Karl Fisher Moisture Titrator

MKA-510N / MKS-510N

Operation Manual

Please read this manual carefully before you use the instrument.

Ver.10
#595-0246

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1. Introduction

1-1. Feature

The instrument you have purchased is Karl Fischer Volumetric Moisture Titrator to determine water content in liquid or solid sample. It measures moisture content with high precision by easy operation in a short period of time.
The MKA-510N is twin buret titrator that can perform back titration and automatic factor calibration with water-methanol standard.
The MKS-510N is single buret titrator designed for normal titration with high cost performance.
Since basic specifications of both models are the same, only different parts of instrumental operations and measurement procedures are separately described in this manual.

[Feature]

- Easy operation

  You can go on routine measurement simply by pressing [Pre-Titr] key and [Start] key.

- Digital display of the results with high reproducibility

  It displays reproducibility of ±0.01mL by 10mL buret.

- Easy dispensing dehydration solvent

  Delivery and draining of dehydration solvent is automated by single button switch by the built-in solvent dispenser, which is now standard.

- Easy replacement of buret unit

  Reagent of different factor can be easily switched by replacing the buret unit.

- Standard built-in interfaces

  The interface for personal computer via RS-232C, for Balance and for Printer is now standard and each is built-in.

It is recommended to peruse this manual so that you can obtain the maximum efficiency and performance of the instrument for a long duration.

Note:
If you should find any portion in this manual that may differ from the unit you have purchased, please always refer to the specification that accompanies your system.

1-2. About the manual

You are requested to respect the safety rules and symbols which you will find from place to place in this manual.

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

> **⚠WARNING!**
> **Danger of severe injury or even leading to death unless the instruction is followed.**

2. Where there exists danger of property damage:

> **⚠CAUTION!**
> **Danger of property damage of yourself and others unless the instruction is followed.**

3. Where there exists danger of malfunctioning of the instrument:

> **Note:**
> **May not be covered by warranty unless the instruction is followed.**

- It is prohibited to copy a part or all of this manual.
- If you should find any questions about the description in this manual, please contact your local dealer.
- The manufacturer will not be liable for any damage by use of the measurement results of the instrument.

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.

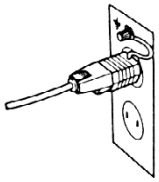
⚠ Warning This symbol means "Danger of severe injury or possible death".	This symbol means prohibition of an act.
⚠ Caution This symbol means "Danger of injury or property damage".	This symbol means mandatory.

⚠ 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.

⚠Safety measures

Place for installation

- The performance and reliability of the instrument may not be secured if your instrument is used under excess ambient condition. Avoid a place under any of the following conditions:
  - · Under or near vibration
  - · Direct sunlight
  - · Corrosive gas atmosphere
  - · Power source of heavy load fluctuation or strong magnetic field
  - · Ambient condition other than 5 to 35°C, below 85% RH, which is normal condition for use of this instrument.

About power source

- Available power source for the instrument: AC100 to 120V, AC200 to 240V, 50/60Hz
- Supply power direct from power outlet.
- Do not share power from a power tap.

About place for storage

- Store the disassembled titration vessel after cleaned and dried. It is recommended to use the carton box in which the unit was first delivered.
- Avoid a place for storage under dusty condition or excess temperature or humidity.

About use

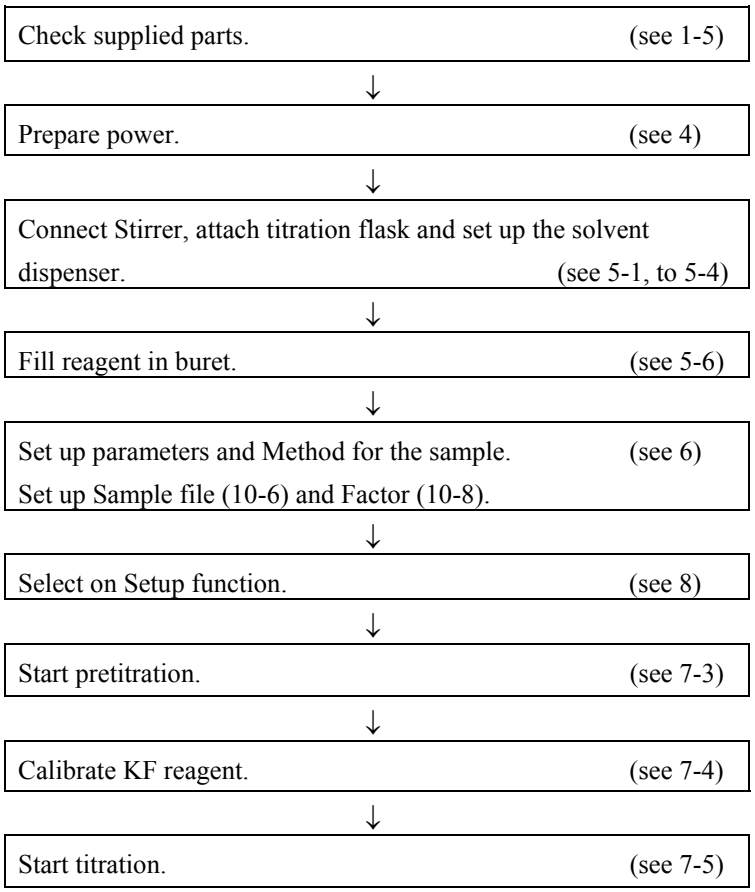
- Karl Fischer reagents are toxic chemicals. Therefore, please handle in a well ventilated room and be aware of its danger.
- When a reagent etc. is spilt to Main unit or the connectors of magnetic stirrer, there is a possibility of malfunction.

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.

1-4. From unpacking till starting titration

The below chart shows the flow from unpacking the carton box until the first measurement is started.



1-5. Supplied parts

The carton box that has been delivered to you contains the following items including the MKA-510N / MKS-510N, the parts and Users manual. Please check them with the below parts list:

