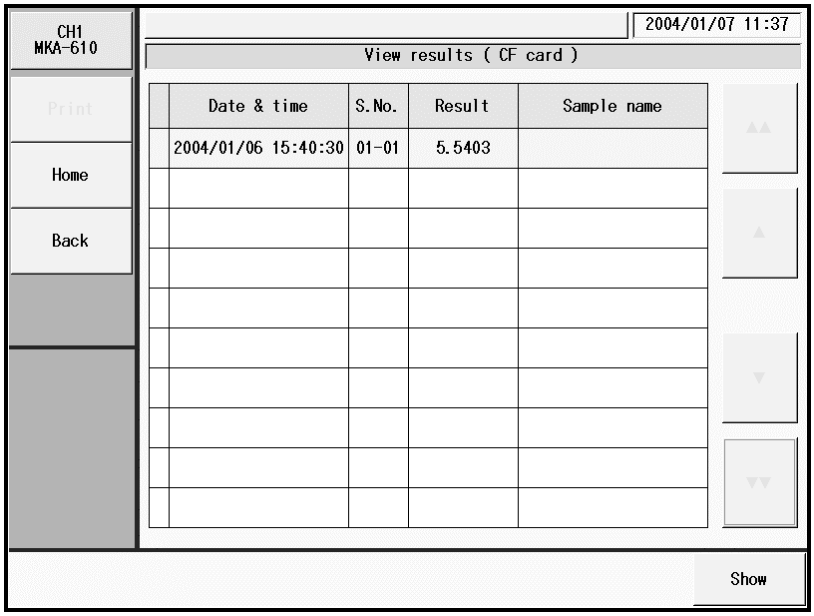


< How to load titration results >

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



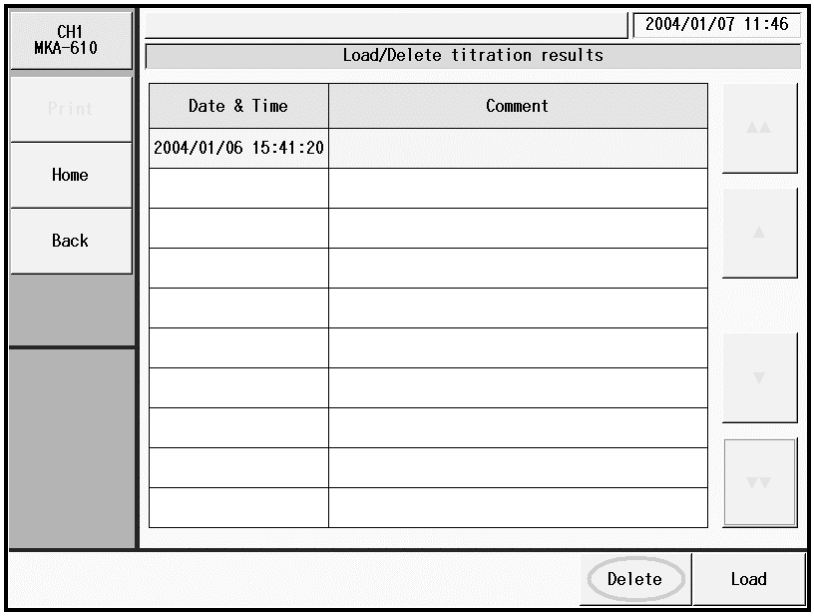
2) The screen of “View results (CF card)” will be displayed. Select the titration results to be displayed on the measuring unit and press [Show] button.



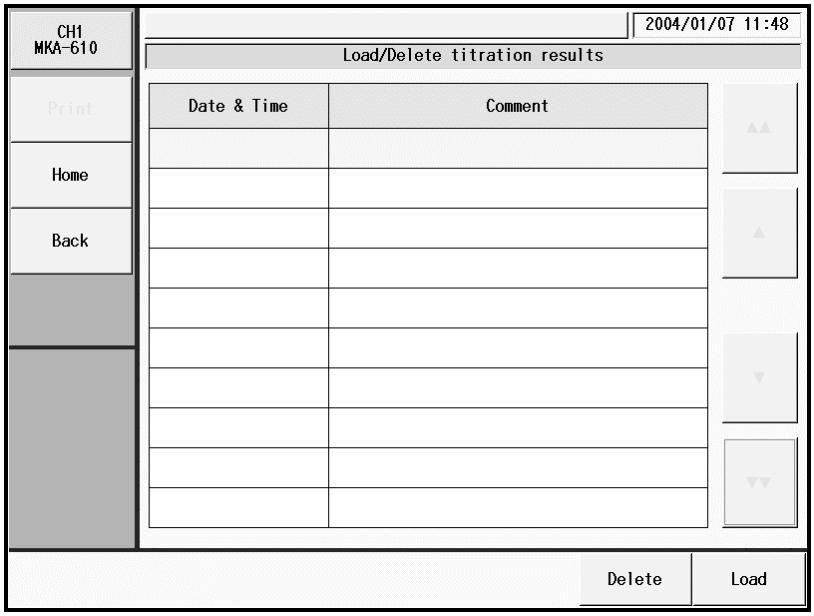
3) The selected titration results will be displayed on the measuring unit.

< 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).

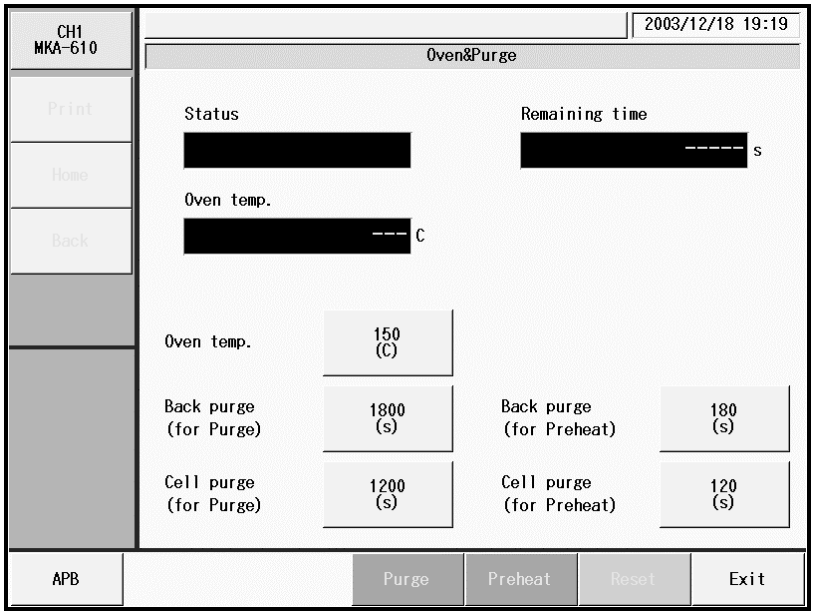


3-6. About Option

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.

[APB]

This button changes the display to “APB manual operation”.

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).

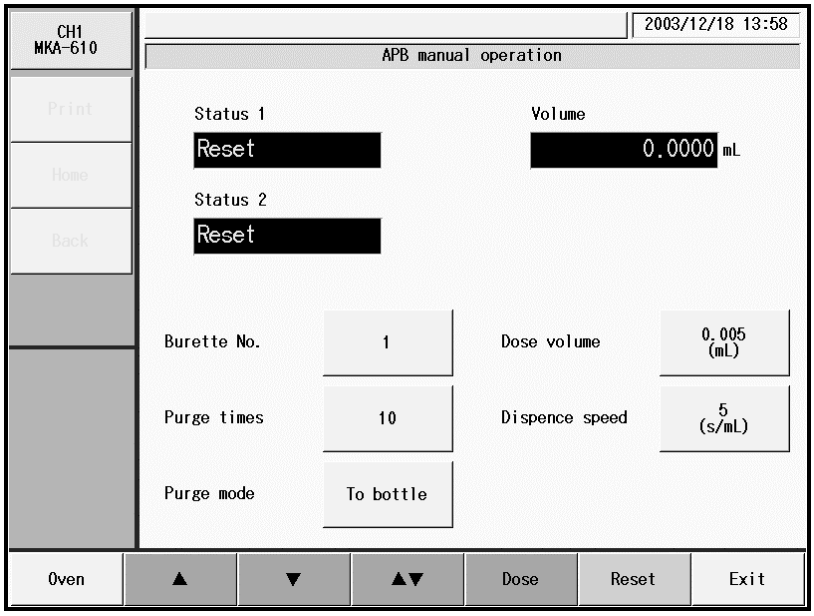
Display screen for Remaining time:

Will display the remaining time for purging or preheating.

3-6-2. [APB manual operation]

The burette can be manually operated for filling or fixed dosing the burette with reagent or to purge the burette. You can manually operate the burette like these only when the unit is in “Wait for Pre-Titr.” mode.

Press [Option] button on Main display, and then, press [APB] button on “Oven & Purge” to show [APB manual operation].



[Burette No.]

Select the burette for use in titration:

- Both : Two burettes can be operated at a time.
- 1 : The supplied one burette works.
- 2 : Additionally installed second burette works.

[Purge times]

Select a number of purge cycles:

- 1 ~ 99

[Purge mode]

You can select a purge mode:

- To bottle : Reagent moves between the reagent bottle and burette. This is for degassing the nozzle and to average the reagent quality.
- To nozzle : This is for degassing the nozzle and to drain out titration liquid.

[Dose volume]

Select how much reagent is dosed from burette:

- 0.0005 ~ 999.0000mL

[Dispence speed]

Selection of dispence speed:

- 1 ~ 999s/mL

[▲]

This button once pressed pushes out the reagent to the nozzle, and stops the piston when it reaches the upper limit top position. The piston also stops when pressed again. The switching valve is turned to discharge direction during this event.

[▼]

This button lowers the piston to aspirate the reagent from the bottle. When pressed again, the piston stops.

[▲▼]

Once pressed, it purges for a number of preset times, and stops by filling the burette with reagent. When pressed again, it stops purging and sets in standby for discharge position.

[Dose]

It doses the preset amount of reagent. This is for degassing the burette or volumetric validation.

[Reset]

This button stops discharge, suction or fixed dosing, and returns to reset condition.

[Exit]

Returns to Main display.

[Oven]

This button changes the display to “Oven purge”.

Status displays

The various burette positions are shown below:

- Reset : Piston is in lower limit bottom position.
- Upper limit : Piston is in upper limit top position.
- Replace : Piston is in a position where the burette unit can be removed. The front lamp blinks.
- Up : Piston is moving upward to discharge reagent.
- Down : Piston is moving downward to aspirate reagent.
- Stop : Piston is stopping at any point in burette.
- Purge : Piston is moving for purge event.
- Dose : Piston is dosing now.
- Disconnect : The burette is not connected for use.

Volume display

The display shows the amount of dosed reagent.

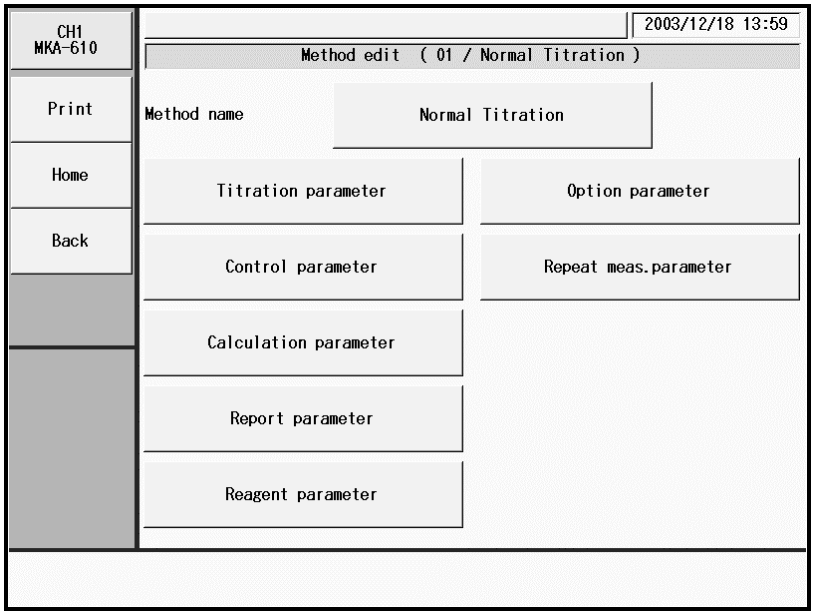
3-7. About Method

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], [Option parameter] and [Repeat meas. parameter].

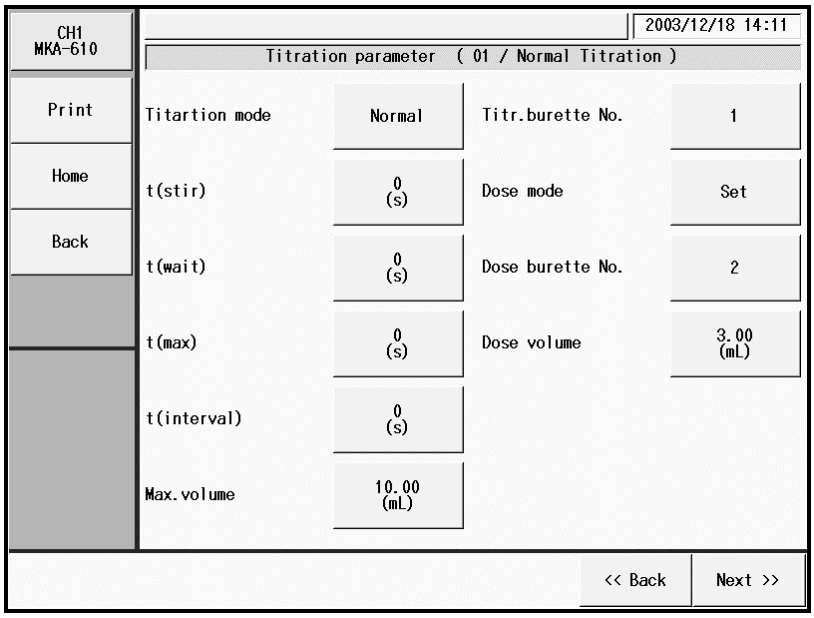
To edit a Method, press [Function] – [Method edit] button on Main display to show “Method list”, and press [Edit] button by pointing the cursor on the Method you want to edit.



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:

- Normal : Normal titration for routine measurement.
- Back : Back titration for slow water extraction by dehydrated solvent or slow reaction of KF reagent and water.

[t(stir)]

Select a time length to wait for titration start after a sample is discharged into the titration flask, particularly for those samples which are hard to dissolve in the dehydrated solvent and difficult to extract moisture.

- 0 ~ 99999s

[t(wait)]

Enter the shortest time length for a measurement from start to end. This parameter is necessary when, for example, there are two inflection points but endpoint is determined in between the two points since dehydration is maintained between the two peaks.

- 0 ~ 99999s

[t(max)]

Limit a time length for a titration. 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 Evaporator is connected or when micro amount of moisture continues to be extracted from solvent even after most of water has been titrated.

- 0 ~ 99999s

[t(interval)]

Enter an intermittent time for dosing reagent. The "t(interval)" appears only when [t(wait)] = 0 is preset. For example, when a titration is started and End time (e.g. 30s) has elapsed where conditions for finding an endpoint are satisfied, the system will wait for preset [t(interval)] length since then. If water is detected during that intermittent time, it will further continue titration, however, if water is not detected, then, the titration will be finished after [t(max)] time has elapsed succeeding End time and intermittent time. If selected [t(interval)] length is longer than titration [t(max)], titration will be finished when the limit time has elapsed. In case [t(max)] = 0 is preset, press [Reset] button to terminate titration.

This is useful to complete KF titration for such a sample of which reaction with reagent is slow.

- 0 ~ 99999s

[Max. volume]

Titration will end when it reaches preset amount of titrated volume regardless of potential changes or time length elapsed in titration for endpoint detection. Such titration results will not be calculated.

- 0.00000000 ~ 9999.00000000mL

[Titr. burette No.]

Selection of a burette for titration:

- 1 : The supplied first burette
- 2 : The additional second burette

[Dose mode]

Selection of fixed dose of reagent or water methanol standard before titration is started:

- Off : No fixed dose. This appears only when "Titr. mode" is set to "Normal ".
- Set : The reagent is dosed into the burette for the preset amount of [Dose volume] volume.
- Auto : Fixed dose activates by automatically sensing over-dose of KF reagent. This appears only when "Titr. mode" is set to "Back".

[Dose burette No.]

Selection of a burette for fixed dose. This appears only when "Dose mode" is set to "Set" or "Auto".

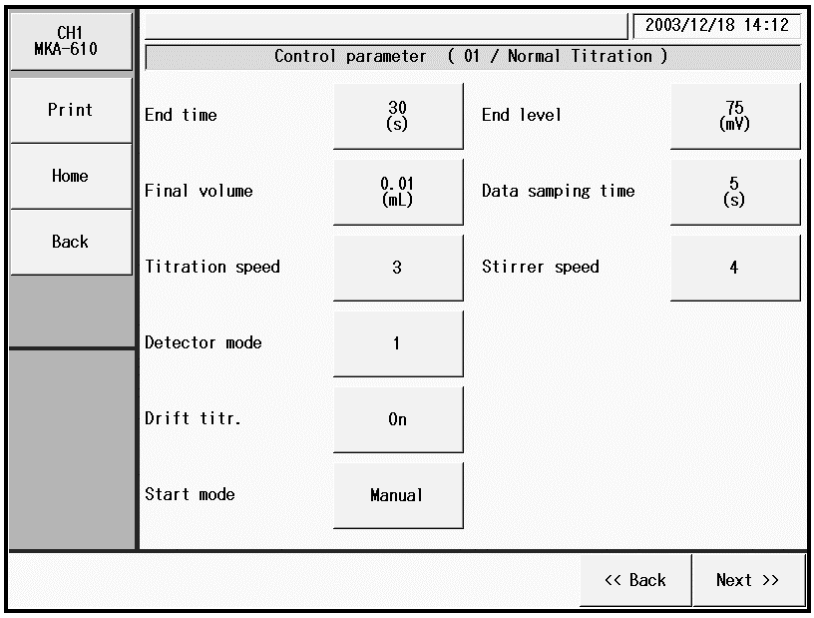
- 1 : The supplied first burette
- 2 : The additional second burette

[Dose volume]

Enter the amount of fixed dose, which appears only when "Dose mode" is set to "Set".

- 0.0000 ~ 9999.9999mL

3-7-3. [Control parameter]



[End time]

If over-dosing of reagent in the vicinity of endpoint continues longer than preset time length, the titration ends as it is regarded as the endpoint. EP will not be sensed if [End time] = 0.

- 0 ~ 99s

[Final volume]

Enter the minimum amount of KF reagent dosed in the vicinity of endpoint. Titration time may be shortened if a larger amount is preferred but the error will increase. Whereas, selection of smaller amount will decrease the error but it will end the titration in a longer time.

- 0.01 ~ 9.99mL

[Titration speed]

Optimum titration speed depends on selection of reagent, dehydrated solvent or the sample to be measured. If titration speed is found to cause over-titration, slow down the speed. Recommended: 1 ~ 6 for normal titration and 1 ~ 3 for back titration.

[Detector mode]

Selection of electric current for the electrode depending on dehydrated solvent or sample type:

- 1 : Typical unless otherwise specified
- 2 : For titration of oil samples using CM dehydrated solvent or in case of no ending of titration even with excessive KF reagent dosed.