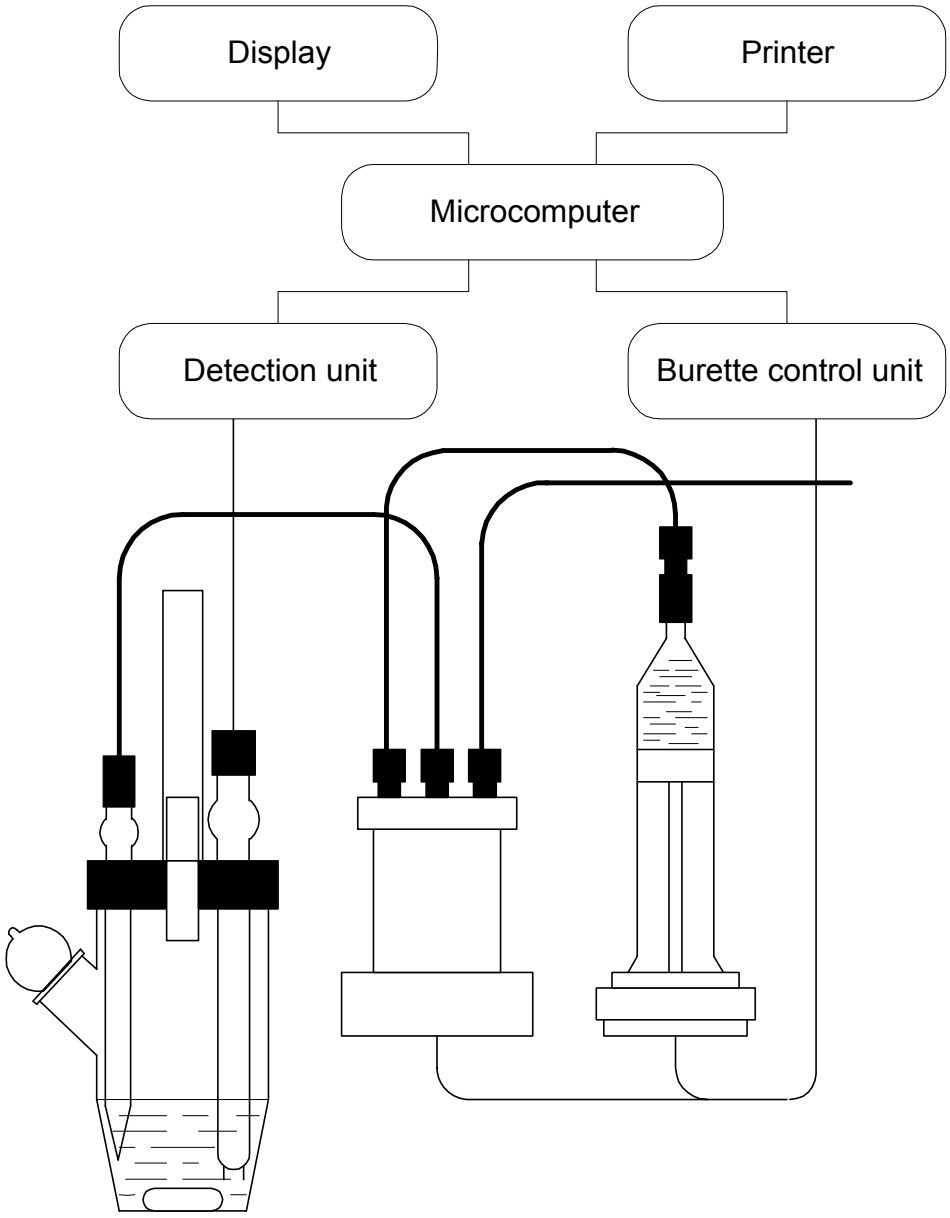
			MKA-510N	MKS-510N
(1)	Main unit		1 unit	1 unit
(2)	Magnetic stirrer with Dispenser	#433-0068	1 unit	1 unit
(3)	Buret unit (for KF)	APB-510-KF	1 set	1 set
(4)	Buret unit (for ME)	APB-510-ME	1 set	–
(5)	Stirrer cable	#030-0006	1 pce	1 pce
(6)	Power cord with earth (AC 100V area only)	#320-3198	1 pce	1 pce
	(AC 100-120V area)	#320-3194		
	(AC 220-240V area)	#320-3461		
	(UK)	#320-4199		
(7)	AC-3P adapter (AC 100V area only)	#320-3199	1 pce	1 pce
(8)	Earth wire (AC 100V area only)	#433-3331	1 pce	1 pce
(9)	S-type titration flask	#740-3001	1 pce	1 pce
(10)	Titration flask cover	#433-3435	1 pce	1 pce
(11)	Detection electrode (2-pin platinum)	#103-M714	1 pce	1 pce
(12)	Stirrer spinner (25mm)	#500-3141	1 pce	1 pce
(13)	Ball stopper for titration flask	#550-3500	1 pce	1 pce
(14)	KF grease (5g)	#433-3138	1 pce	1 pce
(15)	Desiccant tube A	#433-3116	3 pcs	2 pcs
(16)	Piston rod	#552-5002	1 pce	1 pce
(17)	Wrench (8mm)	#514-3339	1 pce	1 pce
(18)	Bottle holder	#560-0017	1 set	1 set
(19)	Waste bottle cover	#433-0021	2 pcs	2 pcs
(20)	Bottle for waste solution	#500-0022	1 pce	1 pce
(21)	Desiccant tube (for solvent)	#444-6542	1 pce	1 pce
(22)	Drain tube	#433-0025	1 pce	1 pce
(23)	Injection tube	#433-0024	1 pce	1 pce
(24)	Silicone tube (25,40,43cm)	#521-0009	1 set	1 set
(25)	Operation manual	#595-0246	1 copy	1 copy
(26)	Operation manual (RS-232C)	#595-0248	1 copy	1 copy
(27)	Warranty		1 copy	1 copy

2. Principle of measurement

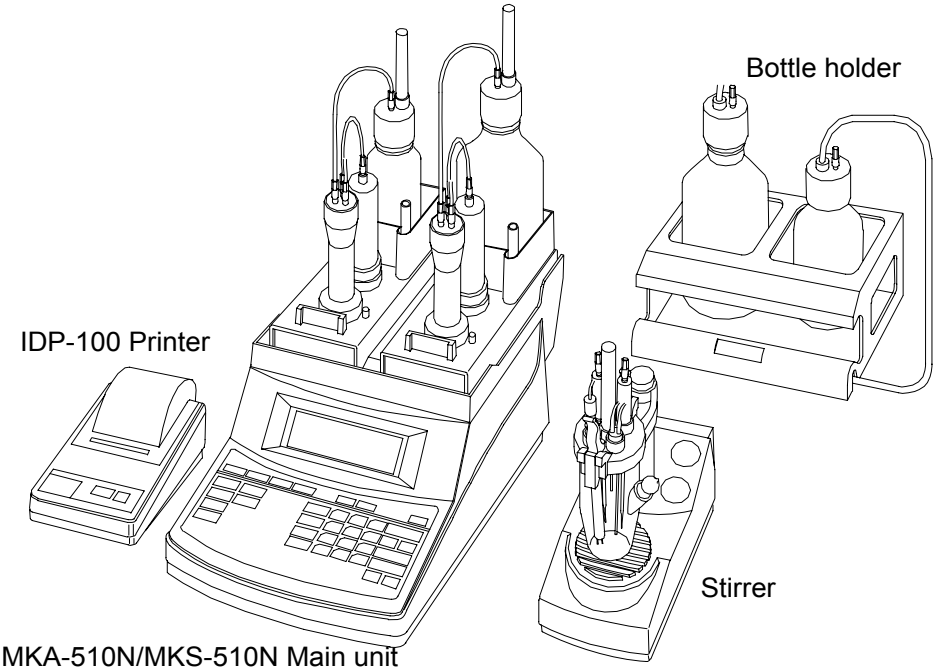
Water content in the presence of base and alcohol reacts with iodine and sulfur dioxide quantitatively as follows:

$$H_2O+I_2+SO_2+CH_3OH+3RN \rightarrow [RNH]SO_4\ CH_3+2[RNH]I$$

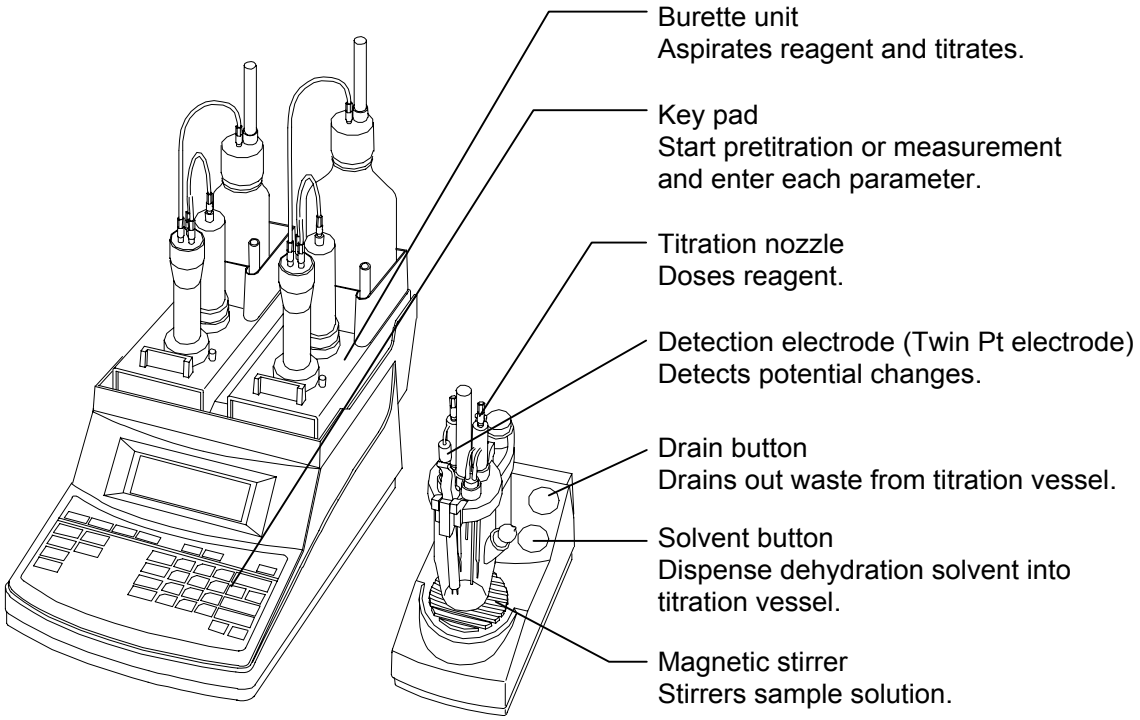
Karl Fischer moisture determination is based on this reaction. Add sample solution after the solvent in titration vessel is dehydrated by KF reagent. Quantitative titration of water is complete with KF reagent, of which factor is determined in advance (mg H_2O/mL) by standard water-methanol. Titration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



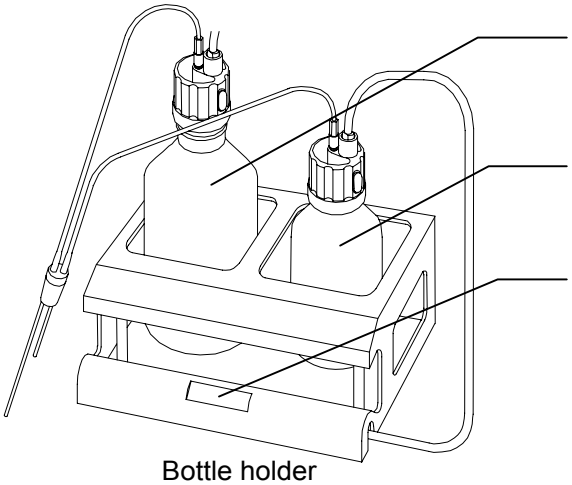
3. Parts name and function



MKA-510N/MKS-510N Main unit
This sketch is MKA-510N



MKA-510N/MKS-510N Main unit
This sketch is MKA-510N.

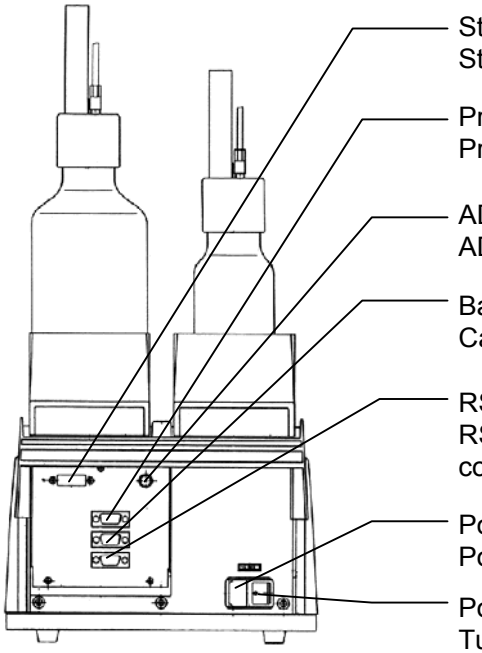


Waste bottle
Keeps waste solution.

Dehydration solvent

Desiccant tube
Extracts moisture from air going through the desiccant tube.

Bottle holder



Stirrer cable
Stirrer cable is connected here.

Printer connector
Printer cable is connected here.

ADP connector
ADP cable is connected here.

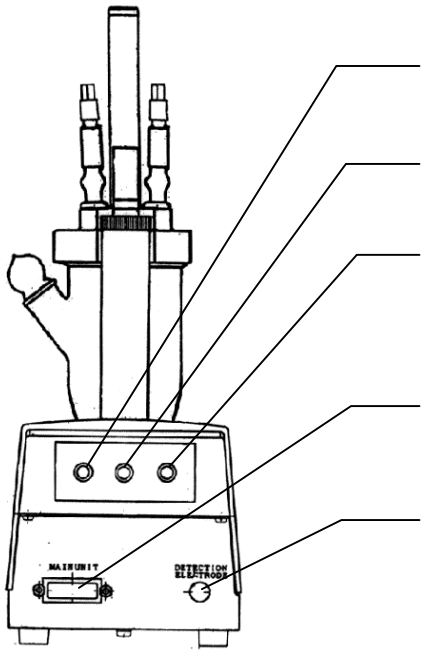
Balance connector
Cable from Balance is connected here.

RS-232C connector
RS-232C cable from computer is connected here.

Power receptacle
Power cable is plugged here.

Power switch
Turns ON/OFF power.

Rear view of MKA-510N



Vent hole
Exhausts funs from extracting reagent.

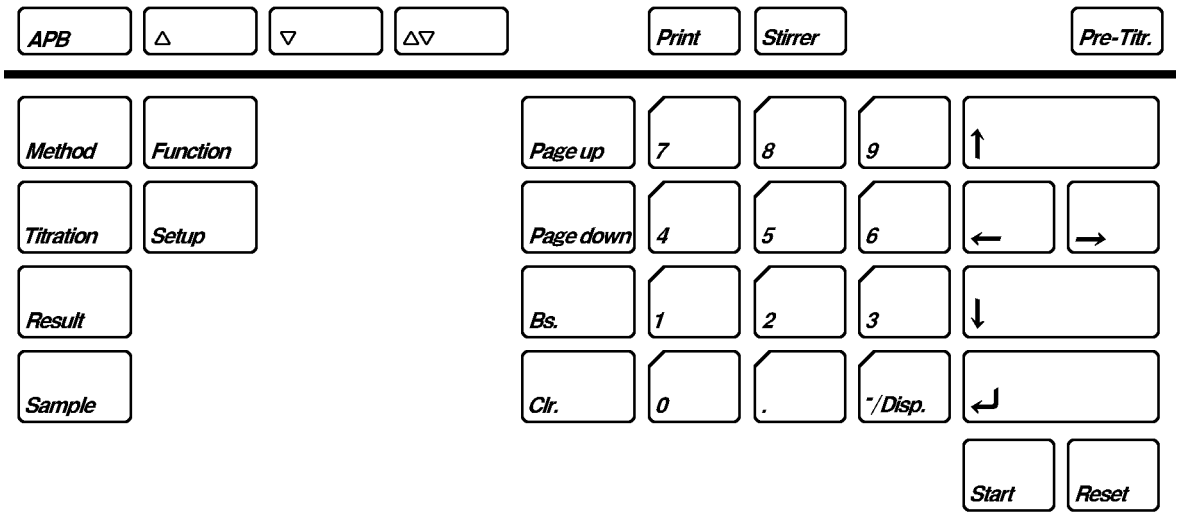
Waste outlet
Air intake for waste is connected here.

Pressurized air outlet
Pressurized air to transfer dehydratin solution is exhausted here.

Main connector
Connect Main unit.

Electrode connector

Key configuration



Method .....Key to select Method

Titration .....Key to set up Titration parameter

Result .....Key to set up parameter for Calculation, Print and Data list

Sample .....Key to enter Sample number, Lot number and Sample weight, etc.

Function .....Key to set up Function parameter

0. Input reagent factor and confirmation
1. Recalculation
2. Auto statistics
3. Deletion of data
4. Auxiliary function for Sample
5. Ageing Evaporator
6. Auxiliary function for buret
7. Calibration
8. Set up Check day and review Check record
9. Initialize stored data

Setup .....Key for Setup parameter

0. Set up interface
1. Set up date
2. Register Operator's name
3. Confirm serial number and version number
4. Adjust brightness of LC display
5. Set up display and selection of beep

Print .....Key to print out data

Stirrer .....Key to turn ON/OFF Stirrer and select stir speed

APB ..... Selection of manual buret (MKA-510N only) and set up number of times of purging.

△ ..... Dose key

Key to drain by buret manually

▽ ..... Suction Key

Key to aspirate reagent by buret manually

△▽ ..... Key to purge manual buret

Pre-Titr. ..... Key to pretitration

Start ..... Key to start titration

Reset ..... Key to stop titration

"/Disp. ..... Display Key

Key to change page on display or enter alphabetic characters (ABC....Z...) one after another.
Also to enter a bar "-".

. ..... Period key

Key to enter a period "." or characters in reverse order (Z,Y,X...A).

0 ~ 9 ..... Numeric Key

↑ , ← , → , ↓ .... Key to move the cursor

↵ ..... Enter Key

Key to confirm key entry

Page up ..... Key to return the ▲ marked display to the previous page

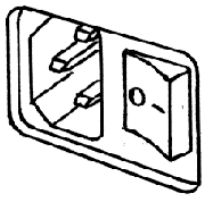
Page down ..... Key to move the ▼ marked display to the next page.

Bs. ..... Key to erase the preceding character or numeral

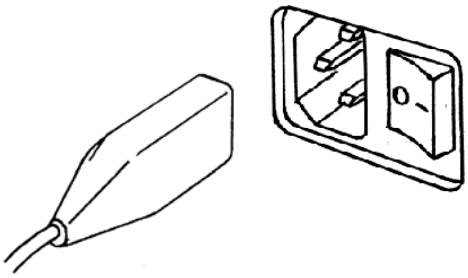
Clr. ..... Key to erase all the entered characters or numerals

4. Power source

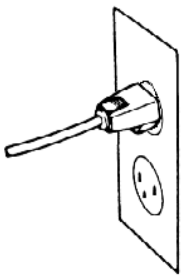
(1) Make sure the power switch is in OFF position.