[Drift titr.]

Selection of drift titration as follows:

- Off : Once the titration flask is dehydrated, it will not be re-dehydrated even when water is detected during titration wait-time. For example, when "Drift titration" is set to "On" and "Start mode" is set to "Auto" and in this situation if water content in a sample is extremely of a small amount, the water in the sample, when injected into the flask, is regarded as drift water and, dehydration continues without measurement is performed.
  In this case, "Off" is preferred for drift titration. Discharge the sample immediately after dehydration in order to avoid increasing positive error due to the drift.
- On : This setting is for normal situation where titration starts automatically as soon as water is detected during titration wait time while maintaining the titration flask dehydrated.

[Start mode]

Selection of titration start. This appears only when "Drift. titr." is set to "On".

- 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 flask.

[End level]

Select an endpoint potential, usually 75mV for water.

- 0 ~ 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.

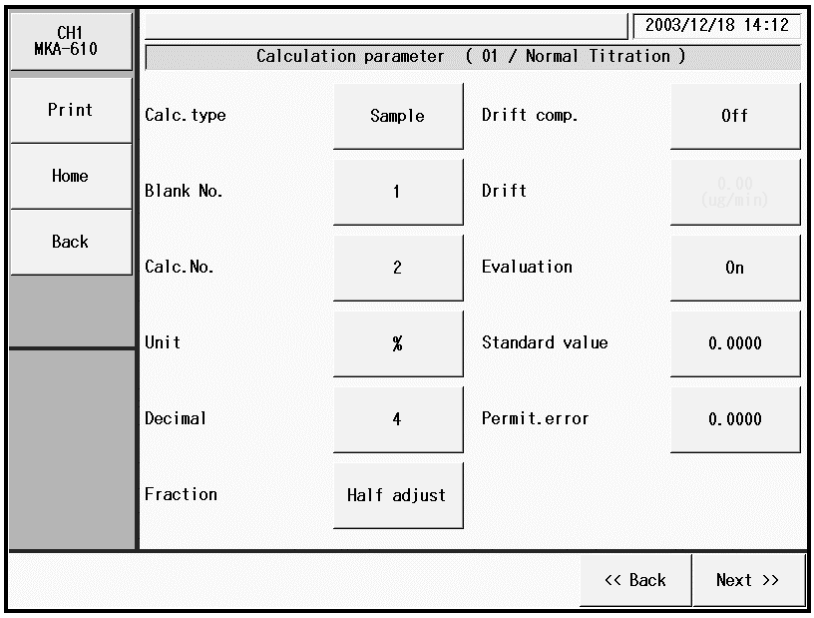
- 1 ~ 99999s

[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.
- Factor : Set up a Method for factor 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:

- 0 : For Calc. type of "Sample" or "Check"
- 1 : For Calc. type of "Blank", "Sample" or "Check"
- 2-6 : For Calc. type of "Sample" or "Check"
- 7, 8 : For Titr. mode of "Normal" and Calc. type of "Factor"

Note:

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

[Unit]

Here you select a unit used in calculation.

- mg : For Calc. No. of "0"
- mL : For Calc. No. of "1"
- %, ppm, mg/g : For Calc. No. of "2", "3", "4", "5", or "6"
- mg/mL : For Calc. No. of "7" or "8"

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.

[Drift]

Enter the offset value for correcting the drift level. This is significant only for "Manual" compensation. The unit of a drift level entered here differs from the unit in the time of using it in a calculation formula.

- 0.00 ~ 99.99ug/min

[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

3-7-4-1. Calculation formula

Calc. No.	Purpose	Equation
0	Titration volume of burette	Data Unit: mL
1	Calculation of water content	$\mathrm{Data} \times \mathrm{TF} - \mathrm{Drift} \times \mathrm{t} - \mathrm{Blank}$ Unit: mg
2	Concentration of liquid or solid by weighing	$\frac{\mathrm{Data} \times \mathrm{TF} - \mathrm{Drift} \times \mathrm{t} - \mathrm{Blank}}{\mathrm{Wt1} - \mathrm{Wt2}} \times \mathrm{k}$ Unit: % (k=0.1), ppm (k=1000), mg/g (k=1)
3	Concentration of a weighed part of water in liquid or solid dissolved with solvent extraction	$(\frac{\mathrm{Data} \times \mathrm{TF} - \mathrm{Drift} \times \mathrm{t} - \mathrm{Blank}}{\mathrm{Wt1} - \mathrm{Wt2}} \times \frac{\mathrm{B} + \mathrm{Wt0}}{\mathrm{Wt0}} - \frac{\mathrm{A} \times \mathrm{B}}{\mathrm{Wt0}} \times 10^{-3}) \times \mathrm{k}$ Unit: % (k=0.1), ppm (k=1000), mg/g (k=1)
4	Concentration when the volume of liquid sample is measured	$\frac{\mathrm{Data} \times \mathrm{TF} - \mathrm{Drift} \times \mathrm{t} - \mathrm{Blank}}{\mathrm{Vl} \times \mathrm{Dens}} \times \mathrm{k}$ Unit: % (k=0.1), ppm (k=1000), mg/g (k=1)
5	Concentration when the volume of gas sample is measured	$\frac{(\mathrm{Data} \times \mathrm{TF} - \mathrm{Drift} \times \mathrm{t} - \mathrm{Blank}) \times 22.4}{\mathrm{V2} \times 18} \times (1 + \frac{\mathrm{Temp.}}{273}) \times \mathrm{k}$ Unit: % (k=0.1), ppm (k=1000), mg/g (k=1)
6	Concentration of a weighed part of water in solid dissolved with solvent extraction (Sample is not soluble)	$\mathrm{X} = \frac{\mathrm{Data} - \mathrm{Drift} \times \mathrm{t} - \mathrm{Blank}}{\mathrm{Wt1} - \mathrm{Wt2}} \times (\frac{\mathrm{B}}{\mathrm{Wt0}} + \frac{\mathrm{X}}{10^6}) - \frac{\mathrm{A} \times \mathrm{B}}{\mathrm{Wt0}} \times 10^{-4}$ $\therefore \mathrm{X} \times \mathrm{k}$ Determine X from this equation Unit: % (k=0.1), ppm (k=1000), mg/g (k=1)
7	Factor measurement of KF reagent with pure water or standard	$\frac{\mathrm{Cl} \times (\mathrm{Wt1} - \mathrm{Wt2})}{\mathrm{Data}} \times 10 \times \mathrm{k}$ Unit: mg/mL (k=1)
8	Factor measurement of KF reagent with water-methanol standard	$\frac{\mathrm{Dose} \times \mathrm{DF}}{\mathrm{Data}} \times \mathrm{k}$ Unit: mg/mL (k=1)

< Calculation of back titration >

The section of Data × TF in Eq. 1 to 6 is replaced with:

$\mathrm{Dose} \times \mathrm{DF} - \mathrm{Data} \times \mathrm{TF}$

< Calculation of titration after fixed dose of KF reagent >

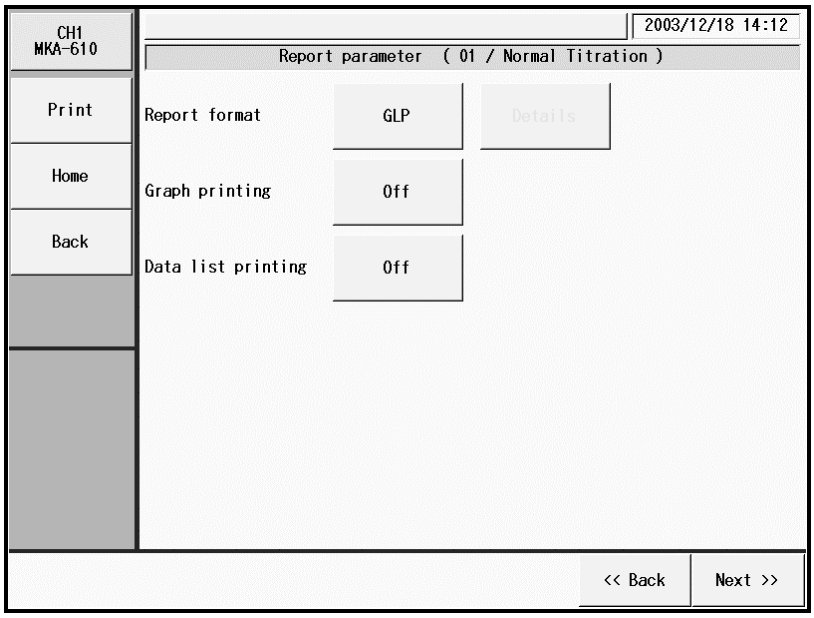
The section of Data × TF in Eq. 1 to 6 is replaced with:

$\mathrm{Dose} \times \mathrm{DF} + \mathrm{Data} \times \mathrm{TF}$

< Symbols used in calculation formulas >

Data (mL)	: The amount of the reagent titrated in the titration flask.
Dose (mL)	: The amount of the reagent dosed in the titration flask.
TF (mg/mL)	: Factor of the reagent titrated
DF (mg/mL)	: Factor of the reagent dosed
Drift (mg/s)	: Drift level which changes by ambient moisture and carrier gas permeating into the titration flask
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 (mg)	: 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
k	: Unit conversion coefficient
C1 (%)	: Concentration (%) of standard

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	Variable
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
Factor	Off	Off	On	On/Off
Titration time	Off	On	On	On/Off
End time	Off	Off	On	On/Off
Init.potential	Off	Off	On	On/Off
Init.resistance	Off	Off	On	On/Off
Operator	Off	On	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]

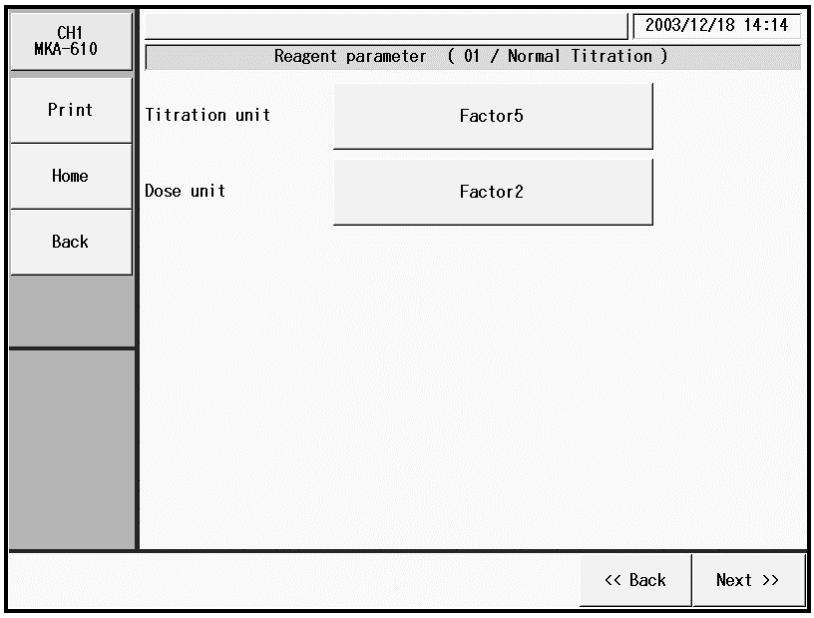
Time	Unit	Total
00:00:10	0.2750	0.2750
00:00:20	1.5000	1.7750
00:00:30	1.2250	3.0000
00:00:40	0.5250	3.5250
00:00:50	0.8750	4.4000
00:01:00	0.3250	4.7250
00:01:10	0.3500	5.0750
00:01:20	0.1750	5.2500
00:01:30	0.1250	5.3750
00:01:40	0.0500	5.4250
00:01:50	0.0000	5.4250
00:02:00	0.0000	5.4250

Graph is printed here if it is "On".

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

Model : MKA-610	←	Model
Serial No. : YYY99999	←	Serial number
Print : 2003/10/23 17:18	←	Printed date
*** R e s u l t ***		
Method No./Name :	←	Method name
01/Normal Titration		
Sample No. : 01-01	←	Sample number
Sample name :	←	Sample name
Sample x		
Sample ID :	←	Sample ID
99-03-26532		
Date 2003/10/23 17:18	←	Titration date
Titr.reagent name	←	Titration reagent name
Factor 5		
Titr.factor	←	Titration reagent factor
5.0000 mg/mL		
Calc.No. : 2	←	Calculation number
Moisture 5.4250 mg	←	Moisture (total water content)
Result :	←	Result
1.11763 %		
Evaluation : OK	←	Evaluation
Burette 1 1.0850 mL	←	Titration volume of Burette 1
Titr.time : 00:02:09	←	Titration time
End Time 30 s	←	End time
Init.pot. 28 mV	←	Initial potential
Init.res. 0 k ohm	←	Initial resistance
Wt1 : 36.89950 g	←	Net weight
Wt2 : 36.41410 g		
Net : 0.48540 g		
Blank : 0.00000 mg	←	Blank
(Wt input after titr.)		
Operator :	←	Operator: when re-calculated, its person's name appears here
KEMTARO		

3-7-6. [Reagent parameter]



[Titration unit]

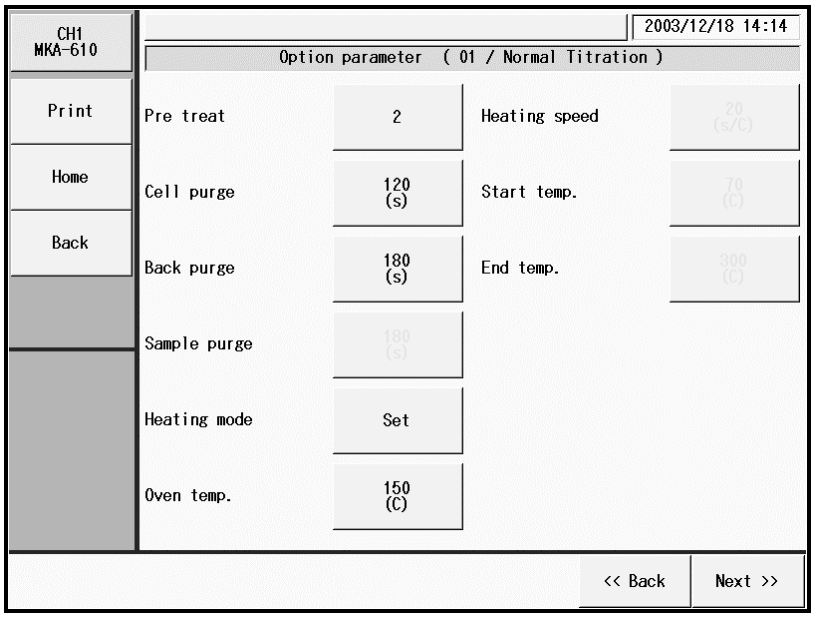
Select a burette to be used in titration. Select a reagent from the reagent information in Function".

[Dose unit]

Select a burette to be used in fixed dose. Select a reagent from the reagent information in Function".

3-7-7. [Option parameter]

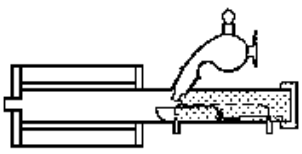
This parameter is provided for measurement with an oven or a sampler connected to Mains.



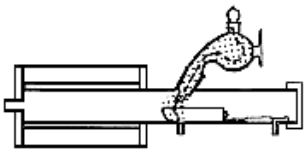
[Pre treat]

Selection of sampling into the oven:

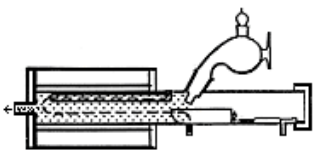
- Pre treat 1 : An optional eggplant shape sampler is used for sampling and discharge into the sample inlet. It begins with back purge, sample purge and cell purge, and then, starts measurement process when the drift level becomes stable while carrier gas is flowing through the system.
- Pre treat 2 : 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

[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.

[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.

- 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.

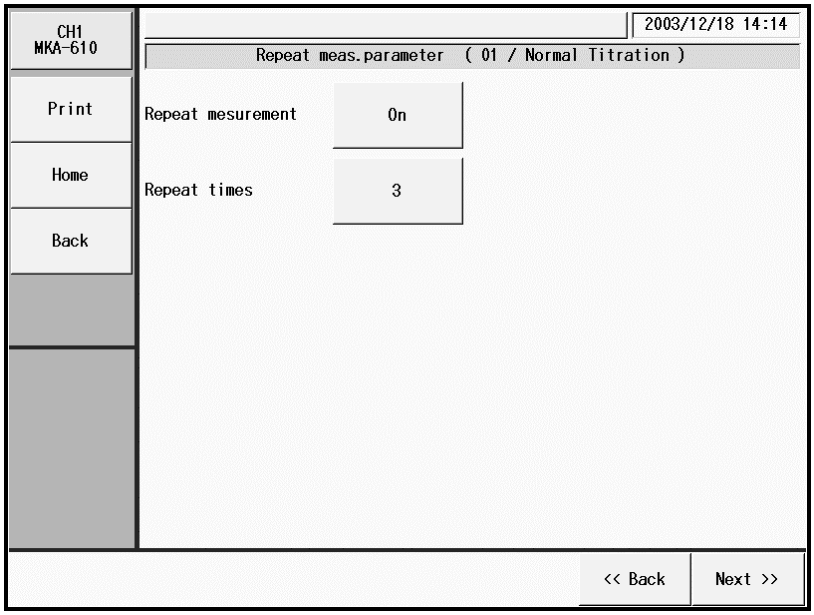
- 0 ~ 300°C

[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

3-7-8. [Repeat meas. parameter]



[Repeat meas.]

Repeat measurement is the automatically reciprocating measurements for a preset number of cycles. This is useful for factor validation with water methanol standard using the additionally installed burette.

- On : Repeat measurement is on.
- Off : Repeat measurement is off.

[Repeat times]

Sect a number of cycles for repeated measurements:

- 2 ~ 99

Note:

In order to reflect the mean value of factor validated in a series of measurements, it is necessary to turn on "Auto setting, mean" in [Function] – [Other settings].

4. Other usage

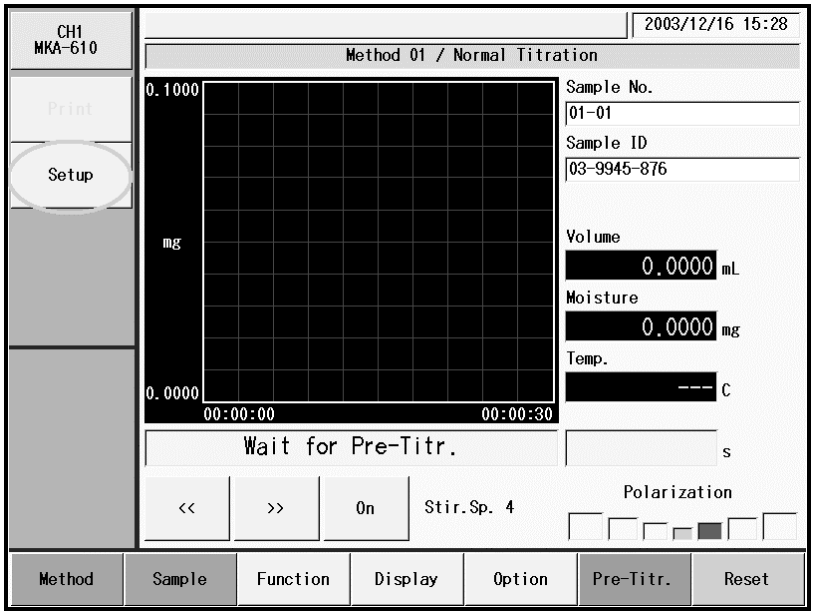
4-1. Connecting Balance

4-1-1. How to connect a balance

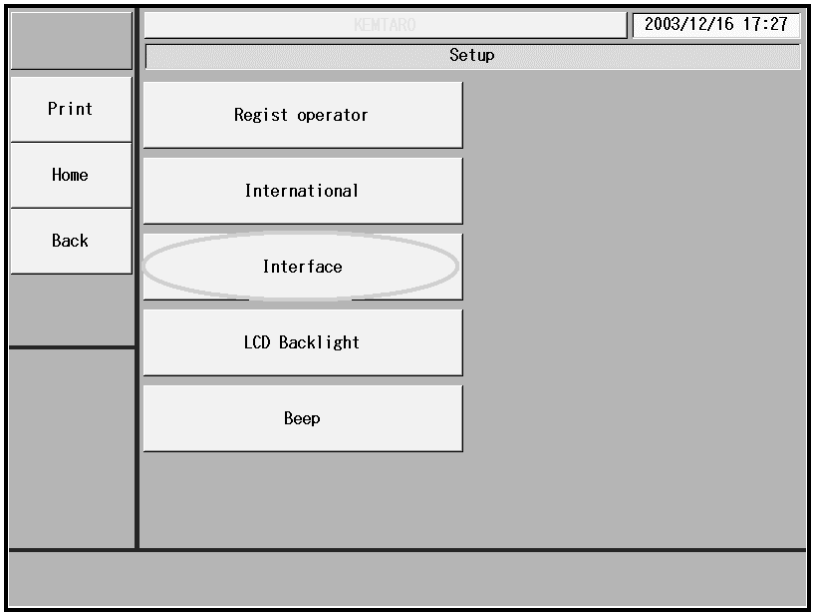
When an electronic balance is connected and set up appropriately, the sample size (weight) is automatically input into the measuring unit.

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.

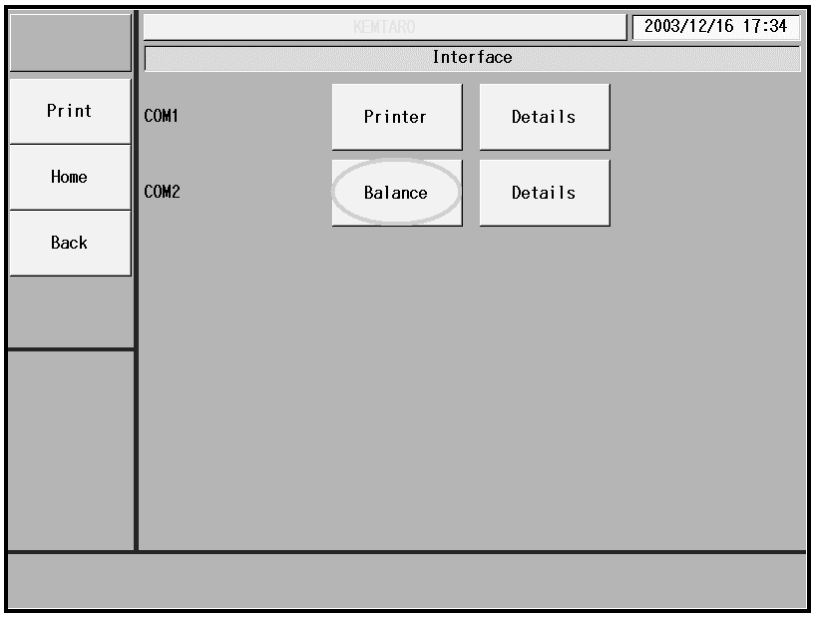


2) Press [Interface] button on “Setup”.

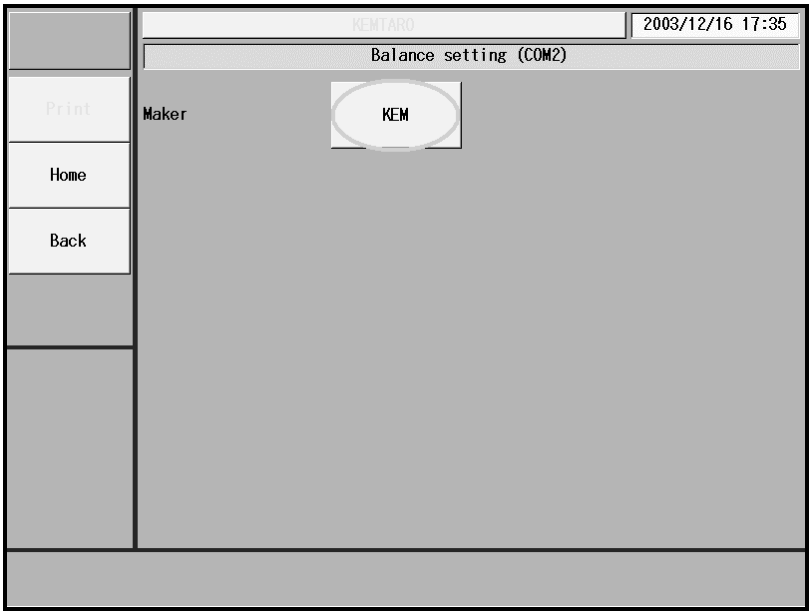


3) Select a COM port for “Balance” on “Interface”.

4) Press [Details] button.

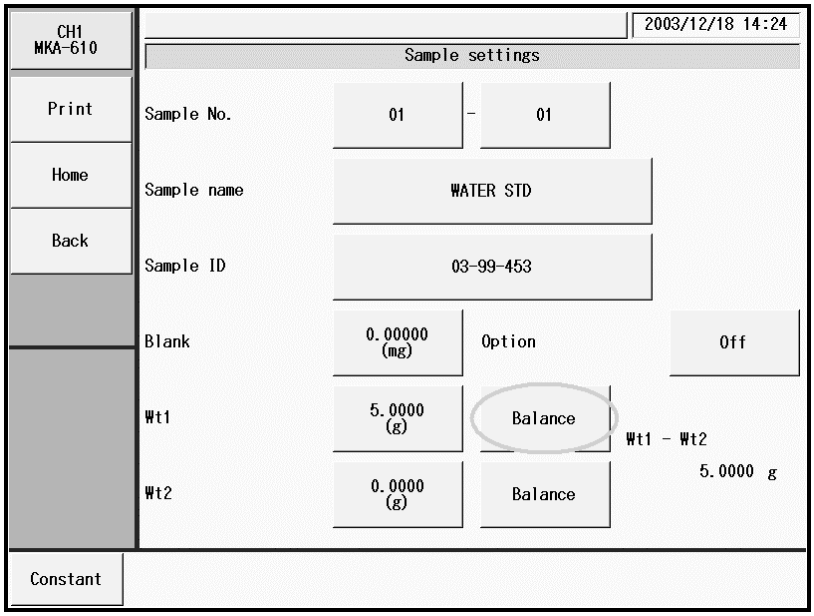


5) Choose the maker of your balance from the list on display.

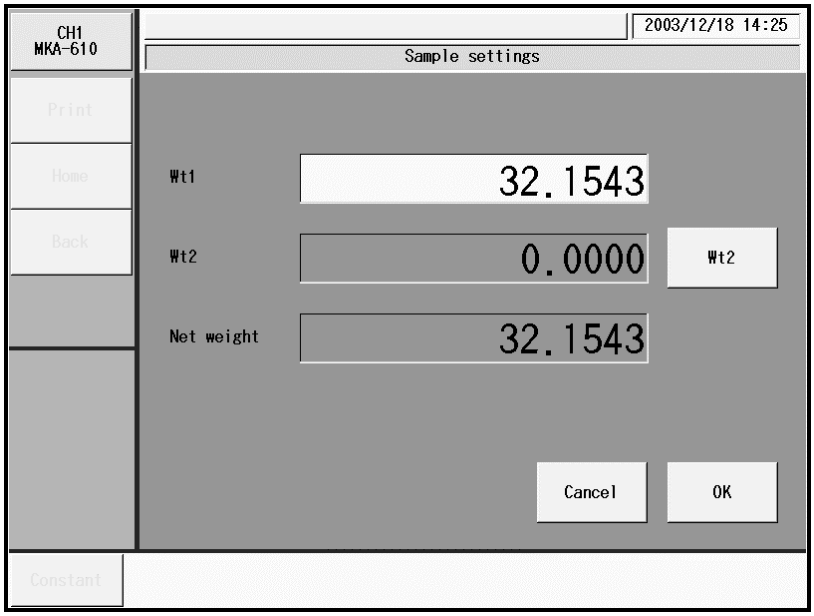


4-1-2. Input sample size on balance

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”.



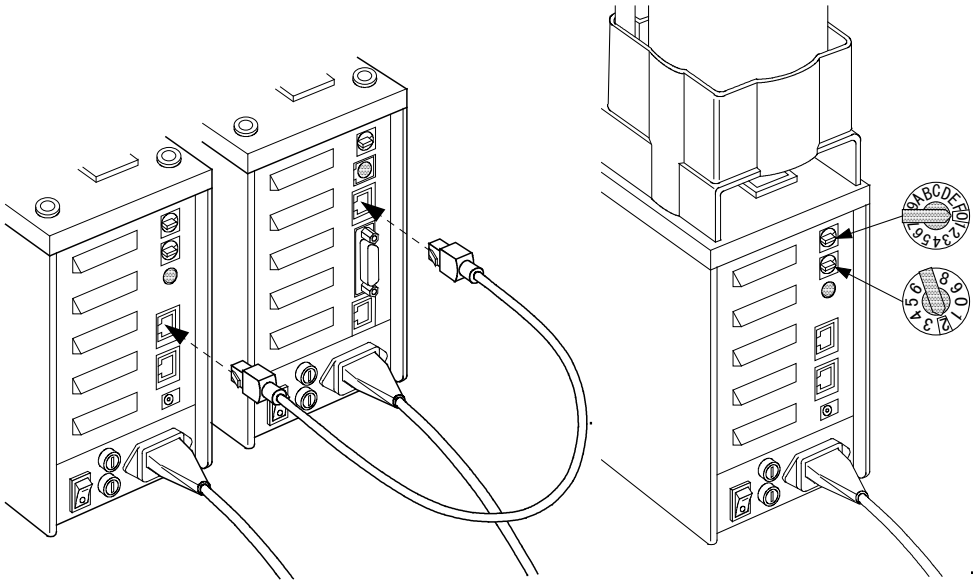
3) To continue the weight input, press [Balance] button for Wt2, and input the weight from the balance.

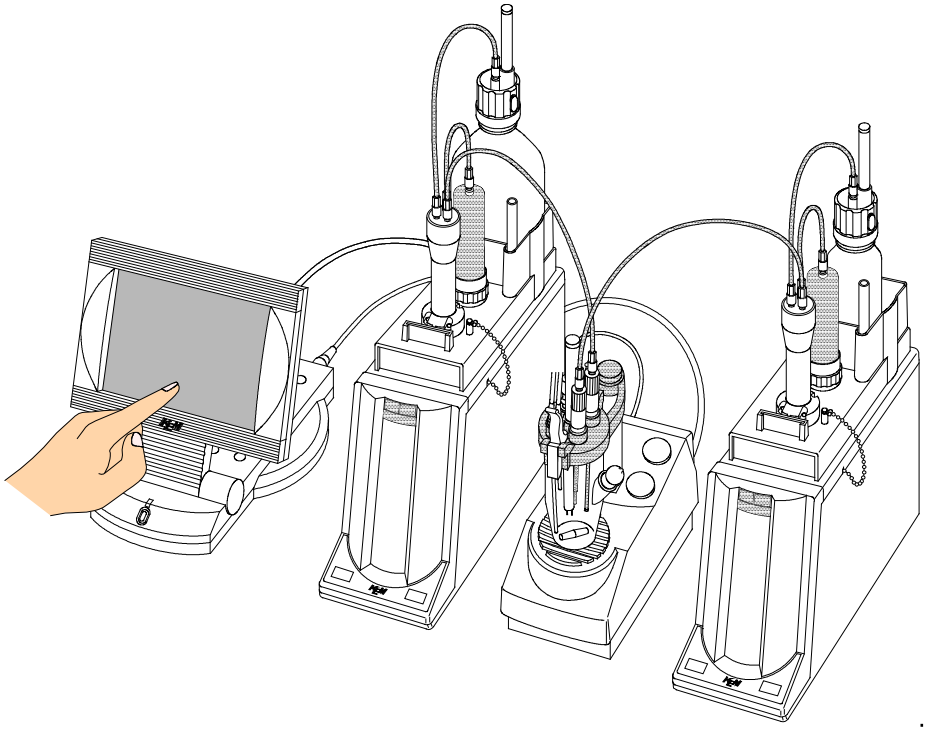
Note:

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. Connecting additional burette

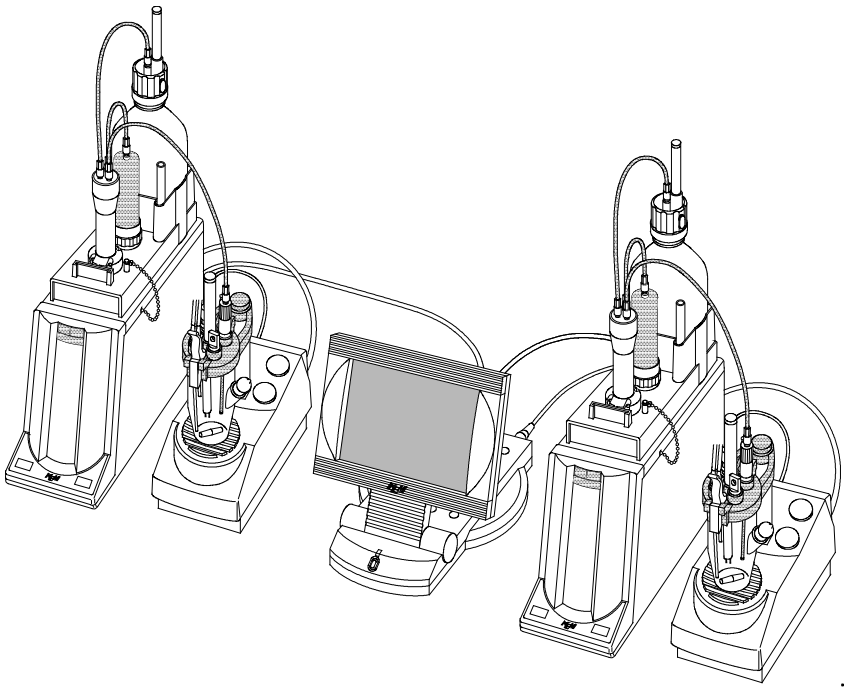
1) Connect S-Bus port on the rear panel of measuring unit and S-Bus port of the additional burette with APB-APB cable as shown below.
2) Turn the “APB No.” switch on the back of the additionally connected burette to “2” position.
3) Turn on the power.





4-3. Connecting a plural number of measuring unit

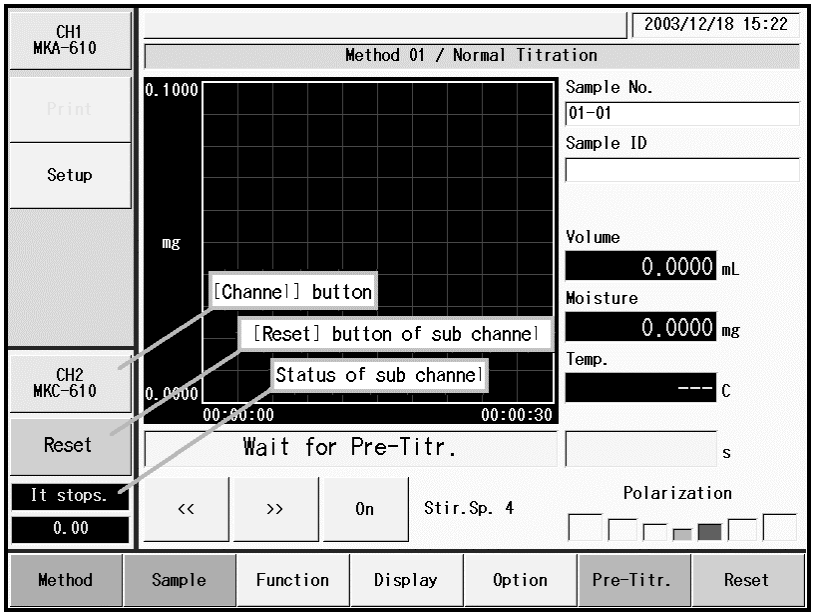
1) Connect the additional unit and Main control unit MCU-610 as below.
2) Set MCU number on the back of the additional unit to “1”.
3) Turn on the power of the measuring units and optional peripherals.
4) Turn on MCU-610. The additional measuring unit is taken for channel2 (CH2).



Note:

The power for Main control unit MCU-610 must be turned on only after the peripherals are turned on.

< When MKC-610/2ND is connected >

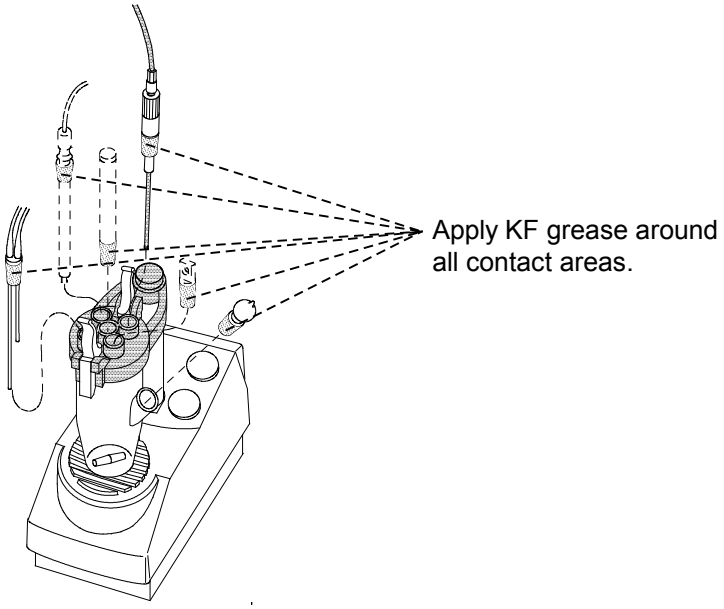


5. Maintenance

5-1. Daily checkup

5-1-1. Karl Fischer grease

Twin platinum electrode,desiccant tube,port plug, and plug for titration flask are removed from a titration flask. 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 flask 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 contact areas becomes hard and the respective parts are difficult to separate, taken the following steps;

1) Drain the solution in titration flask.
2) Heat the contact areas with a hair dryer to melt the grease.

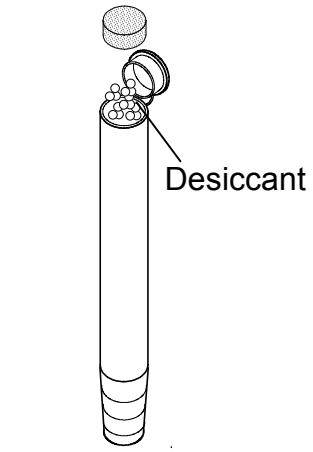
⚠ WARNING!