(2) Plug in the supplied power cord to the receptacle.

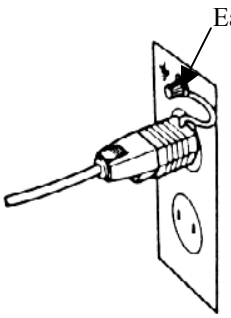


(3) Plug in the other end of the cord to the power outlet.



<3P power outlet>

The 3-pin plug has earth terminal in it and grounding to earth is not necessary.



<2P power outlet>

Attach the supplied AC-3P adapter and ground the green wire to earth.

⚠ WARNING!

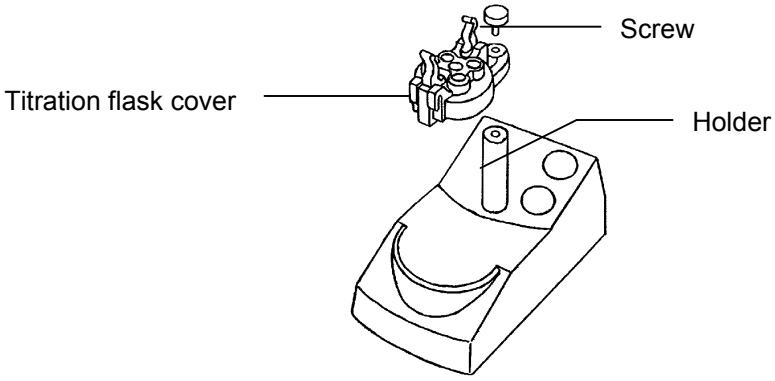
The earth line must be grounded.
Danger of electric shock if not grounded.

5. Preparation before measurement

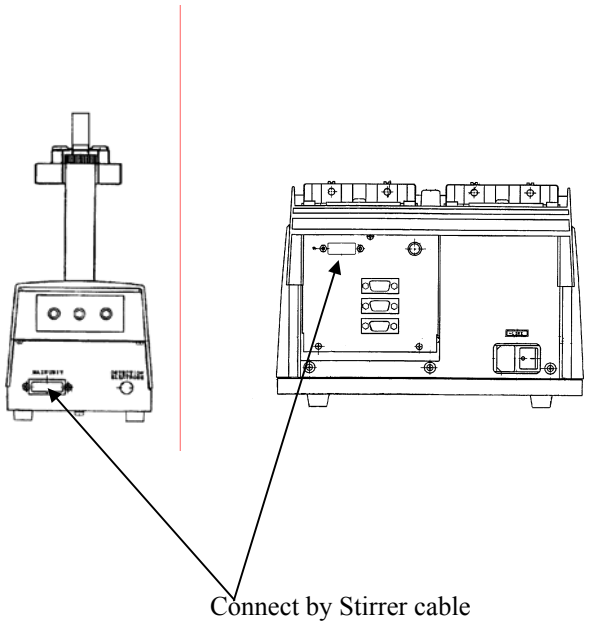
5-1. Assembly of Stirrer

Assemble the magnetic stirrer and connect it to Main unit.

(1) Fasten the titration flask cover to the holder by the screw.



(2) Connect Magnetic stirrer and Main unit by Stirrer cable.

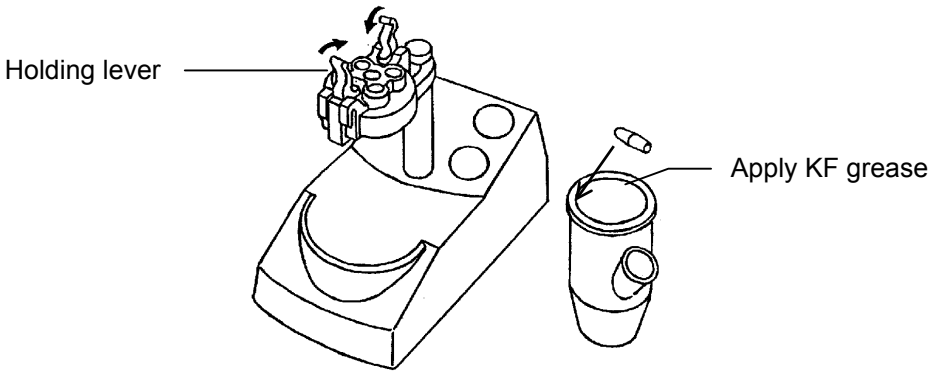


⚠CAUTION!

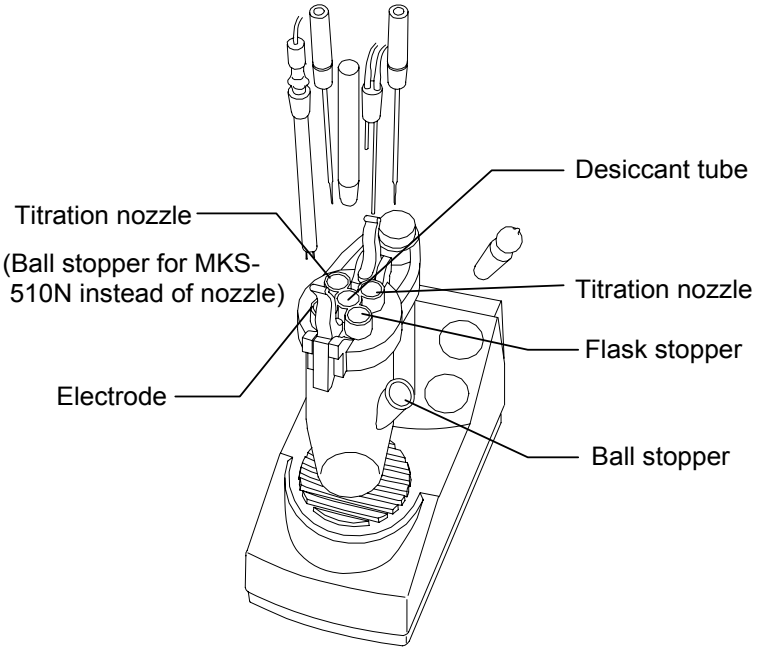
Turn OFF power of Main unit before plug in Stirrer cable in order to avoid electric trouble in the unit.

5-2. Setup of titration flask

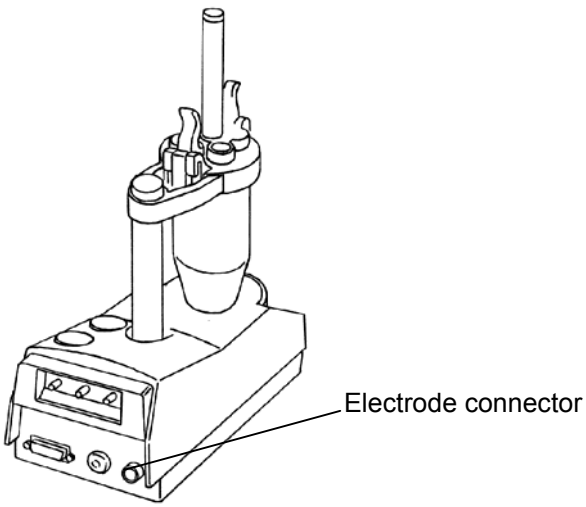
(1) Apply KF grease around the flask-cover contact area and put the stir spinner, and then, attach the flask by opening the holding levers.



(2) Apply KF grease around the contact area with electrode, desiccant tube and ball stopper.



(3) Plug in the electrode cable into the connector and fasten by the screw.