Care should be taken not to get burned when heating the unit. Do not tap or try to remove solidified area by force. Titration flask or electrode may break and cause injury.

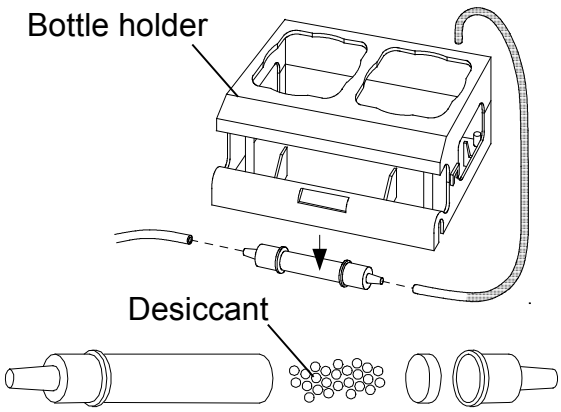
5-1-2. Changing the desiccant

The desiccant tube is removed from a titration flask 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.



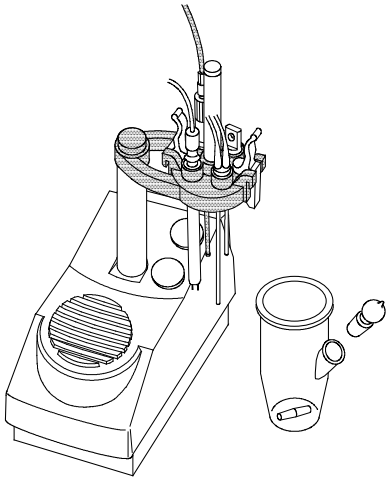
< Desiccant tube A >



< Desiccant tube >

5-1-3. Cleaning the titration flask

1) Here you drain out the liquid in the titration flask.
2) Turn the flask to the right 90° clockwise, and release the lever on titration vessel stopper to remove the flask.
3) Remove the port plug, and cleanse the flask with commercially sold neutral detergent.
4) Dry the flask in a heater dryer or the like, and leave it in a desiccator to cool it down.



5-1-4. Disposal of waste liquid

> ⚠ **Caution!**
>
> **Dispose of the waste in reagent bottle (1L /brown) before it is filled up in order to avoid malfunction of the stirrer caused by leaking solvent.**

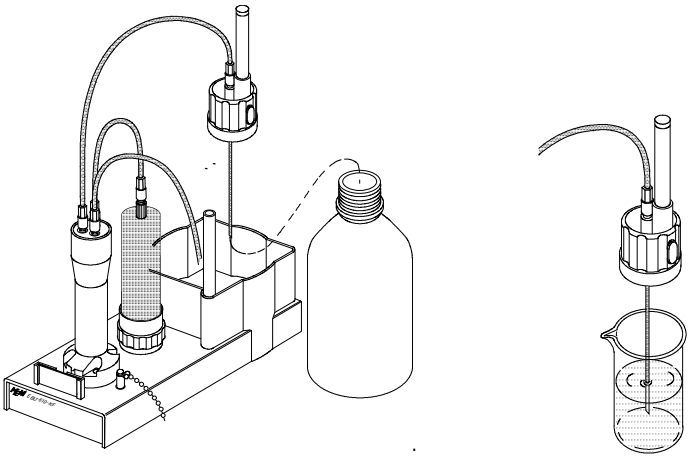
1) Remove the cap of bottle by turning the bottle itself so that the connected tubes would not be twisted or jammed.
2) Discard the waste in bottle into a polyethylene container disposed of as organic solvent.
3) Clean up the bottle cap with tissue paper if stained with solvent.
4) Fix the bottle cap onto the bottle by turning the bottle itself so that the connected tubes would not be twisted or jammed.

5-1-5. Changing the dehydrated solvent

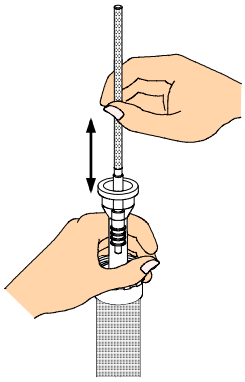
1) Remove the cap of solvent bottle by turning the bottle itself so that the connected tubes would not be twisted or jammed.
2) Fix the bottle cap securely onto another solvent bottle by turning the bottle itself so that the connected tubes would not be twisted or jammed.
3) Self clean the titration flask with solvent for a few times if necessary.

5-1-6. Cleaning the burette unit

1) Remove the reagent bottle from burette unit.
2) Prepare methanol in a beaker. Put the reagent tube tip into the beaker, and fix it to avoid splashing the reagent.



3) Make sure the titration nozzle is inserted in the titration flask.
4) Press [Option] button to show “Oven & purge” screen.
5) Press [APB] button to show “APB manual operation” dialog box.
6) Press [▲] button to drain out the reagent in burette cylinder into titration flask.
7) Press [▼] button to fill the cylinder with methanol.
8) Press [▲] button to drain out the methanol in cylinder into titration flask.
9) Repeat the above step 7 and 8 for a few times.
10) Remove the cylinder from the burette unit, and pull out the piston head. Rinse it with methanol using the piston extraction rod to draw out piston.



11) Completely drain out methanol inside the burette, and reassemble the unit.

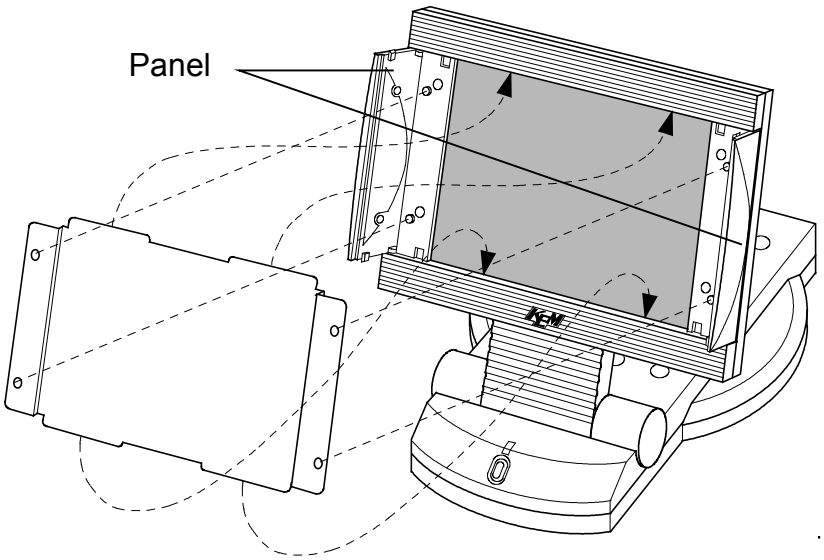
⚠ Caution!

The Karl Fischer reagent filled within the system and left unused for more than a week will form crystalline precipitation, which causes clogging and leak of titration nozzle and tube lines.
Cleaning care must be taken to prevent crystallization if you are not going to use the unit for the next several days.

5-1-7. 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.



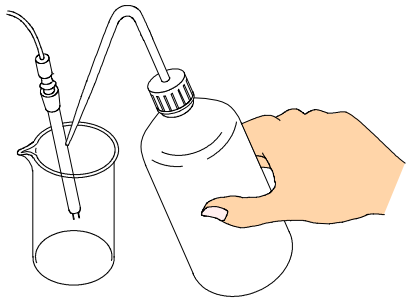
5-2. Other Maintenance

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 flask, inner burette and electrode as they are after cleansed and dried.

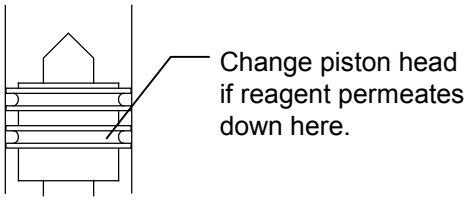
5-2-2. Cleaning the electrode

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.

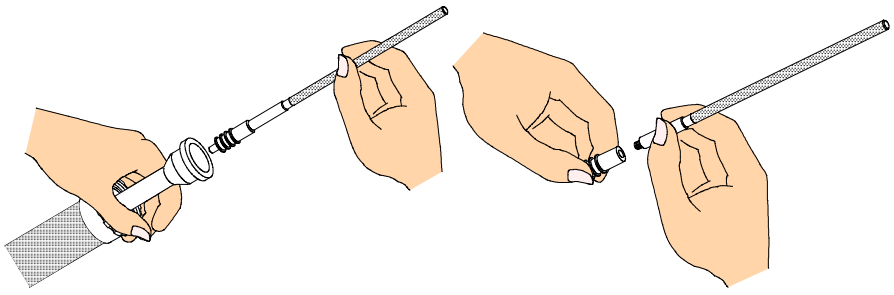


5-2-3. Changing the piston head

The piston head will cause leak as wear occurs in the course of time. If KF reagent permeates down to below indicated line when the burette is filled with reagent and is in use for a few times after it is cleaned and dried, the piston head needs to be changed with new one.



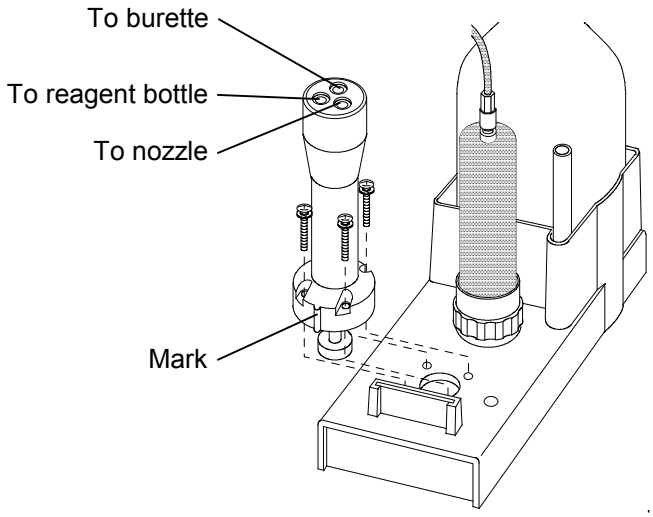
1) Remove the worn-out piston head by turning the piston extraction rod.
2) Squeeze the extraction rod securely onto the head.
3) Carefully insert the head into the cylinder.



5-2-4. Changing the switching valve

The switching valve needs to be changed when reagent leaks due to its use for an extended period of time or crystalline precipitation in the course of time.

1) Remove all tube lines connected to the cock with the supplied wrench. (see 5-2-6)
2) Undo the screws fastened to the cock.
3) The cock can be disconnected when the four (4) screws are removed.
4) Place the new cock with its mark facing in front, and fasten to burette unit with screws.
5) Fix the tubes back to their original position.

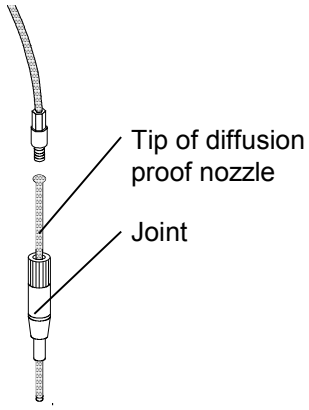


⚠ Caution!

The switching valve must be positioned with its mark facing the front. Wrong placement will cause malfunction in suction or discharge and leak of reagent liquid.

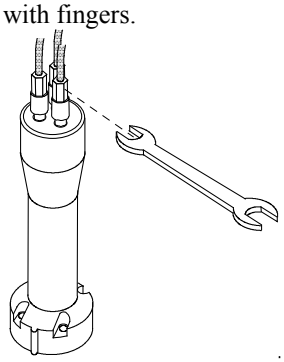
5-2-5. Changing the titration nozzle

Remove the tube from the joint, and then, the old nozzle from the joint. Squeeze the new nozzle into the joint, and fasten the joint as secured as before.



5-2-6. Changing the tubes

Change the tubes if any of them is bent or its joint leaks. Use the supplied wrench to change the switching valve. Other joints can be fastened with fingers.



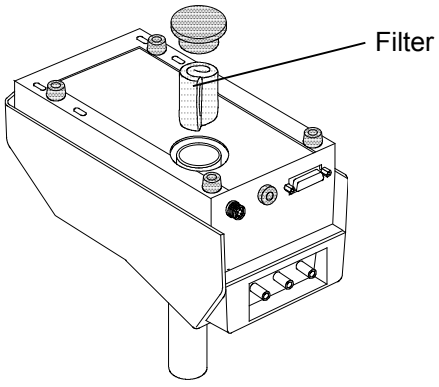
⚠ Caution!

The tubes must be jointed securely straight upright. Avoid dirt or stains at the joints to avoid reagent leak.

5-2-7. Changing the filter for dispenser

Change the dispenser filter if it should be clogged with waste liquid from the waste container.

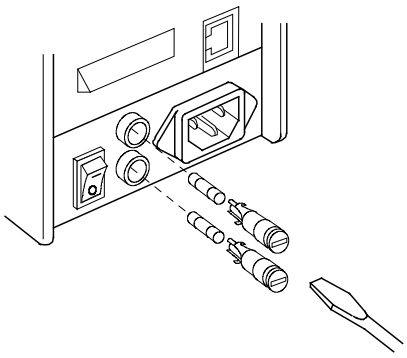
1) Remove all connections to stirrer for dispenser including tubes, nozzle, electrode, desiccant tube, titration flask and cable.
2) Remove the rubber made filter cap at the bottom of stirrer.
3) Remove the old filter.



4) Fold the filter rounded in a coil, and put the filter cap on it.
5) Place the filter cap in stirrer, and reassemble the stirrer.

5-2-8. 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.

5-2-9. 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 messages 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.
Potential Too Low ↑↓ Inject Water	· Over titrated.	· Discharge water into the flask.
	· Reagent with too much iodine is flask.	· Slow down speed to refrain from excessive iodine.
Reach Max Titr. ↑↓ Decrease Samp. Amt.	· Titration exceeded max volume.	· Increase max volume. · Reduce sample size. · Use reagent of larger factor.
Can't Pretitr. ↑↓ Check solvent	· Pre-titration exceeded 40mL. · Wrong solvent is used. · Reagent is deteriorating.	· Change reagent and solvent with new ones.
	· Too much water adhered to titration flask.	· Use a dried titration flask.
Soln. Resist. Too High ↑↓ Check det. electrode	· Foreign particles or stains.	· Remove dirt or stains.
	· Sample resistance is high.	· Reduce sample size.
	· Electrode is not dipped in solvent.	· Increase dehydrated solvent.
	· Electrode cable is broken.	· Change the electrode.
Wrong Parameters Set ↑↓ Review settings	· Titration started with wrong parameters. · “0” is set to End time and [t(max)]. · Set to [t(wait)]〉[t(max)] time.	· Change parameters.
Burette Not Connect. ↑↓ Check connect.	· Wrong burette is attempted. · Wrong burette number is used.	· Use the preset burette number.
	· “APB No.” switch on additional burette is set to “1”.	· Change the “APB No.” switch to “2”.
Detect. Mode Error ↑↓ Set Detect mode “2”	· Wrong detector mode is used.	· Change the mode to 2.
	· When dehydrated solvent for oil is used.	· Use “1” when dehydrated solvent is used.
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.

Error message	Trouble	Remedies
Burette Error ↑↓ Check Burette	· Switching valve is not in normal condition. · Lock pin is missing. · The cock does not work.	· Check on the lock pin, and clean the cock.
	· Cock sensor is defective. · Motor is defective.	· Contact your local dealer if motor is not working.
V/F Error ↑↓ Contact the manufacturer	· Preamplifier circuit is now defective.	· Contact your local dealer.
Epidemic on Preamp. ↑↓ Contact the manufacturer	· Preamplifier circuit is now defective.	· Contact your local dealer.
Oven won't operate ↑↓ Check connect.	· Parameter is set to ON without oven.	· Turn “Option” to OFF on sample settings.
	· With an oven connected, its power is turned off or power cord is not connected.	· Check the oven on its power. · Make sure the power cord is connected.
	· Connecting cable is broken.	· Replace the connecting cable.

6-2. Alarm message and remedies

Alarm message	Reason	Remedies
Reagent vol. low limit (Titr.) ↑↓ Replace reagent	Reagent level comes down to the preset lower limit.	Supply reagent, and enter the present reagent volume as for remaining reagent data.
Reagent vol. low limit (Dose) ↑↓ Replace reagent	Reagent level comes down to the preset lower limit.	Supply reagent, and enter the present reagent volume as for remaining reagent data.
Replace reagent (Titr.) ↑↓ Replace reagent	It is due date to change reagent for titration today.	Supply reagent, and clear the day for reagent change date.
Replace reagent (Dose) ↑↓ Replace reagent	It is due date to change reagent for fixed dose today.	Supply reagent, and clear the day for reagent change date.
Reagent replace. overdue (Titr.) ↑↓ Replace reagent	It is past due to change reagent for titration today.	Supply reagent, and clear the day for reagent change date.
Reagent replace. overdue (Dose) ↑↓ Replace reagent	It is past due to change reagent for fixed dose today.	Supply reagent, and clear the day for reagent change date.
Replace reagent in XX days (Titr.)	It is XX days before scheduled reagent change date.	Continue measurement, or supply reagent, and clear the day for reagent change date.
Replace reagent in XX days (Dose)	It is XX days before scheduled reagent change date.	Continue measurement, or Supply reagent, and clear the day for reagent change date.
Periodic check date ↑↓ Make periodic check	It is the day for periodic check as scheduled.	Check on the unit according to the periodic check procedure.
Periodic check date overdue ↑↓ Make periodic check	It is past due for periodic check as schedule.	Check on the unit according to the periodic check procedure.
Periodic check in XX days	It is XX days before scheduled check date.	Continue measurement, or check on the unit according to the periodic check procedure.
Periodic factor meas. date ↑↓ Make periodic check	It is due date to measure factor of regent as schedule.	Perform factor measurement.
Periodic factor meas. overdue ↑↓ Make periodic check	It is past due to measure factor of regent as schedule.	Perform factor measurement.
Periodic factor meas. in XX days	It is XX days before scheduled factor measurement.	Continue measurement or perform factor validation.

Alarm message	Reason	Remedies
Replace piston (Titr.) ↑↓ Replace piston head	It is due date to change piston in burette unit for titration liquid.	Change the piston head and renew the date for piston change.
Replace piston (Dose) ↑↓ Replace piston head	It is due date to change piston in burette unit for fixed dose.	Change the piston head and renew the date for piston change.
Piston replacement overdue (Titr.) ↑↓ Replace piston head	It is past due to change piston in burette unit for titration liquid.	Change the piston head and renew the date for piston change.
Piston replacement overdue (Dose) ↑↓ Replace piston head	It is past due to change piston in burette unit used for fixed dose.	Change the piston head and renew the date for piston change.
Replace piston in XX days (Titr.)	It is XX days before scheduled date for changing the piston used for titration.	Continue titration or change the piston and renew the date for piston change.
Replace piston in XX days (Dose)	It is XX days before scheduled date for changing the piston used for fixed dose.	Continue titration or change the piston and renew the date for piston change.

6-3. When titration nozzle becomes clogged

1) Remove the titration nozzle.
2) Dip it in warm water at about 60°C or clean it in an ultrasonic cleaner.
3) After cleaned, rinse it with alcohol.
4) Install the nozzle back to its position.