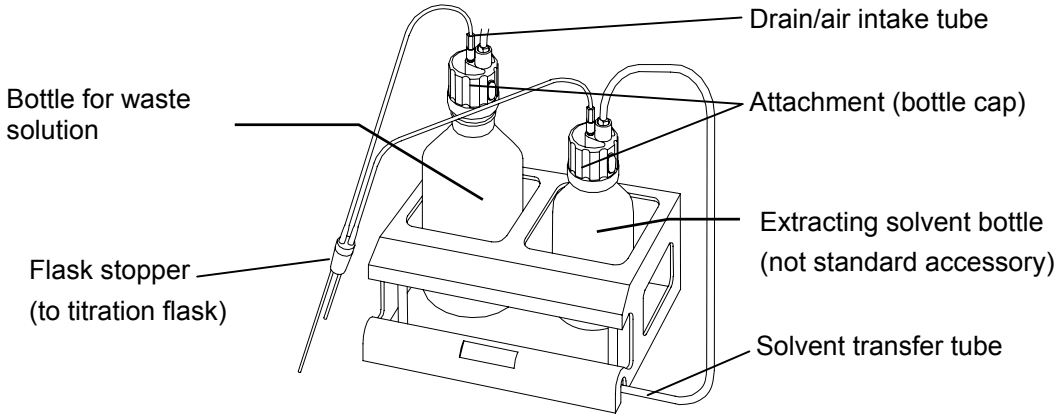
5-3. Setup of Dispenser

Connect the dispenser to the magnet stirrer.

(1) Set the bottle each for dehydration and waste solution to the attachment, and screw them securely.

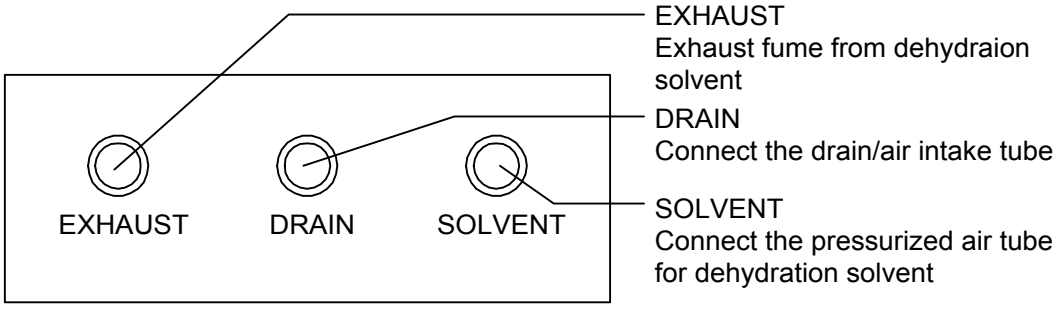
> **Note:**
> **If the bottles are not securely fixed in the bottle cap, pressurized air may leak out and the solvent may not be well dispensed.**

(2) Set extracting solvent and waste bottle on the bottle holder.



(3) Insert the flask holder into the position on the titration flask.
Apply KF grease thinly around contact area.

(4) Connect the solvent transfer tube to SOLVENT and the drain/air intake tube to DRAIN on the rear of Stirrer.



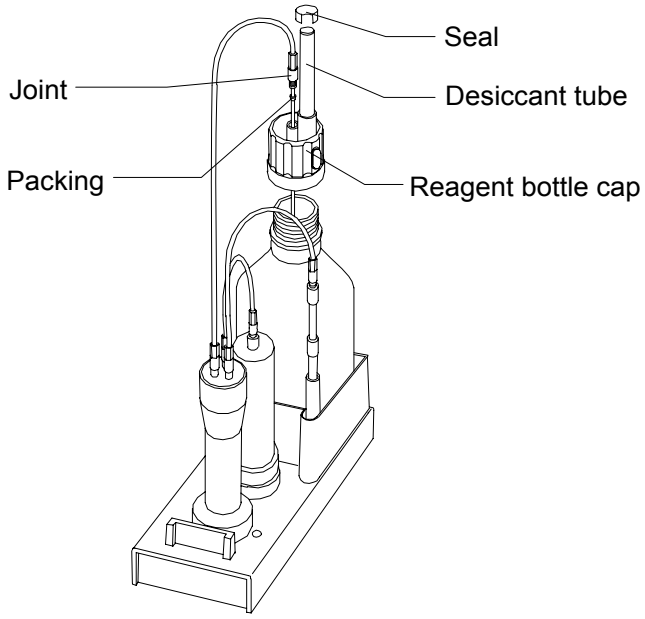
> **WARNING!**
> **Toxic fume of dehydrating solvent and KF reagent will be exhausted from EXHAUST.**
> **Vent it out by a tube away far enough for safety.**

5-4. Setup of Buret unit

Place the reagent bottle on buret unit and then, mount it on the titrator.

Use the KF reagent bottle as it is with reagent in it.

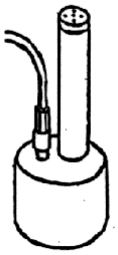
(1) Remove the joint and packing of the reagent bottle cover and insert the reagent tube through the bottle cover. Remove the seal of desiccant tube during this job.



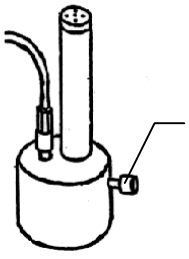
Note:

1. **Seal of desiccant tube must be removed before operating the instrument.**
2. **The reagent bottle cover has two kinds, one is KF for KF reagent and the other is ME (MKA-510N only) for water- methanol.**

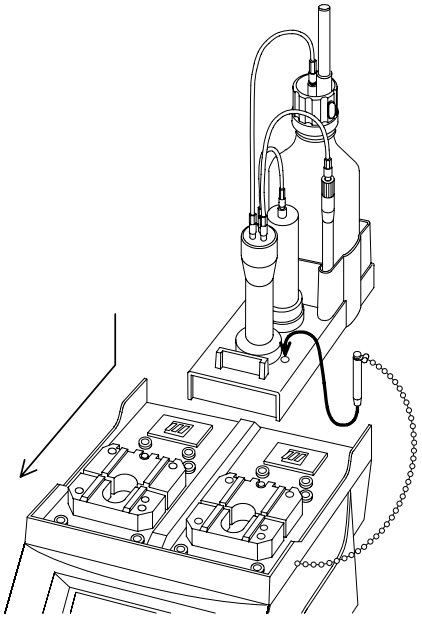
for KF



for ME



(2) Place the buret on top of Main unit, and fasten by pulling it to the front. The buret to the right is Burret 1 for KF reagent and the buret to the left is Burret 2 for water-methanol. (for MKA-510N). Then, insert the lock pin.



(3) Insert the titration nozzle into the position("5-2.").
Apply KF grease thinly around contact area.

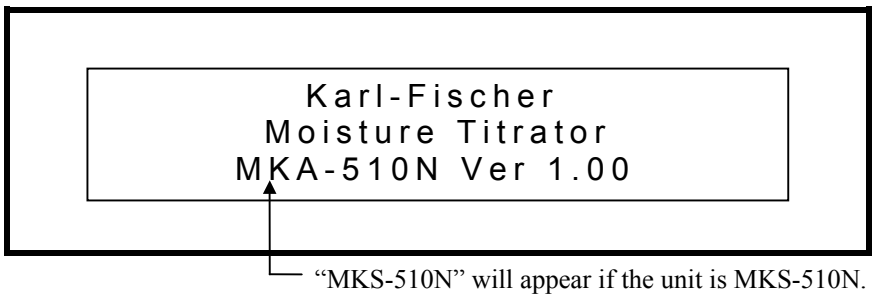
Note:
If the buret unit is hard to be mounted, follow the steps 14-12.

5-5. Initial displays

When the power of MKA-510N / MKS-510N is turned on, the initial displays will appear in the following sequence:

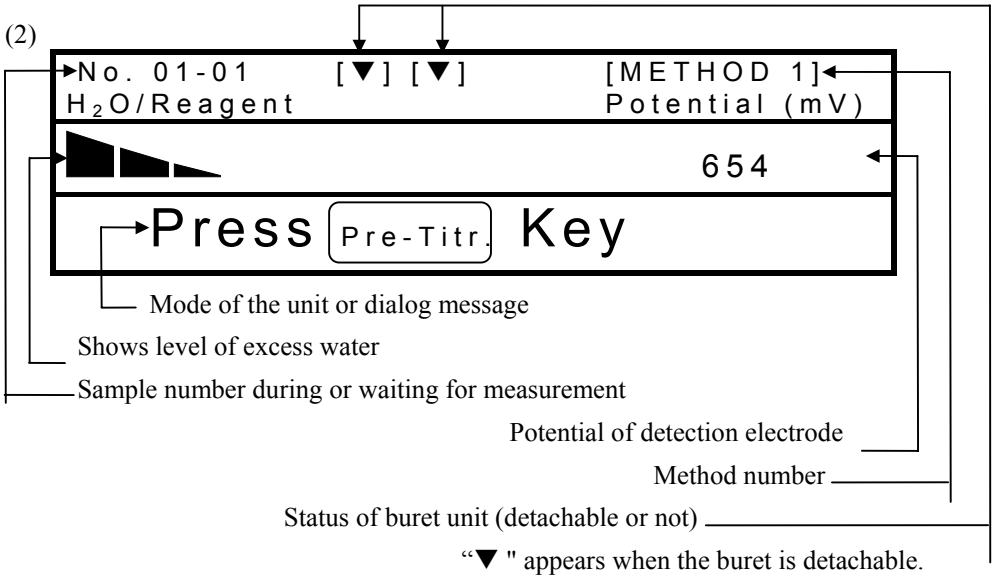
The below display appears for two seconds and the product version number can be checked during the display. Then, the second display will appear as follows until pretitration starts.