6-4. When switching valve is clogged or jammed

1) Remove all those tubes connected to the cock including the titration nozzle, burette and reagent cap.
2) Fill the inside cock with ethanol using a dripping pipette, and leave it for more than 30 minutes.
3) Then, remove the ethanol inside the cock with the pipette.
4) Repeat the above step 2 and 3 for a number of times so necessary.
5) Reassemble the cock as before.

⚠ Warning!

Karl Fischer reagent is a toxic chemical. Use it in a well ventilated room, and handle it with utmost care.

⚠ Caution!

Karl Fischer reagent may precipitate crystalline formation if left unused for more than a week. Clean the system before it leaks by attempting discharge the precipitating liquid.

6-5. When the glass contact sliding area is jammed

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

1) Drain the solution in titration flask.
2) Heat the contact areas with a hair dryer to melt the grease.

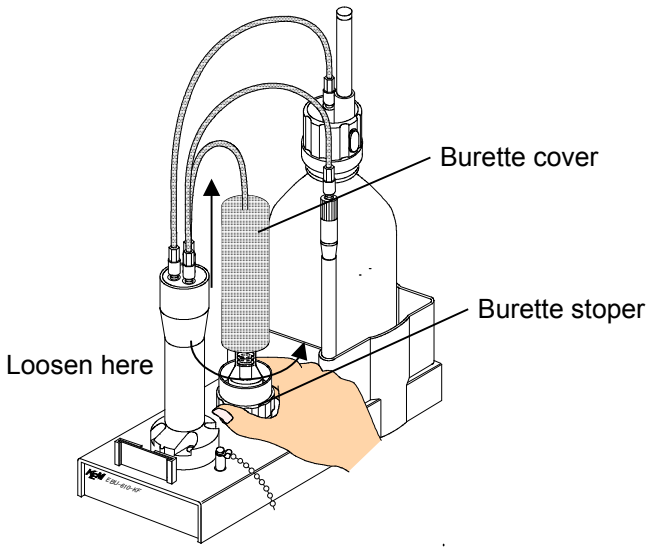
⚠ Warning!

Do not tap or try to remove solidified area by force. Titration flask or electrode may break and cause injury.

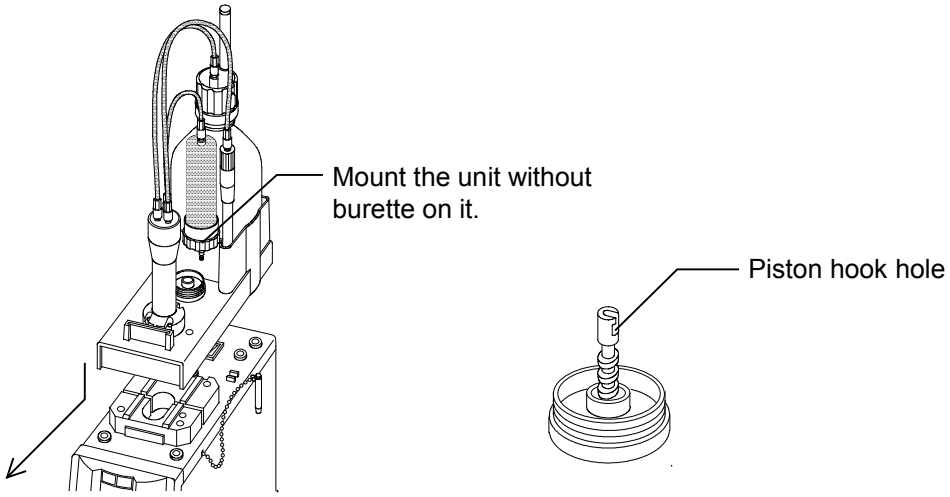
6-6. When it is difficult to mount the burette unit

Follow the below steps when you find it difficult to set it onto the unit:

1) Remove the burette cover, and loosen burette stoper to remove it.



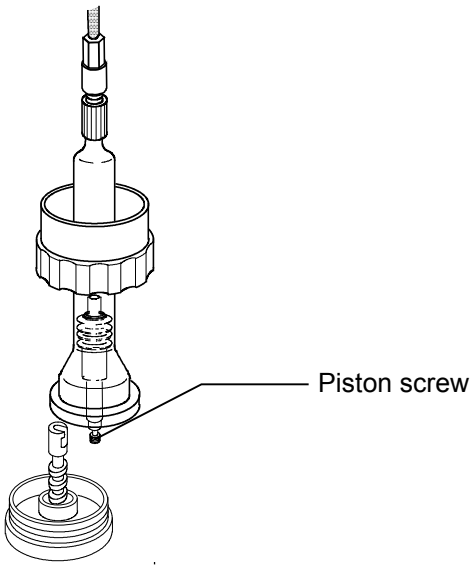
2) Place the burette unit without burette on it, and pull back the unit towards you, and then, insert the rock pin to fix it.
3) Turn on the power and press [Option] button on Main display. Select the burette number on "APB manual operation" dialog box, and press [▲] key. When the piston hook hole appears, press [▲] key again to stop it.



Note:

The rock pin to fix the burette unit is interlocked. Therefore, the pin must be inserted into the hole in order to use the piston extraction rod. When you set in the burette unit, make sure the status is in "Replace" on "APB manual operation" dialog box (Press [Option] button on Main display and press [APB]). Otherwise, press [▼] key to show "Replace" first on display before the burette unit is mounted.

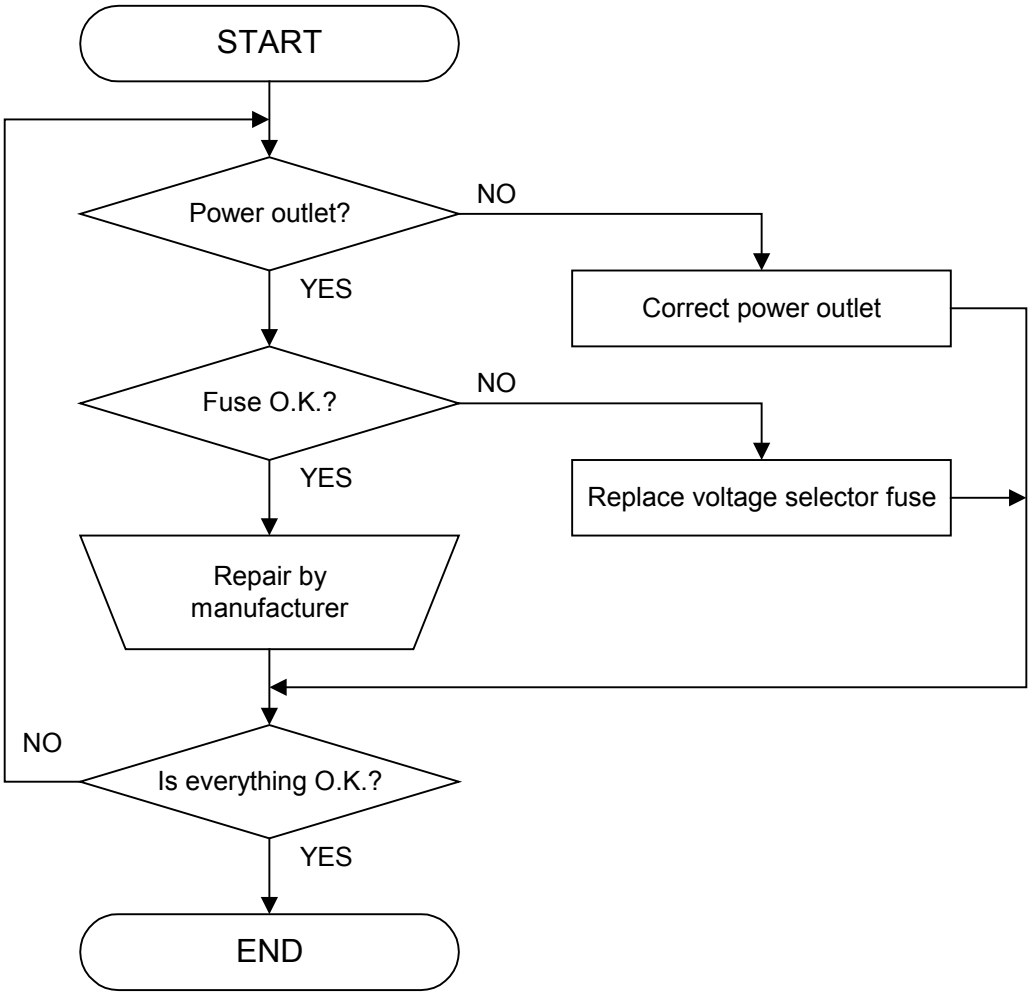
4) Hook the piston screw in the hole, and press [▼] key to lower it. At this point, hold the burette in order to align it with the piston extraction rod on the same axis. When the piston stops, fasten it with the stopper and fix the burette.



⚠ Caution!

In order to avoid breaking the burette, hold the burette with your fingers upright and align it with the piston extraction rod on the same axis while the piston is moving down.

6-7. Power failure



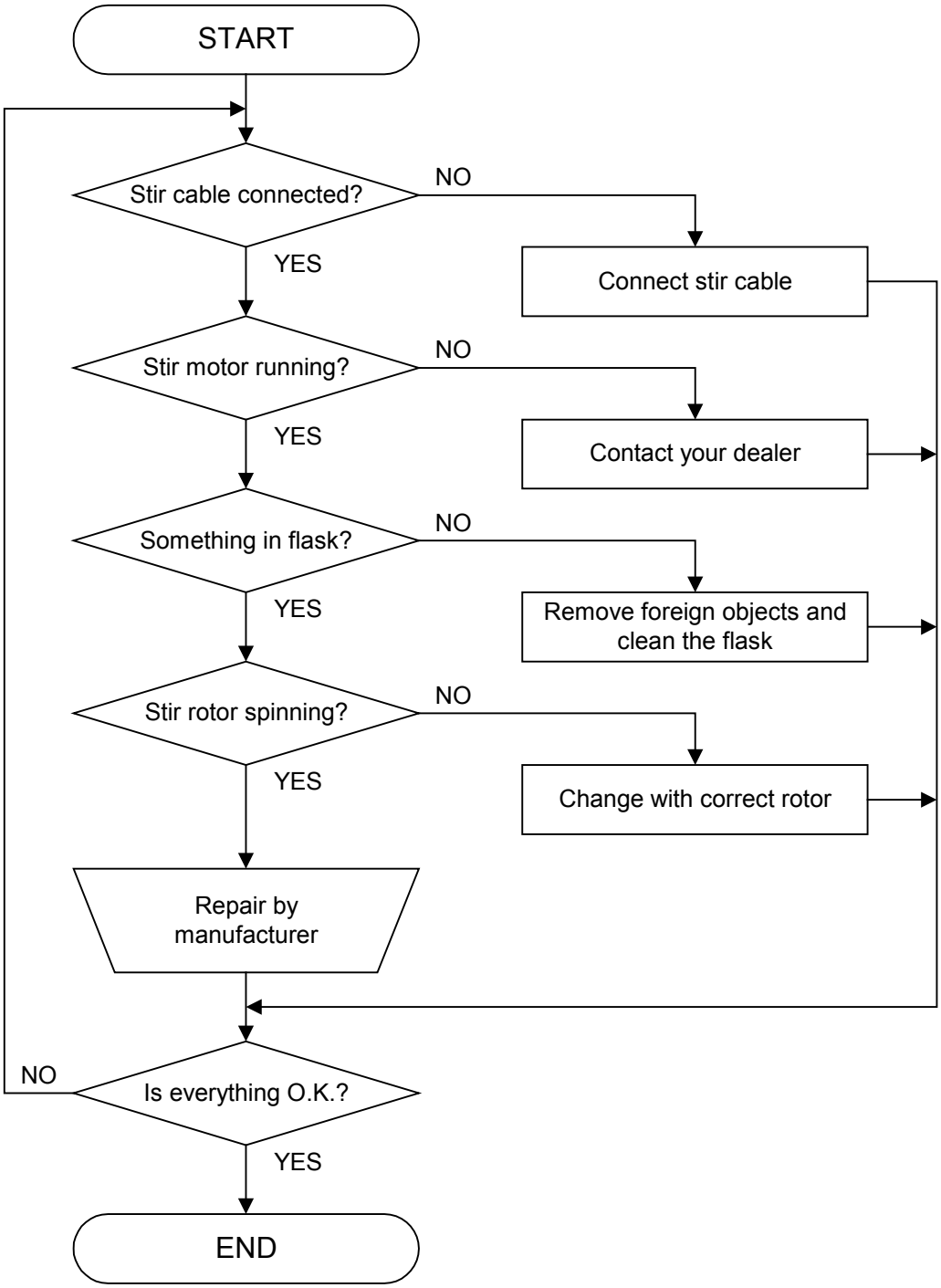
⚠ Warning!

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

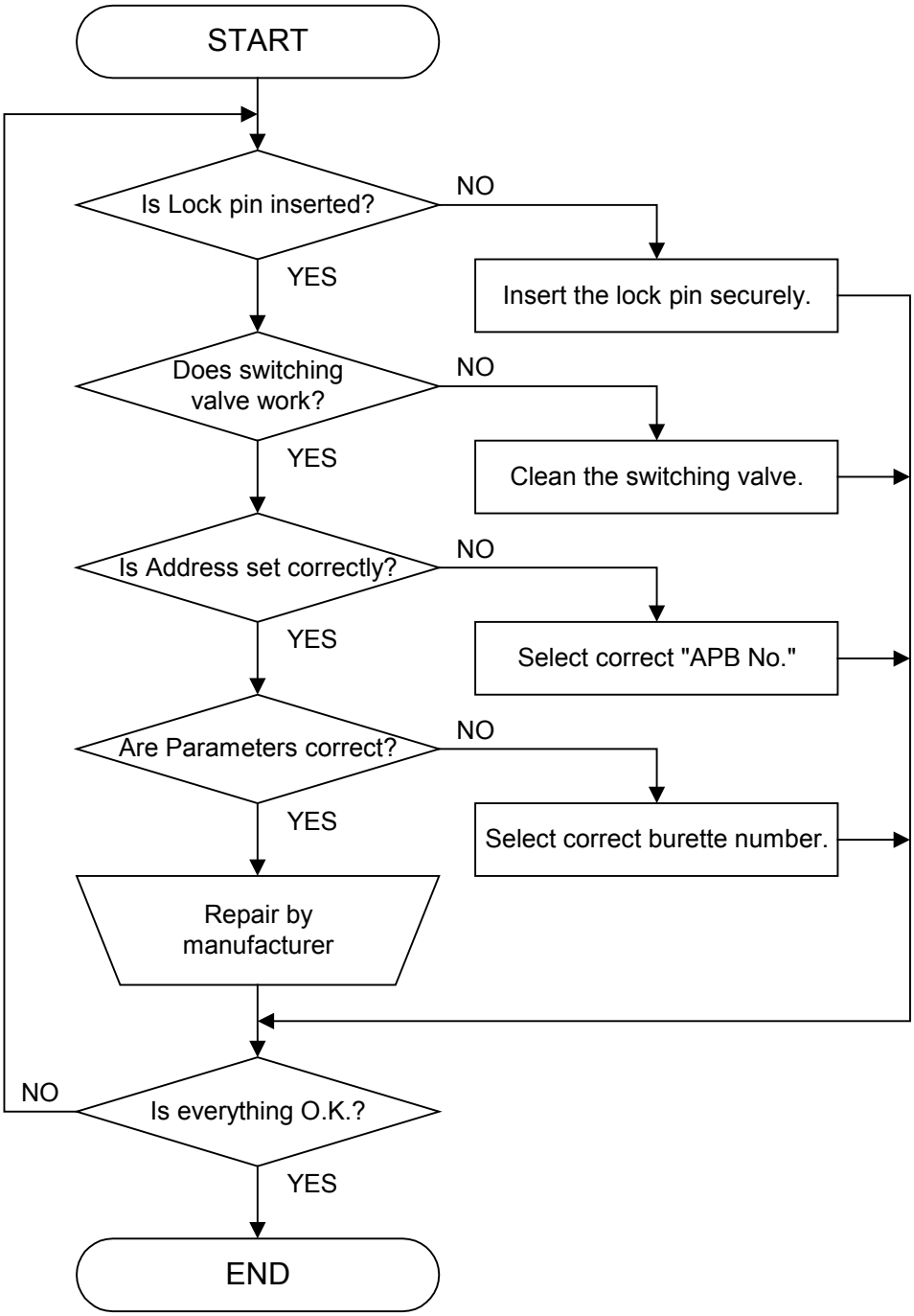
⚠ Caution!

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

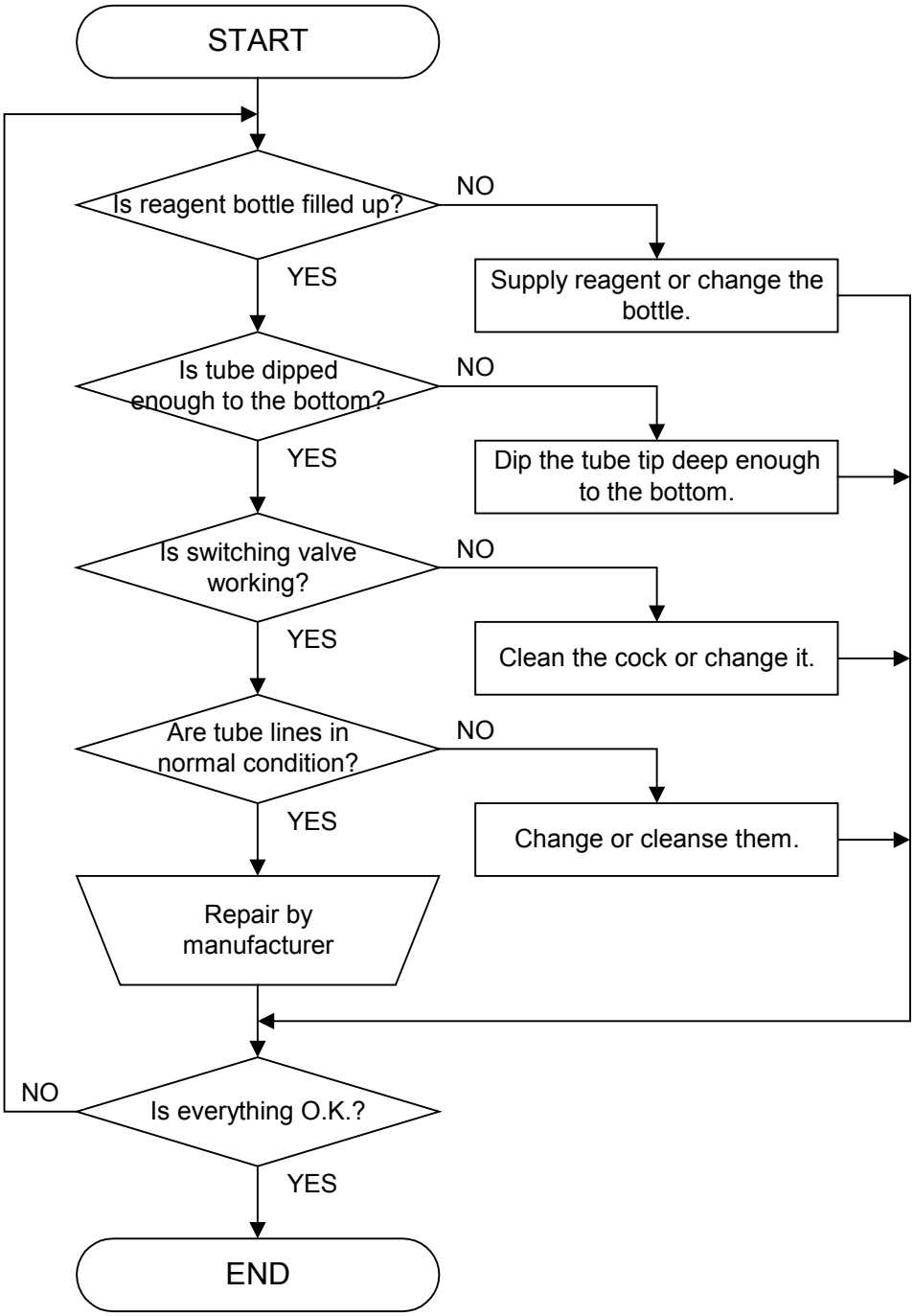
6-8. Stirrer does not work properly



6-9. When the burette does not work



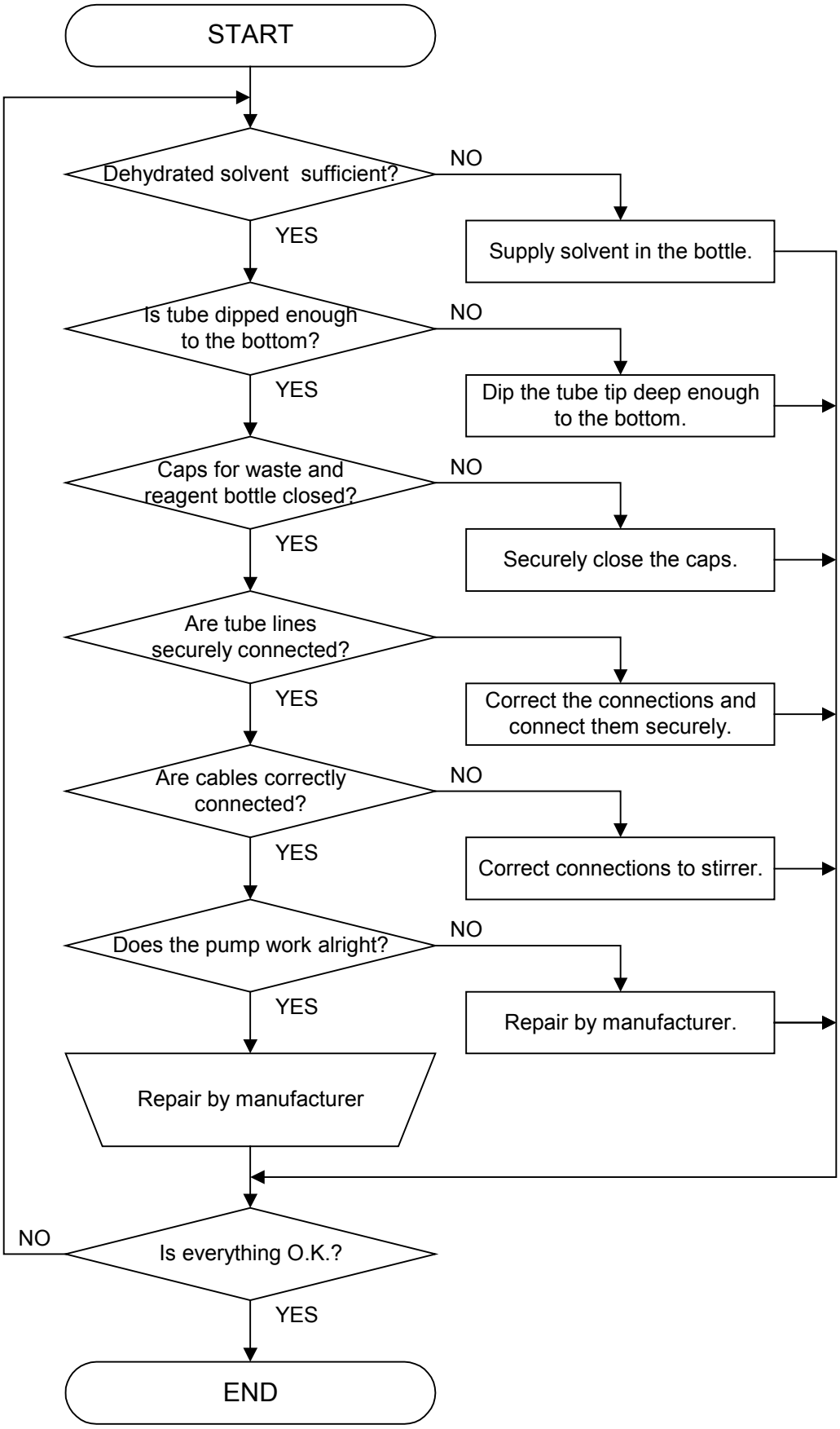
6-10. When air bubbles are found in burette



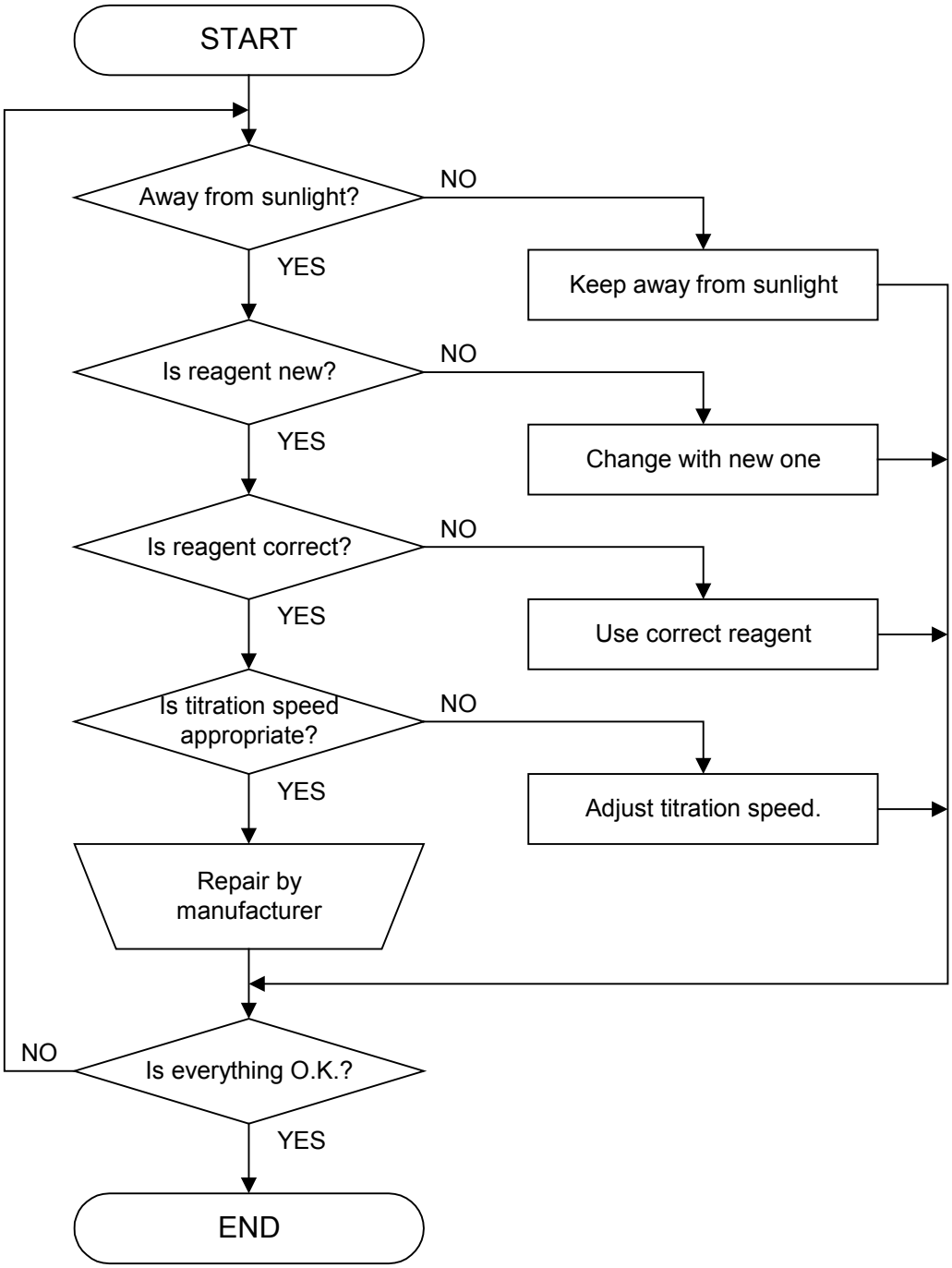
Note:

Karl Fischer reagents contain sulfur dioxide. This type of chemicals easily evaporates, bearing air bubbles when transferred from a dark place to a warm room.

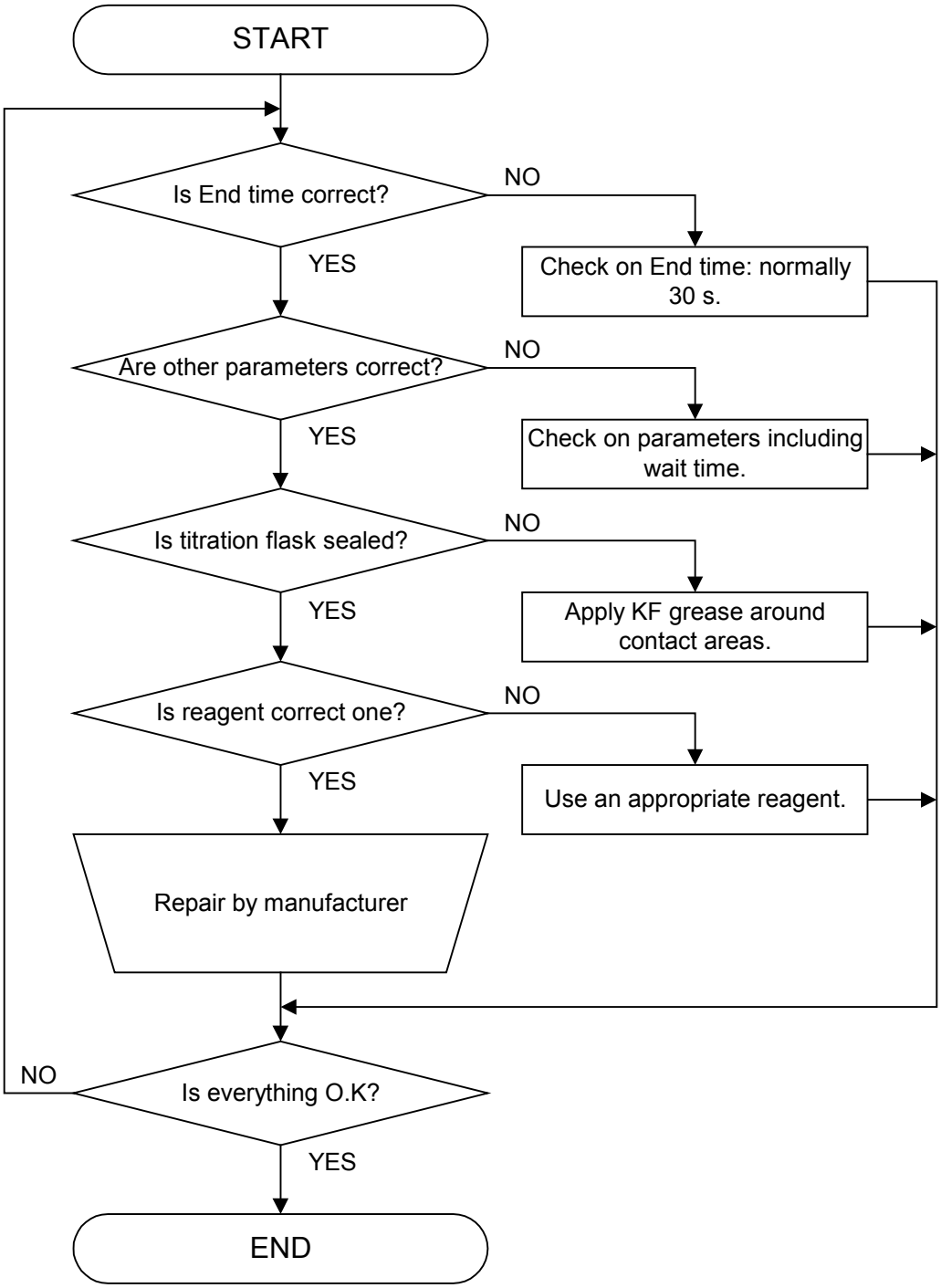
6-11. Dispenser does not work



6-12. It runs into over-titration



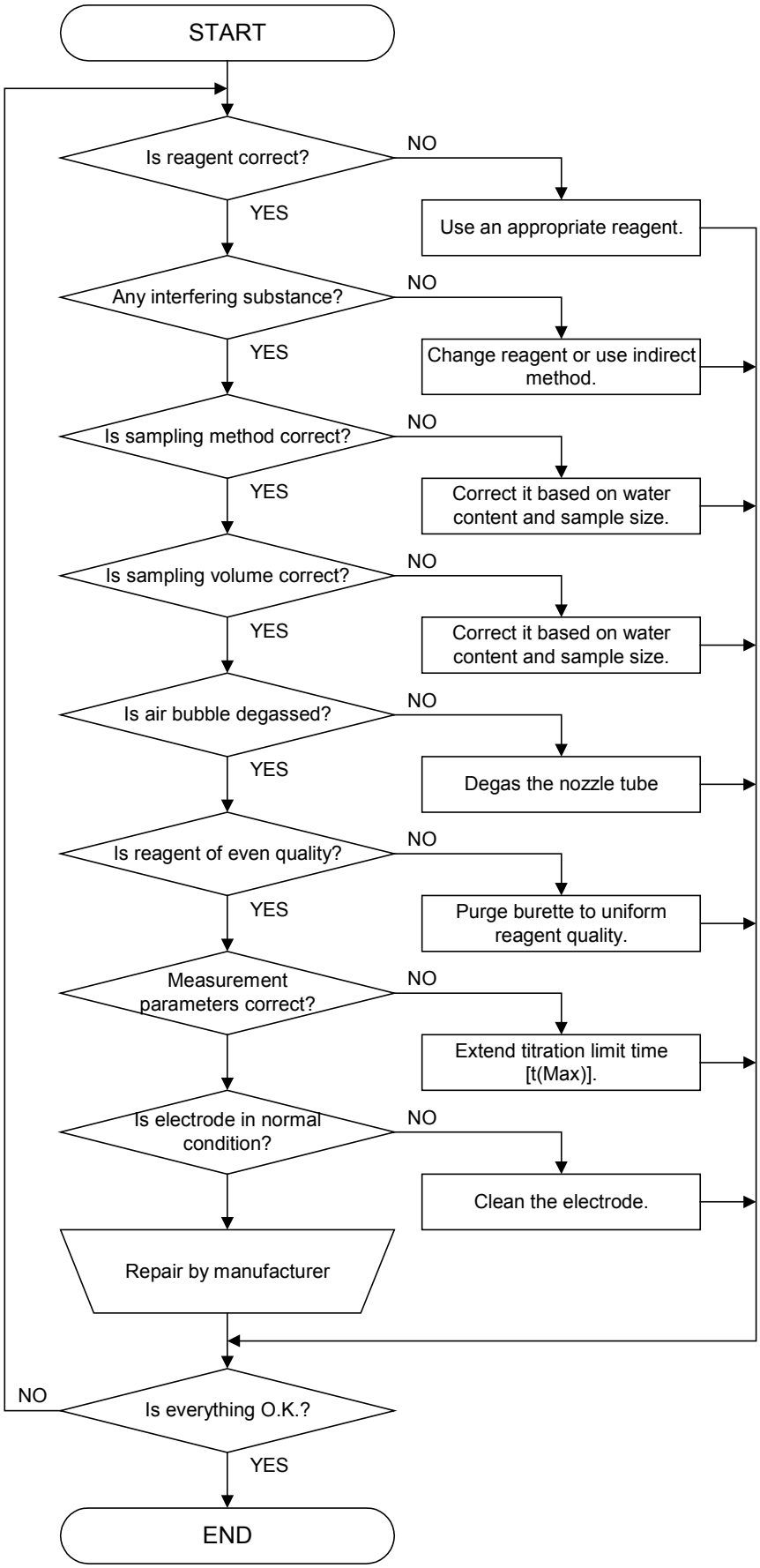
6-13. No endpoint is found or it takes a long time to find EP:



Note:

For measurement of those samples which contain interfering substance like Ketone, Aldehyde, Amine, etc., it may be necessary to change the dehydrated solvent, and add a masking agent.

6-14. Poor repeatability or no EP found



<Relation of water content and sample size>

For your reference, below chart shows the relation of water concentration (10ppm ~ 100%) and sample size for repeatability expected in volumetric method. For this purpose, the titration volume must be more than 3mL.