(1)



"MKS-510N" will appear if the unit is MKS-510N.

(2)



Mode of the unit or dialog message

Shows level of excess water

Sample number during or waiting for measurement

Potential of detection electrode

Method number

Status of buret unit (detachable or not)

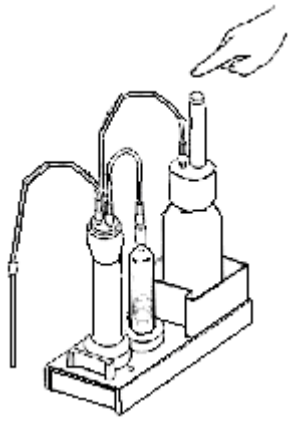
"▼ " appears when the buret is detachable.

5-6. Filling reagent in the buret

Fill KF reagent and water-methanol in the buret. (Water-methanol is for MKA-510N only)

5-6-1. Filling KF reagent

(1) Press [APB] key and enter the working buret number. (for MKA-510N only)
(2) Press [▲] key to lift the piston to the upper limit.
(3) Press [▼] key to fill the reagent.
(4) Press on [▲] key to push out the air to Titration flask until the reagent comes out of the nozzle tip. Then, press [▲] key again to stop the piston.
(5) Close the top of desiccant tube by a finger and then, press [▼] key to remove the air sticking around piston head.



(6) Press [▲] key and push out air bubble in the buret into Titration flask.
(7) Press [▼] key to fill reagent in the buret.

5-6-2. Filling water-methanol (MKA-510N only)

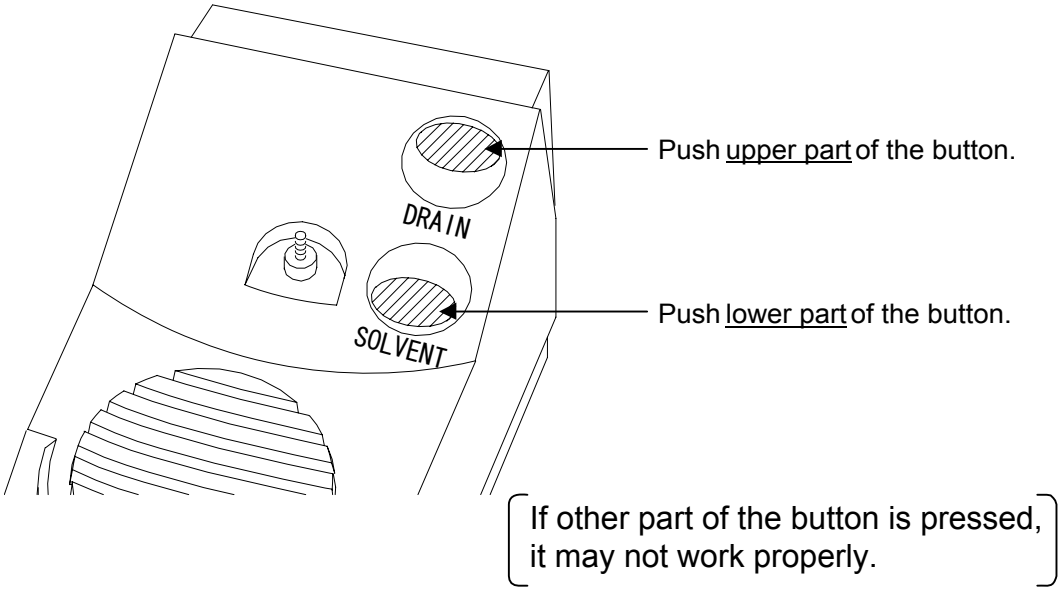
The water-methanol standard solution to calibrate KF reagent is filled in the buret as follows:

(1) Press [APB] key and enter the working buret number.
(2) Press [▲] key to lift the piston to the upper limit
(3) Press [▼] key to fill the reagent.
(4) Further press [▲] key to push out the air and reagent in the buret towards Titration flask.
(5) Close stop switching valve of reagent cap(for ME), and press [▼] key to degas air bubbles sticking around piston head.
(6) Open the stop switching valve.
(7) Press [▲] key to push out the bubble and reagent in the buret into Titration flask.
(8) Press [▼] key to fill reagent in the buret.

5-7. Filling and delivering dehydration solvent

For volumetric moisture measurement, the solvent to dehydrate the sample is necessary for effective reaction of extracted water with KF reagent. The MKA-510N/MKS-510N has the built-in dispensing unit within magnet stirrer that can deliver or aspirate extracting solvent to/from the titration flask by a button.

(1) Press “DRAIN” button of Stirrer to drain out remaining solvent in Titration flask.
If dosing speed is slow, push the button further in to speed it up.
(2) Press “SOLVENT” to deliver approximately 30mL solvent into titration flask.



⚠CAUTION!

Drain tube of Dispenser will be clogged if such sample as insoluble or hard to be dissolved in extracting solvent is drained out after titrated directly.

Do not use Dispenser to drain out such sample.

When a reagent etc. is spilt to Main unit or the connectors of magnetic stirrer, there is a possibility of malfunction.

5-8. Purging the buret

The reagent filled in the buret will absorb minute moisture through the joint and piston head as the time elapses. This will cause the different concentration of reagent between the buret and the bottle. Purging is necessary to eliminate this difference of concentration.

(1) Press [APB] key and enter the working buret number (MKA-510N only) and the desired number of times of purging, and then press [APB] key again. (see 6-2-5)
(2) Press [▲▼] key to start purging. After purging for the preset number of times is finished, it will set in standby mode.

6. Key entry and display messages

6-1. Parameter setup

6-1-1. General

The MKA-510N / MKS-510N can measure water content by the initial parameters, however, if adequate parameters and method are set up according to the sample, the measurement can be made faster and at higher precision.

(1) Press the name of desired parameter.
(2) Point the desired item by cursor using [↑][↓][←][→] key.
(3) Selection of condition is confirmed by [↵] key, and when letters and numerals are entered, also confirm by [↵] key.
(4) To exit from the settings, press the key used in (1).

Note:
1. Some parameters are set up in a different way from the above. Refer to the description for each parameter.
2. Just pointing an item by the cursor does not activate the entry. Selection or key entry must be confirmed by [↵] key.

6-1-2. Method parameter

Method can be selected out of five methods 1 to 5, and each parameter including calculation, print, data list etc. is stored in memory according to the selected Method individually. The default values differ from Method 1 to 5 and CALIBRATION, (see "10.Initialization of Parameter and Default"), however, parameters of each Method can be changed to your need.(except Calibration) If you wish to protect the preset parameters from erroneous key entry, it can be protected by using Protect Function.

Press [Method] key:
Display changes as below. Select Method number by [↑],[↓] key and choose Protect or not by [←],[→] key and confirm by [↵] key.

< METHOD>		
	Protect	
METHOD 1 :	Off	On
METHOD 2 :	Off	On
METHOD 3 :	Off	On
METHOD 4 :	Off	On
METHOD 5 :	Off	On

After setup, press [Method] key. When the cursor stays at "METHOD 1", the display returns to the previous page by [↑] key.

6-1-3. Titration parameter

Set up parameters to control titration including EP detection method, titration speed, etc.

Press [Titration] key:

The display changes as below to <TITRATION> first display for setting each parameter. Point the item by cursor using [↑][↓][←][→] key and confirm by [↵] key after desired values and conditions are entered.