Water concentration	Reagent factor 5mg/mL	Reagent factor 3mg/mL	Reagent factor 1mg/mL
50 ~ 100 %	0.03 ~ 0.015 g	0. 012 ~ 0.006 g	0.006 ~ 0.003 g
10 ~ 50 %	0.15 ~ 0.03 g	0.06 ~ 0.012 g	0.03 ~ 0.006 g
1 ~ 10 %	1.5 ~ 0.15 g	0.6 ~ 0.06 g	0.3 ~ 0.03 g
0.1 ~ 1 %	15 ~ 1.5 g	6 ~ 0.6 g	3 ~ 0.3 g
100ppm ~ 0.1 %	150 ~ 15 g	60 ~ 6 g	30 ~ 3 g
10ppm ~ 100ppm			300g ~ 30 g

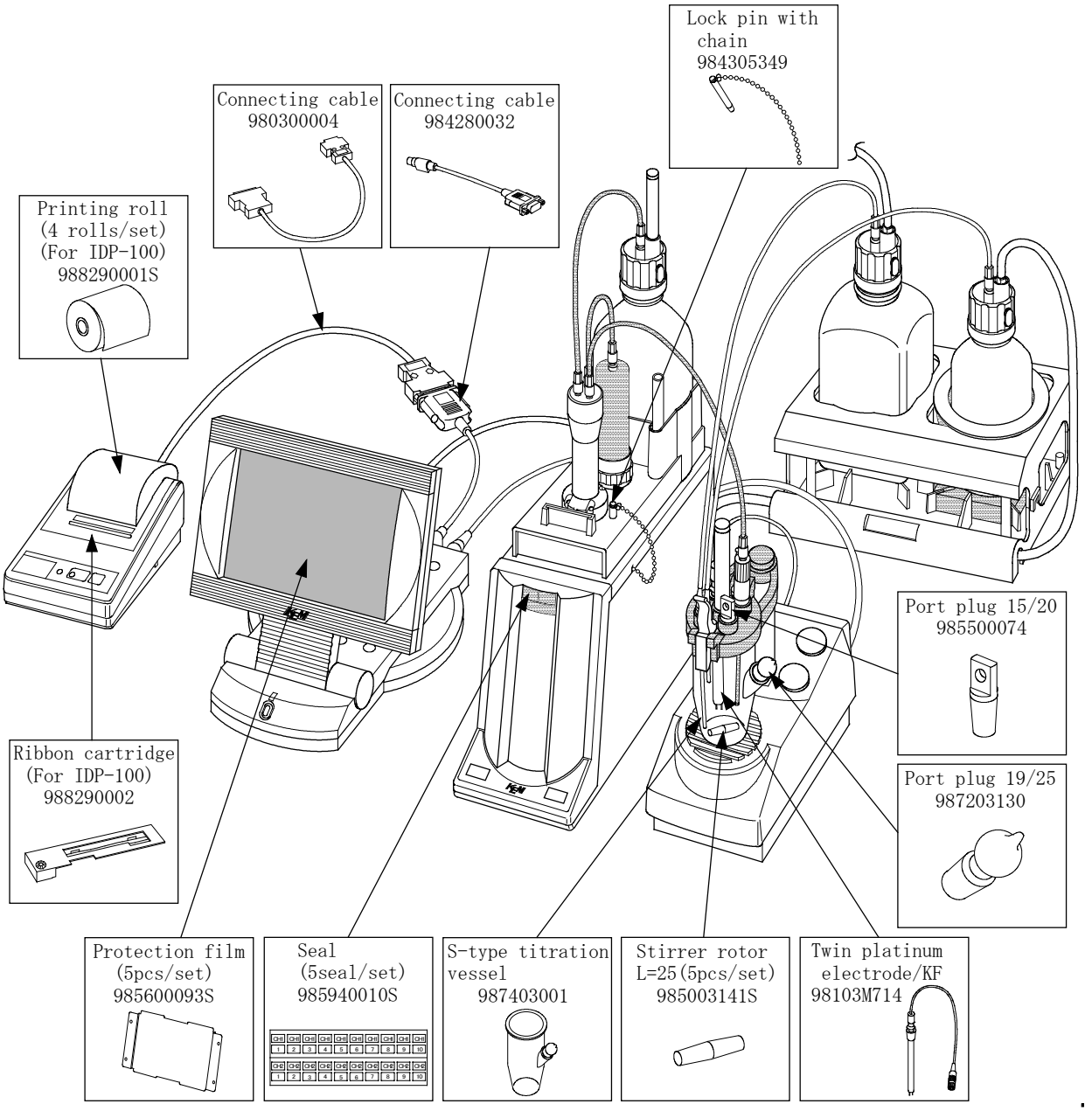
6-15. Other Symptoms:

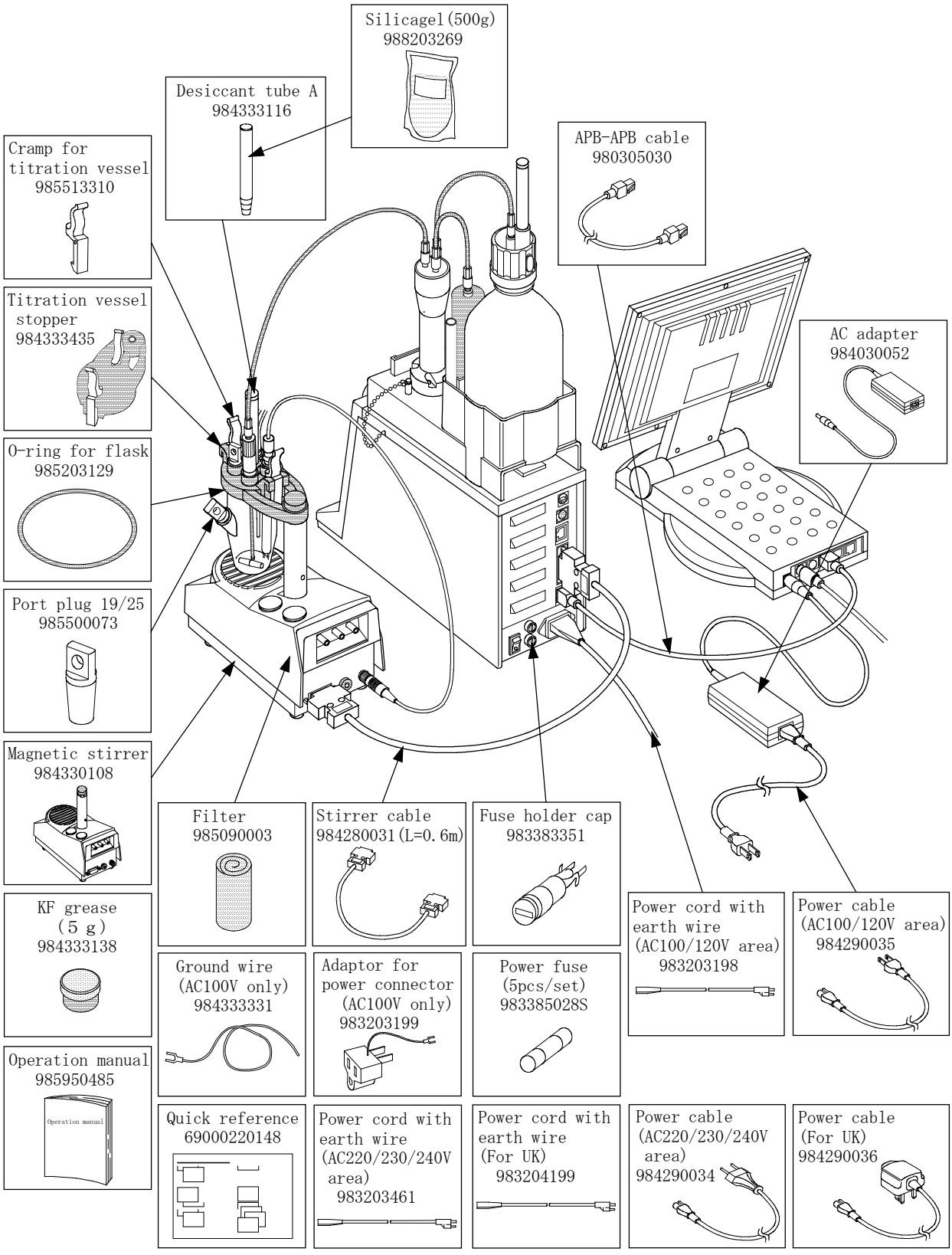
Error symptom	Reason	Remedy
Only one measurement is done even when “Repeat meas.” is set.	• The ‘Start mode’ of ‘Control parameter’ of method is set to “Manual”.	• Change the ‘Start mode’ of ‘Control parameter’ to “Auto”.

7. Others

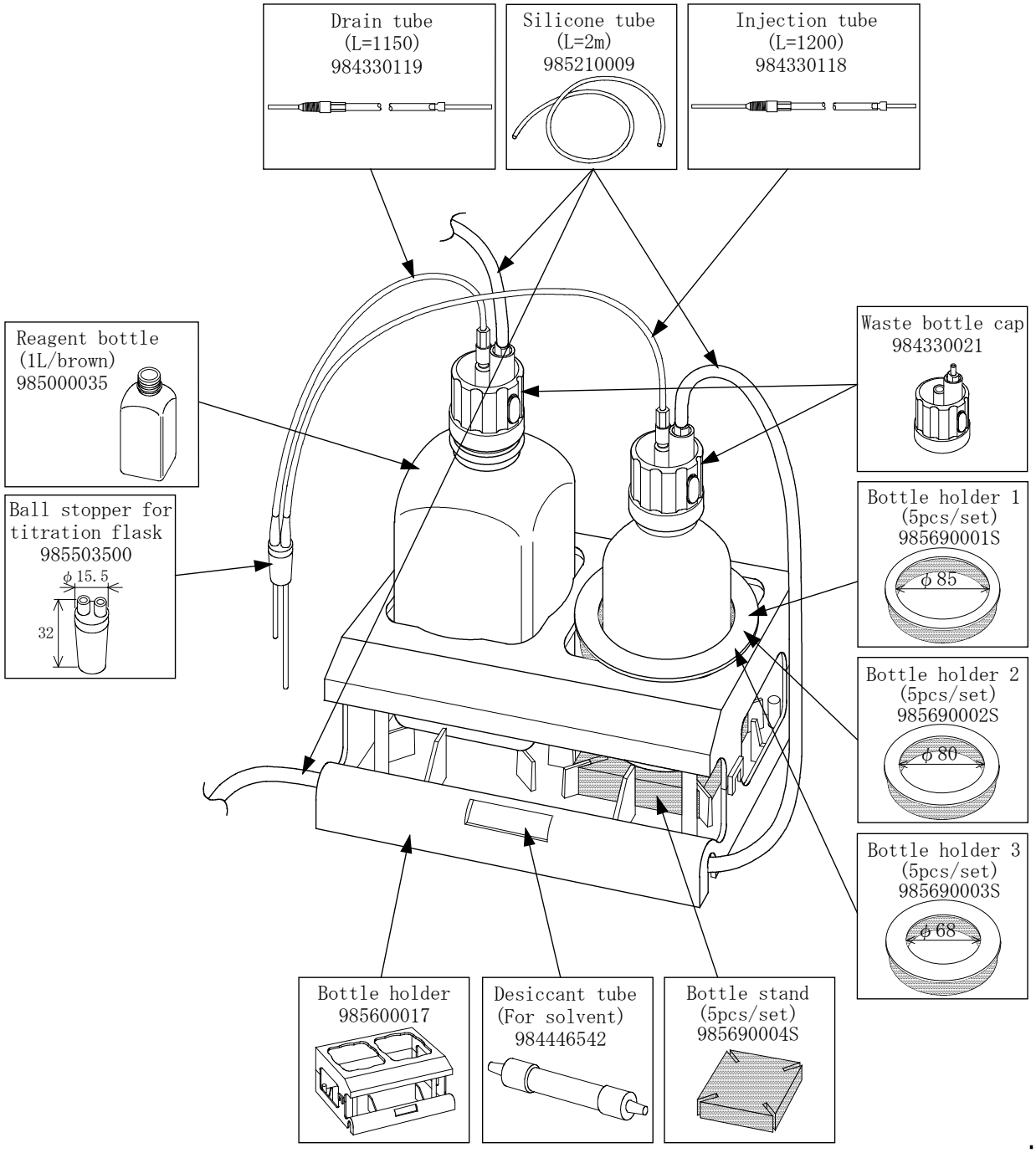
7-1. Part list

7-1-1. Consumable parts · Maintenance parts

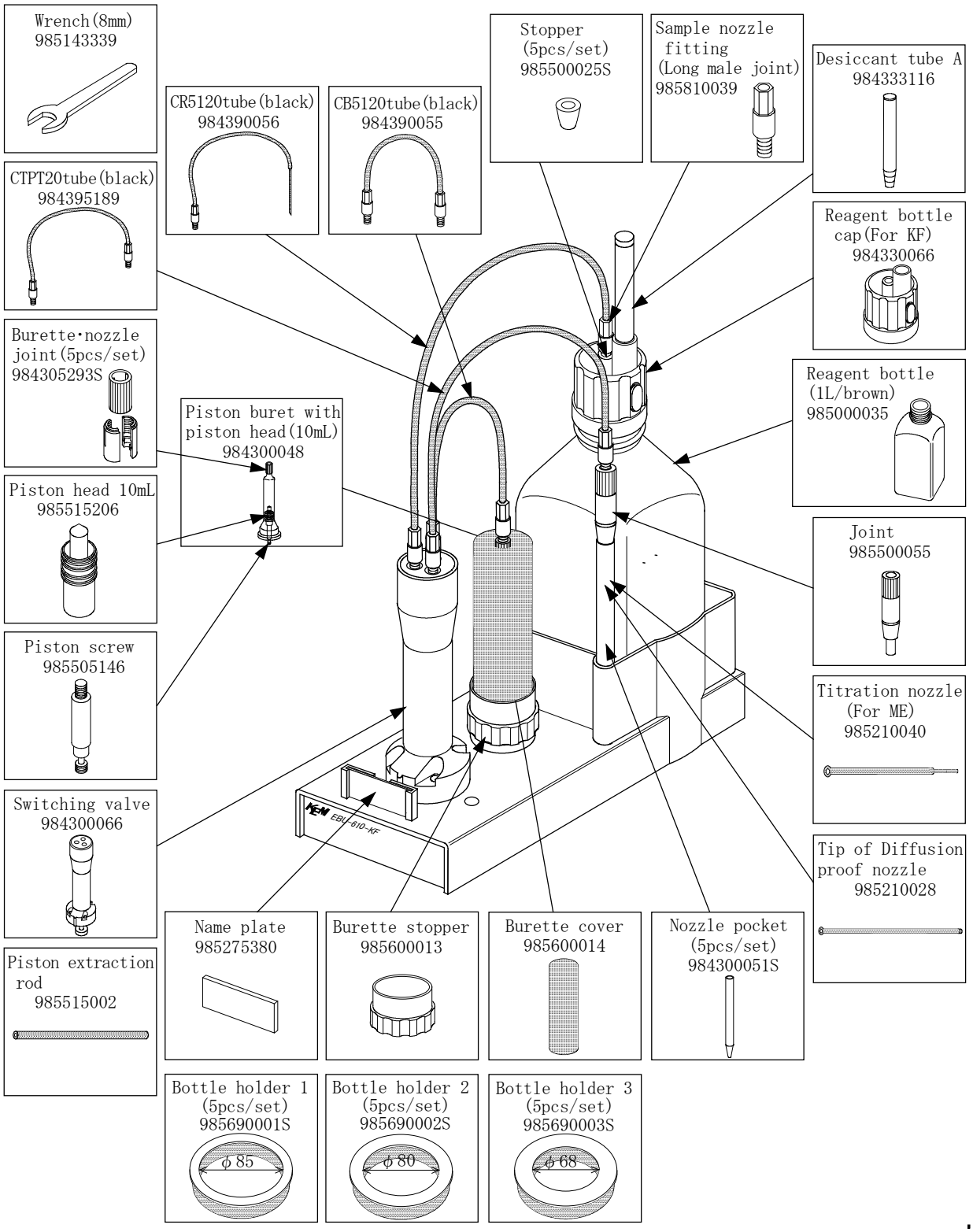



Silicagel(500g)
988203269
Desiccant tube A
984333116
Cramp for
titration vessel
985513310
APB-APB cable
980305030
Titration vessel
stopper
984333435
AC adapter
984030052
O-ring for flask
985203129
Port plug 19/25
985500073
Magnetic stirrer
984330108
Filter
985090003
Stirrer cable
984280031(L=0.6m)
Fuse holder cap
983383351
Power cord with
earth wire
(AC100/120V area)
983203198
Power cable
(AC100/120V area)
984290035
KF grease
(5 g)
984333138
Ground wire
(AC100V only)
984333331
Adaptor for
power connector
(AC100V only)
983203199
Power fuse
(5pcs/set)
983385028S
Operation manual
985950485
Operation manual
Quick reference
69000220148
Power cord with
earth wire
(AC220/230/240V
area)
983203461
Power cord with
earth wire
(For UK)
983204199
Power cable
(AC220/230/240V
area)
984290034
Power cable
(For UK)
984290036

< Solvent change unit >

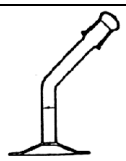
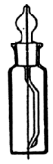
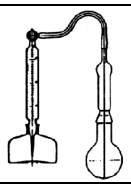
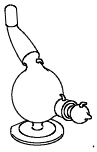
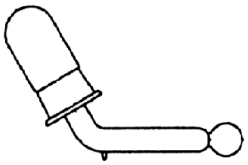
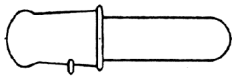
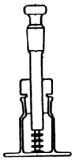
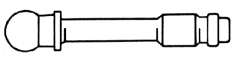


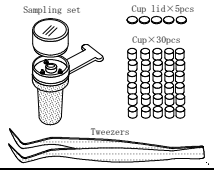
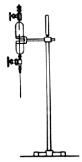
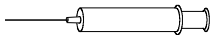
< Burette unit: EBU-610-KF >



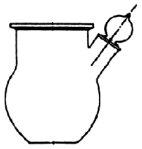
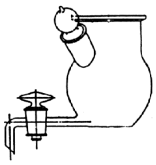
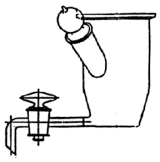
7-1-2. Option

< Sampler >

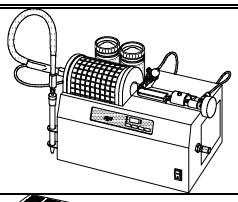
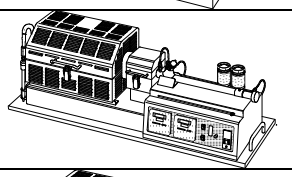
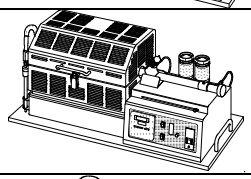
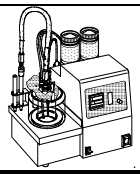
Part code	Part name	Remarks	Sketch
987100038	Finger shaped sampler		
987403011	Bent-type sampler		
987403012	Spoon-type sampler		
987403013	Oil sampler		
987403020	C-type sampler		
987403024	Eggplant-type sampler		
987403025	Powder sampler		
987403026	Straight-type sampler		
987403030	Viscous sampler		
987403031	High viscous sampler		

Part code	Part name	Remarks	Sketch
984330093	Sampling set		
984333014	Liquefied gas sampler		
985003166	Syringe (with needle)	5mL	
985003225	Syringe 20mL		

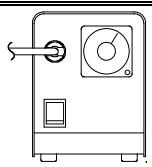
< Titration flask >

Part code	Part name	Remarks	Sketch
987403002	N-type titration vessel		
987403003	C-type titration vessel		
987403005	D-type titration vessel		

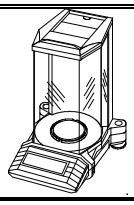
< Evaporator >

Part code	Part name	Remarks	Sketch
ADP-611	Evaporator		
ADP-512	Evaporator for ores		
ADP-512S	Evaporator for high temperature		
ADP-513	Evaporator for oil sample		

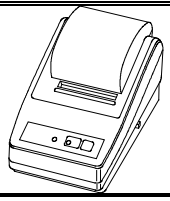
< Pretreatment unit >

Part code	Part name	Remarks	Sketch
ADP-344	Heat Extractor for sugar samples		

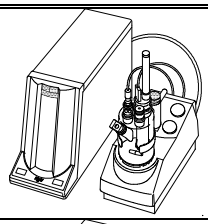
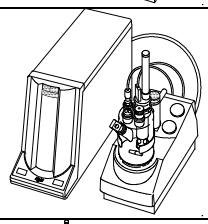
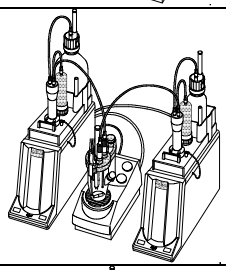
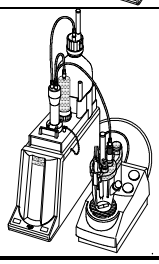
< Balance >

Part code	Part name	Remarks	Sketch
AE-118DR	Balance AE-118DR		

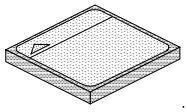
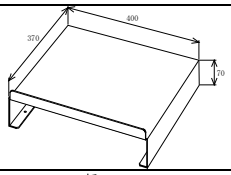
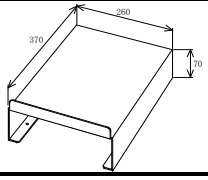
< Printer >