MKA-510N

```
   < TITRATION >        [ METHOD 1 ]  ▼

Titr. Mode      : Normal   Back
Titr. Buret No. (1~2)  [1]
End Time               [ 30] s
Final Volume           [ 0.01] mL
Titr. Speed (1~6)      [3]
```

MKS-510N

```
   < TITRATION >        [ METHOD 1 ]  ▼


End Time               [ 30] s
Final Volume           [ 0.01] mL
Titr. Speed (1~6)      [3]
```

Titr. Mode (Normal Back) : Select Titration mode. (“Titr. Mode” is not displayed for MKS-510N)

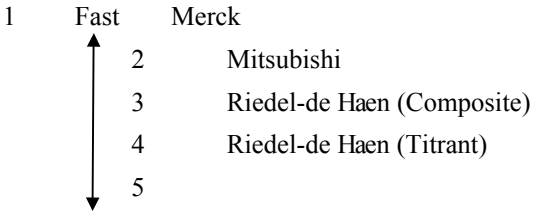
- Normal : Normal titration for routine measurement
- Back : Back titration (MKA-510N only) for slow water extraction by dehydration solvent or slow reaction of KF reagent and water.

Titr. Buret No. (1to2) : Select buret number for titration (MKA-510N only)

End Time : Select time length to end titration. Endpoint is determined when titration continues around in flection point in excess of reagent past preset time. (Normal 30s according to JIS)

Final Volume : Select minimum amount of KF reagent to be dosed when approaching endpoint.
If the selected amount is larger, the more measurement error will be encountered, though titration time can be shorter. If smaller, the less measurement error is expected but in the longer measuring time.

Titr. Speed : Titration speed (1–6(Titr. Mode: Normal), 1–3(Titr. Mode: Back))
Slow down speed if it overtitrates. Appropriate speed differs according to the reagent, sample and solvent. Below chart shows general tendency of Maker's reagent and titration speed:



Press [Page down] key.([↓][↵] will work when the cursor stays at the bottom line):

The display changes as below. Select each parameter on <TITRATION> second display. Select the item by cursor using [↑][↓][←][→] key, and confirm by [↵] key after conditions or value are entered.

```
   < TITRATION >          [ METHOD 1 ] ▲▼
Detector Mode (1~2)     [1]
t(stir)                 [     0]s
t(wait)                 [     0]s
t(max)                  [     0]s
t(interval)             [     0]s
Drift Titration         :Off   On
```

Detector Mode (1 to 2) : Select detection mode. Select the amount of current to be loaded on the detection electrode.
It differs depending on type of extracting solvent and the sample.

1 : EP detection for routine measurement

2 : Select this mode when titrating oil samples using CM solvent or when titration does not end in excess of KF reagent.

t (stir) : Stirring time before titration starts Set up time from starting measurement after sampled until titration starts, for a sample which is hard to dissolve in dehydration solvent. You can not set up t(stir)>t(max).

t (wait) : Waiting time to reach EP
It will not reach EP within the preset time. However, if t(wait)>t(max) is selected, it ends by t(max).
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.

t (max) : Limit time to continue titration

Select limit of titration time. After titration started, it ends by t(max). Therefor, the relation of t(stir), t(wait) and t(max) is generally expressed by t(stir) + t(wait)≧t(max).When Evaporator is connected or when micro amount of moisture continues to be extracted from solvent even after most of water has been titrated. t (max)=0 means no limit time. This parameter is also set up when titration does not end in time (interval).

t (interval) : Intermittent time

Time to cut off titration when t (wait)=0 for a sample of which moisture reaction with KF reagent is slow. To make the reaction complete, it waits for t (interval) when drift becomes stable after EP wait time (i.e.;30s), and if it detects excess water during this time, it will continue and stop titration in t (max) after t (interval). If moisture is not detected during the time being, it will further continue titrating for t(interval) and finally for t(max) to end titration. However, if t(interval)>t(max) is selected. It ends by t(max).

Drift Titration : Drift titration

Select whether to dehydrate titration flask.

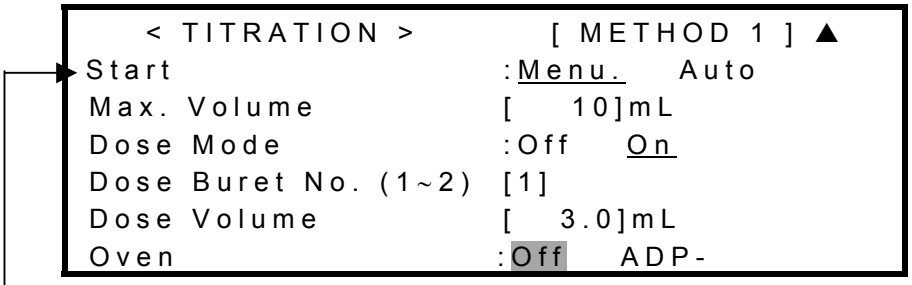
Off : It will not detect moisture even if water is added during waiting for titration. For example, if “Drift Titration :On”, ”Start :Auto” are selected and when a sample of least moisture is injected, it will detect “drift”, and dehydrate instead of titrating. In this case, select “Drift Titration :Off”. Unless the sample is injected immediately after dehydrated, the error will become larger due to the effect of drift.

On : Normal setting for routine measurement when it detects moisture during waiting, it will start titration and keeps dehydrating titration flask.

Press [page down] key. ([↑],[↵] key works when the cursor stays at the bottom line)

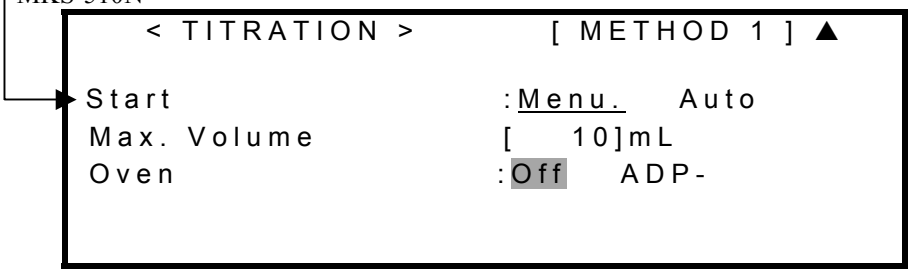
The display changes as below.

MKA-510N



Displays only when "Drift Titration:On"

MKS-510N



The above is the third display on <TITRATION>. Select the item by cursor using [↑][↓][←][→] key and confirm by [↵] key after conditions and value are entered.

Start : How to start (on "Drift titration: On" only)
Select auto or manual to start titration.

Manu. : Manual start to start titration by [Start] key.
Manual start is recommended for a sample of small amount of moisture which may be taken for drift if started by auto

Auto : Automatic start of titration
Auto start is recommended for a sample of level off the waiting time from sampling to starting titration or to save time to press [Start] key.

Max Volume : Setting of maximum titration volume
Titration ends when it reaches preset volume regardless of detection by potential or by time.

Dose Mode : Dose mode (MKA-510N only)
Select or not fixed dose of KF reagent or water-methanol before titration starts.

For Titr Mode Normal

Off : Normal setting for routine measurement

On : Doses reagent before titration starts.
For example, a fixed volume of water-methanol is dosed to calibrate the standard filled in another buret or when titration can be finished earlier by dosing KF reagent of which approximate titration volume is known in advance.

For Titr Mode Back

Auto : Excessive Karl Fischer reagent is automatically discharged in back titration. This is the typical setting for back titration.

Manu. : Karl Fischer reagent for Dose Volume is discharged in back titration.

Dose Buret : Select the number of buret for dosingfixed volume. (MKA-510N only)

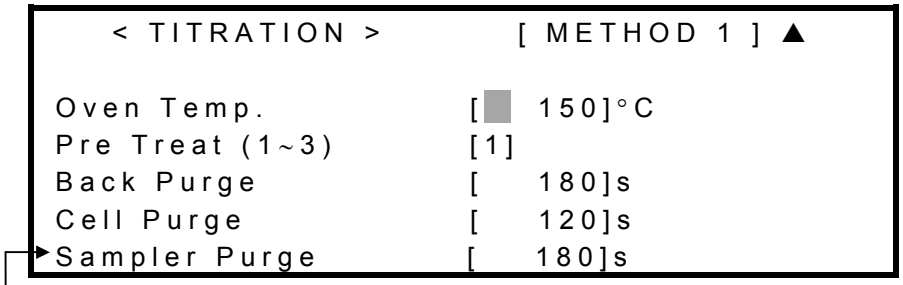
Dose Volume : Enter the amount of fixed volume. (MKA-510N only)

Oven : Select or not the use of Evaporator.

Off : Not to control Evaporator by Titrator This means Evaporator is not selected to use, however, select "Off" if an evaporator other than ADP-342, ADP-342S and ADP-343 that cannot be controlled by Titrator is going to be used.