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

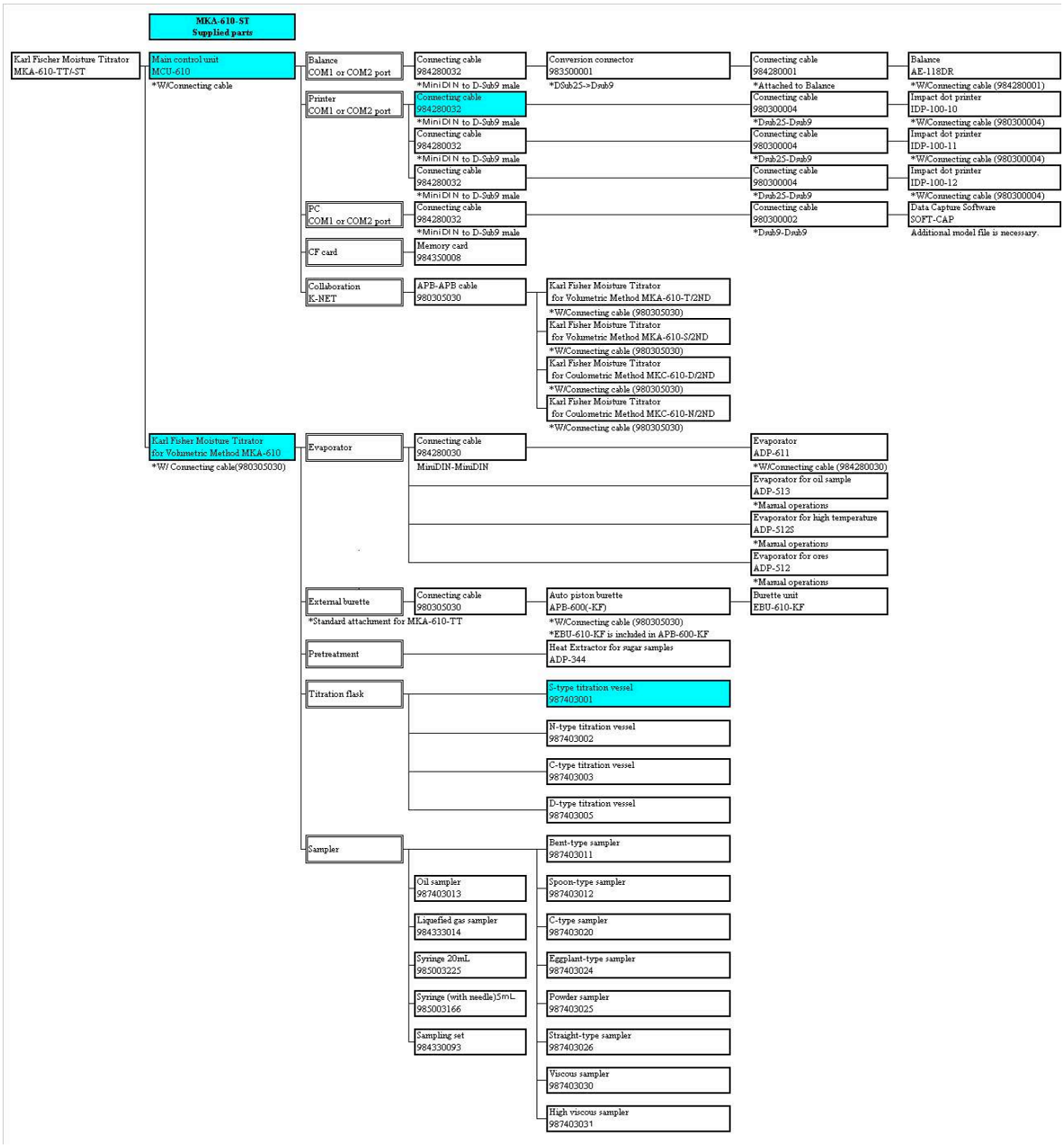
< Measuring unit >

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	

< Others >

Part code	Part name	Remarks	Sketch
984350008	Memory card	32MB	
984330123	System table (1)	For MKA-610-TT	
984330124	System table (2)		

7-2. System Configuration



7-3. Specification

Specification	Contents
Type and model	Model MKA-610 Karl Fischer Moisture Titrator
Measuring method	Karl Fischer Volumetric titration
Measuring range	1) Titration : 0.005 ~ 99.995mL 2) Water content : 0.1 ~ 500mgH_2O(depends on KF reagent factor) 3) Concentration : 10ppm ~ 100%H_2O
Burette precision	1) Volume : 10mL burette 2) Discharge precision : ±0.015mL 3) Repeatability : ±0.005mL
Endpoint detection	By polarized potential level detected with a twin Platinum electrode
EP sense method	Detection of potential level maintained during End preset time. End time range : 1 ~ 99s.
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
Additional features	1) Automatic adjustment of drift level 2) Auto start by sensing sample discharged in titration flask 3) Stores up to 10 blank values 4) Include the stirrer unit with Auto fill-and-drain system for reagents
User control	Up to 50 operators can be registered.
GLP conformance	Check performance with standard substance : Notice of scheduled check date and recording of the results Reagent factor validation : Notice of scheduled validation and reagent change date, and recording of the results
Required solvent	30 ~ 100mL(in S-type titration vessel)
External control	1) COM port × 2 channels for printer/electronic balance 2) RJ45(10BASE-T) × 1 channel for personal computer
Ambient condition	Temperature: 5 ~ 35°C, Humidity: less than 85%RH
Power source	100 ~120/200 ~ 240VAC±10%, 50/60Hz
Power consumption	Touch-on panel control : 20W Measuring unit and stirrer : 60W
Dimensions	1) Touch-on panel controller : 230W × 280D × 255Hmm 2) Titration unit : 120(W) × 363(D) × 610(H) mm 3) Stirrer : 118(W) × 225(D) × 320(H) mm 4) Solvent change unit : 240(W) × 170(D) × 280(H) mm
Weight	1) Touch-on panel controller : Aprox.2.0kg 2) Titration unit : Aprox.4.0kg 3) Stirrer : Aprox.2.0kg 4) Dispenser : Aprox.0.5kg

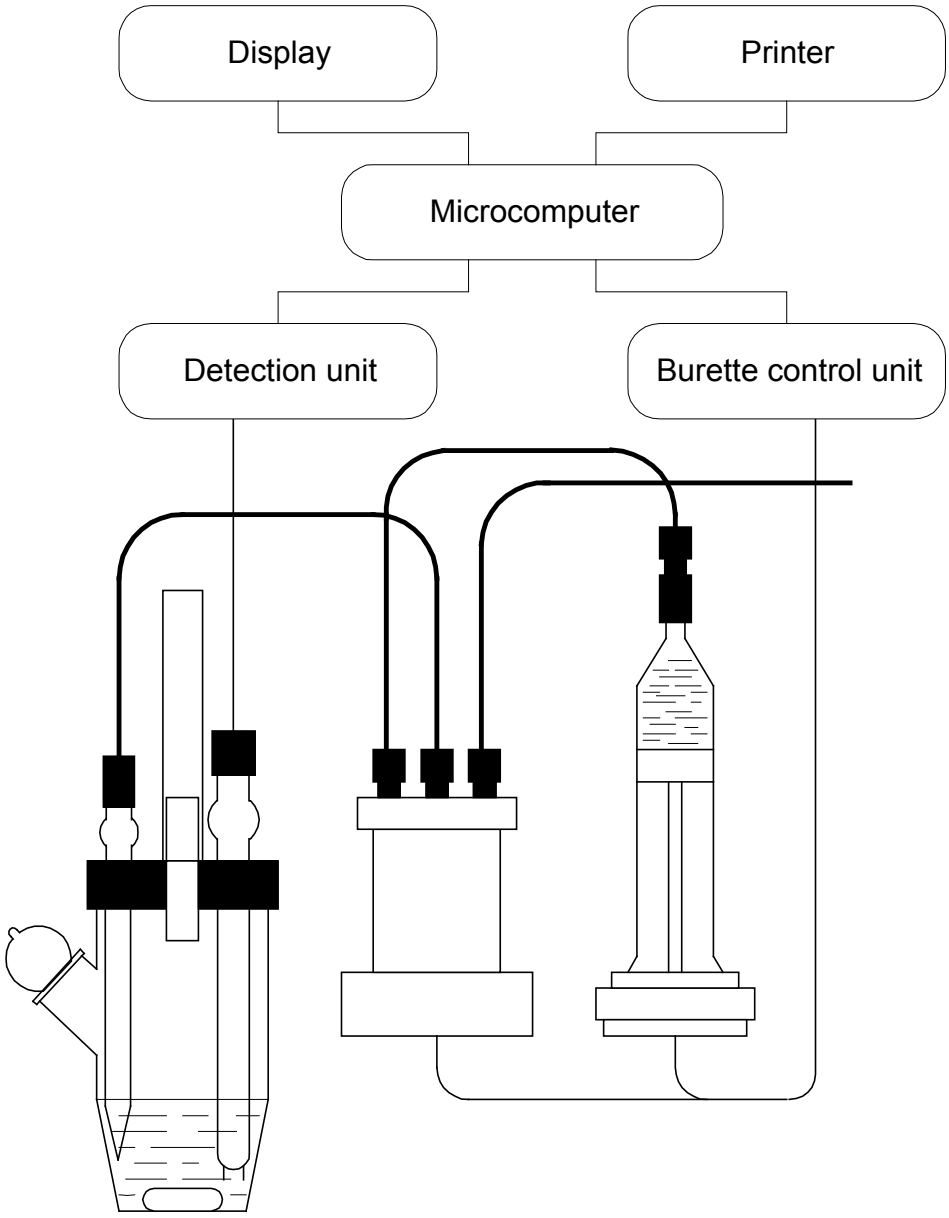
7-4. Reference

7-4-1. Principle of measurement

Water content in the presence of base and alcohol reacts with iodine and sulfur dioxide quantitatively as follows:

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

Karl Fischer moisture determination is based on this reaction. Add sample solution after the solvent in titration vessel is dehydrated by KF reagent. Quantitative titration of water is complete with KF reagent, of which factor is determined in advance (mg H_2O/mL) by standard water-methanol. Titration is progressed by detecting polar potential of the electrode while controlling titration speed.



7-4-2. Karl Fischer reagent

In the volumetric Karl Fischer water determination, adequate KF reagents should be chosen depending on measured samples.

The tables below show the typical uses of each manufacturer's commercial KF reagents.

< Riedel-de Haën & HPC (= Hayashi Pure Chemical) >

Titration Reagent	Dehydrated Solvent	Application
Composite 5 (RdH) Composite 2 (RdH)	Solvent ML Solvent MI Solvent MS Compo Solver (RdH)	for general samples
	Solvent CM Solvent Oil (RdH)	for oils
	Solvent FM Solvent FM II	for sugars
	Solvent ME	for gases
Composite 5K (RdH)	Solvent CE Keto Solver (RdH)	for ketones

< Mitsubishi Chemical >

Titration Reagent	Dehydrated Solvent	Application
SS 0.7 ~ 1.2mgH_2O/mL	Dehydrated Solvent MS	for general samples
SS 2.5 ~ 3.5mgH_2O/mL	Dehydrated Solvent CM	for oils
SS 8 ~ 12mgH_2O/mL	Dehydrated Solvent FM	for sugars
	Dehydrated Solvent CP	for ketones
	Dehydrated Solvent PP	for aldehydes
SS-Z 0.7 ~ 1.2mgH_2O/mL	Dehydrated Solvent GEX	for general samples
SS-Z 2.5 ~ 3.5mgH_2O/mL	Dehydrated Solvent OLX	for oils
SS-Z 4.5 ~ 5.5mgH_2O/mL	Dehydrated Solvent KTX	for sugars
	Dehydrated Solvent SU	for ketones

< Merck AG >

Titration Reagent	Dehydrated Solvent	Application
109234 Titer: 5	Methanol	for general samples

Note:

When the titration reagents and dehydrated solvents are selected, the combination should be the reagent maker's recommended one. Failure to this (combination of different reagent maker's products) may lead to abnormal measurement results.

Additionally, when reagents not listed in the above tables are used, contact respective reagent makers.

(The above data are as of July 2003.)

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 60 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	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
Check Interval	7 Day	1–999	Interval	As displayed
Periodic factor	Off	Off /On	Periodic factor	Off /On
Factor meas. date	—	Day intervals	F.meas.date	As displayed
Interval	7 Day	1–999	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.	Off	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
	Default	Round up/ Half adjust /Round down	—	Round up/ Half adjust /Round down
Statistics	4	0-8	Statistics	As displayed
	Half adjust	Round up/ Half adjust /Round down	—	Round up/ Half adjust /Round down
Titr. & Dose volume	4	0–8	Titr.&Dose Vol.	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 settings]

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
Suction speed (Burette 1)	1s/mL	1-999	Burett 1 Suct.speed	As displayed
Back rush (Burette 1)	0.40mL	0.08-12.00	Burette 1 Back rush	As displayed
Suction speed (Burette 2)	1s/mL	1-999	Burett 2 Suct.speed	As displayed
Back rush (Burette 2)	0.40mL	0.08-12.00	Burette 2 Back rush	As displayed

7-4-3-3. Method parameter

Default Method parameters

Method No.	01	02	03	04	05	06	07-50
Method name	Normal Titration	Check Titration	Back Titration	Evapora -tion	Factor Std. Material	Factor Std. MeOH	Method xx
[Titration parameter]							
Titration mode	Normal	Normal	Back	Normal	Normal	Normal	Normal
t(stir)	0s	0s	120s	0s	0s	10s	0s
t(wait)	0s	0s	0s	0s	0s	0s	0s
t(max)	0s	0s	0s	1200s	0s	0s	0s
t(interval)	0s	0s	0s	0s	0s	0s	0s
Max. volume	10.0000 mL	10.0000 mL	10.0000 mL	10.0000 mL	10.0000 mL	10.0000 mL	10.0000 mL
Titr.burette No.	1	1	2	1	1	1	1
Dose mode	Off	Off	Auto	Off	Off	Set	Off
Dose burette No.	(2)	(2)	1	(2)	(2)	2	(2)
Dose volume	(3.00mL)	(3.00mL)	(3.00mL)	(3.00mL)	(3.00mL)	3.00mL	(3.00mL)
[Control parameter]							
End time	30s	30s	10s	0s	30s	30s	30s
Final volume	0.01mL	0.01mL	0.01mL	0.01mL	0.01mL	0.01mL	0.01mL
Titration speed	3	3	3	3	3	3	3
Detector mode	1	1	1	1	1	1	1
Drift titr.	Off	Off	On	On	Off	Off	Off
Start mode	(Manual)	(Manual)	Manual	Auto	(Manual)	(Manual)	(Manual)
End level	75mV	75mV	75mV	75mV	75mV	75mV	75mV
Data sampling time	5	5	5	10	5	5	5
Stirrer speed	4	4	4	4	4	4	4
[Calculation parameter]							
Calc. type	Sample	Check	Sample	Sample	Factor	Factor	Sample
Blank No.	1	1	1	1	1	1	1
Calc. No.	2	2	2	2	7	8	2
Unit	%	%	%	%	mg/mL	mg/mL	%
Decimal	4	4	4	4	4	4	4
Fraction	Half adjust	Half adjust	Half adjust	Half adjust	Half adjust	Half adjust	Half adjust
Drift comp.	Off	Off	Off	Off	Off	Off	Off
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)	(0.00 ug/min)
Evaluation	Off	Off	Off	Off	Off	Off	Off
Standard value	(0.0000)	(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)	(0.0000)

Method No.	01	02	03	04	05	06	07-50
[Report parameter]							
Report format	Short	Short	Short	Short	Short	Short	Short
Graph printing	Off	Off	Off	Off	Off	Off	Off
Data list printing	Off	Off	Off	Off	Off	Off	Off
[Reagent parameter]							
Titration unit	Reagent 01	Reagent 01	Reagent 02	Reagent 01	Reagent 01	Reagent 01	Reagent 01
Dose unit	Reagent 02	Reagent 02	Reagent 01	Reagent 02	Reagent 02	Reagent 02	Reagent 02
[Option parameter]							
Pre treat	2	2	2	2	2	2	2
Cell purge	120s	120s	120s	120s	120s	120s	120s
Back purge	180s	180s	180s	180s	180s	180s	180s
Sample purge	(180s)	(180s)	(180s)	(180s)	(180s)	(180s)	(180s)
Heating mode	Set	Set	Set	Set	Set	Set	Set
Oven temp.	150C	150C	150C	150C	150C	150C	150C
Heating speed	(20s/C)	(20s/C)	(20s/C)	(20s/C)	(20s/C)	(20s/C)	(20s/C)
Start temp.	(70C)	(70C)	(70C)	(70C)	(70C)	(70C)	(70C)
End temp.	(300C)	(300C)	(300C)	(300C)	(300C)	(300C)	(300C)
[Repeat meas. parameter]							
Repeat measurement	Off	Off	Off	Off	Off	On	Off
Repeat times	(3)	(3)	(3)	(3)	(3)	3	(3)

Selection of Method parameters and printout

[Titration parameters]

Displays		Printout	
Item	Selection	Item	Printing
Titration mode	Normal /Back	Titr.mode	Normal/Back
t(stir)	0-99999s	t(stir)	As displayed
t(wait)	0-99999s	t(wait)	As displayed
t(max)	0-99999s	t(max)	As displayed
t(interval)	0-99999s	t(interval)	As displayed
Max. volume	0.00000000-999.00000000mL	Max.volume	As displayed
Titr.burette No.	1-2	Titr.bur.No.	As displayed
Dose mode	Off/Set/Auto	Dose mode	Off /Set/Auto
Dose burette No.	1-2	Dose bur.No	As displayed
Dose volume	0.00-999.00	Dose volume	As displayed

[Control parameters]

Displays		Printout	
Item	Selection	Item	Printing
End time	0-99s	End time	As displayed
Final volume	0.01-9.99mL	Final vol.	As displayed
Titration speed	1-6	Titr.speed	As displayed
Detector mode	1-2	Detect.mode	As displayed
Drift titr.	Off /On	Drift titr.	Off/On
Start mode	Manual /Auto	Start mode	Manual/Auto
End level	0-1000mV	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/ Factor /Check	Calc. Type	Sample/Blank/ Factor/Check
Blank No.	1-10	Blank No.	As displayed
Calc. No.	0-8	Calc. No.	As displayed
Unit	%,ppm,mg,mL mg/g,mg/mL	Unit	As displayed
Decimal	0-8	Decimal	As displayed
Fraction	Round off/Half adjust/ Round up	Fraction	Round off/Half adjust/ Round up
Drift comp.	Off/Manual	Drift comp.	Off/Manual
Drift	0.00-99.99ug/min	Drift	As displayed
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 parameters]

Displays		Printout	
Item	Selection	Item	Printing
Titration unit	As selected	Titr.unit	As displayed
Dose unit	As selected	Dose unit	As displayed

[Option parameter]

Displays		Printout	
Item	Selection	Item	Printing
Pre treat	1/2/3	Pre treat	As displayed
Cell purge	0-99999s	Cell purge	As displayed
Back purge	0-99999s	Back purge	As displayed
Sample purge	0-99999s	Samp.purge	As displayed
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

[Repeat measurement parameters]

Displays		Printout	
Item	Selection	Item	Printing
Repeat measurement	Off /On	Repeat meas.	Off/On
Repeat times	2-99	Repeat times	As displayed

7-5. Warranty and After-Sale Service

7-5-1. 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.