ADP- : Connect Evaporator (ADP-511, ADP-351).
For details, refer to the users manual of ADP-511 or ADP-351.

Point the cursor to ADP- and confirm by [↵] key. The display changes as below to <TITRATION> fourth display to set up each parameter. Select the item by cursor using [↑][↓][←][→] key and confirm by [↵] key after conditions and value are entered.



Oven Temp. : Heating temperature
Select the oven temperature depending on the melting point and dissociation degree of crystallized water. (Max. 300°C)

Pre Treat (1 to 3) : Sampling method Select the mode according to how the sample is provided. (see below explanation)
Pre Treat 1 (when optional Eggplant type sampler is used)
Pre Treat 2 (Sample is loaded direct through inlet)
Pre Treat 3 (when sample boat with sample on it is weighed and then, transferred by the boat into Oven)

Back Purge : Set up time to purge Heating unit by carrier gasfrom the sample inlet to the boat outlet. (Normal 180s. see Fig.1)

Cell Purge : Set up time to purge by carrier gas from the sample inlet of Heating unit to the titration flask. (Normal 180s. see Fig. 3)

Sample Purge : Set up time to purge by carrier gas in sampler. (Normal 180s. see Fig. 2)

To close the setup, press [Titration].

Pre Treat 1 (Egg plant type sampler used)
Set up the sample in Eggplant sampler to the sample inlet, and start from Back purge (Fig.1), Sampler purge (Fig.2) and then, Cell purge (Fig.3). When the drift is stable with carrier gas flowing through, start measurement.

Pre Treat 2 (Sampling direct through sample inlet)
Start Back purge (Fig.1), then Cell purge (Fig.3), and start measurement when the drift is stable with carrier gas flowing.

Pre Treat 3 (Sample boat with sample weighed in advance)
Dry and weigh the sample, and place it on the boat, and then, into Heating unit. When the drift is stable with carrier gas flowing through, it is ready for measurement to start.

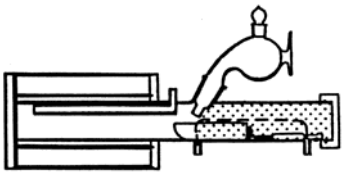


Fig.1 (Back purge)

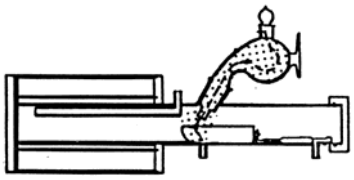


Fig.2 (Sampler purge)

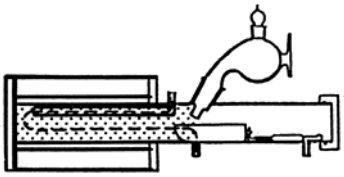


Fig.3 (Cell purge)

• Ball stopper instead of Eggplant type sampler for Pre Treat 2 and 3

6-1-4. Result parameter

Set up parameters on how to process measurement results including concentration, report format, graphic chart of data list, etc.

Press [Result] key to show the display in below. Select the item by cursor using [↑],[↓] key and confirm by [↵] key . (numeric key also works)

```
< RESULT >              [METHOD1]

          0. Calculation
          1. Report
          2. Titr. Curve
```

(1) Setting 0.Calculation parameter

Set up parameter to calculate concentration conversion from titrated water content. Point the cursor to "0.Calculation" on <RESULT> display, and press [↵] key.

MKA-510N

```
<<Calculation>>              [METHOD 1]  ▼


  Calc. No. (0~10)                [ 9]
  Back Calc. No. (1~6)            [ 2]
  Unit              : %      ppm    mg/g
  Weight            : Fixed   Variable
```

MKS-510N

```
<<Calculation>>              [METHOD 1]  ▼


  Calc. No. (0~7)                 [ 2]

  Unit              : %      ppm    mg/g
  Weight            : Fixed   Variable
```

The above shows the first display of <Calculation>. Select the item by cursor using [↑],[↓],[←],[→] key and confirm by [↵] key after desired conditions and value are entered.

Calc. No.(0 to 10) : Select calculation formula. (0 to 7 for MKS-510N)
Select Eq.1 for routine measurement of moisture and Eq.2 for water concentration.
See the formula chart on next page for Calc. No. 0 to 10. The formulas corresponding to No. 0 to 10 are shown on page 34 to 35.

Unit : Select unit for calculation results as follows:
No.0, mg for Calc.No.1, ppm, % or mg/g for Calc.No.2 to 6, mg/mL for Calc. No. 7 to 8

Back Calc. No.(1 to 6) : Calculation for back titration.(MKA-510N only)
When Calc. No. 9 is selected, "Back Calc. No.(1 to 6) " will turn lit and the formula for concentration by back titration will be selected.

Dose Calc.No.(1 to 6) : Calculation of concentration when fixed KF reagent dose volume is selected. When Calc.No.10 is selected, "Dose Calc. No. (1 to 6) " will turn lit and concentration formula for fixed KF reagent dose volume. The display appears in place of "Back Calc.No."

Weight : How to input weight
Select the way to input Wt1 and Wt2. This parameter is only for Calc.No.2, 3 or 6.

Fixed : Calculates concentration of all the samples by fixed weight entered on Sample parameter.

Variable : Calculates concentration of each sample by its individual weight.

Note:
The display message differs according to the selected Calc.No.

Press [Page down] key. ([↓],[↵] key works when the cursor stays at the bottom line)
The display changes as below.
Select the item by cursor using [↑],[↓],[←],[→] key and confirm by [↵] key after conditions and value are entered.

Drift Comp. : Compensation of drift level
Select how to correct the drift.

Off : Off means no compensation will be made.
This is selected when total water amount including drift is determined.

Manu. : Enter correction manually.
This is used when drift value or blank is determined in titration without sample.

Drift : This is manually entered value for drift correction. Select Manu. on Drift Comp. And enter the value.
Although the unit in entering the drift value is 'µg/min', it will be automatically converted to 'mg/min' (=µg/min÷1000) in calculating the concentration.

Calculation formula:

Formula No.	Object	Equation
0	Displays only titration volume. Unit: mL	Data
1	Calculation of water Unit: mg	(Data×F1–Drift×t–Blank) [mg]
2	Concentration of liquid or solid sample after weighed Unit: %, ppm, mg/g	$\frac{(\mathrm{Data}\times \mathrm{F1}-\mathrm{Drift}\times \mathrm{t}-\mathrm{Blank})}{\mathrm{Wt1}-\mathrm{Wt2}}\times 0.1[\%]$
3	Concentration of liquid or solid sample after dissolved in solvent and part of it is weighed. Unit: %, ppm, mg/g	$\frac{(\mathrm{Data}\times \mathrm{F1}-\mathrm{Drift}\times \mathrm{t}-\mathrm{Blank})}{\mathrm{Wt1}-\mathrm{Wt2}}\times \frac{\mathrm{B}+\mathrm{Wt0}}{\mathrm{Wt0}}\times 0.1-\frac{\mathrm{A}\times \mathrm{B}}{\mathrm{Wt0}}\times 10^{-4}$ [%]

Formula No.	Object	Equation
4	Concentration of liquid sample after its volume is measured. Unit: %, ppm, mg/g	$\frac{(\text{Data}\times\text{F1}-\text{Drift}\times\text{t}-\text{Blank})}{\text{V1}\times\text{Dens}}\times 0.1$ [%]
5	Concentration of gas sample after its volume is measured. Unit: %, ppm, mg/g	$\frac{(\text{Data}\times\text{F1}-\text{Drift}\times\text{t}-\text{Blank})}{\text{V2}\times 18}\times 22.4$ $\left[1+\frac{\text{Temp.}}{273}\right]\times 0.1$ [%]
6	Concentration of liquid sample after its moisture is extracted and part of it is weighed. (When the sample does not dissolve in extracting solvent) Unit: %, ppm, mg/g	Water content is obtained $\text{X}=\frac{(\text{Data}\times\text{F1}-\text{Drift}\times\text{t}-\text{Blank})}{\text{Wt1}\times\text{Wt2}}\times$ $\left[\frac{\text{B}}{\text{Wt0}}+\frac{\text{X}}{10^2}\right]\times 0.1-\frac{\text{A}\times\text{B}}{\text{Wt0}}\times 10^{-4}$ X: Sample moisture (%)
7	Factor calibration of KF reagent by pure water or standard	$\frac{\text{C1}\times(\text{Wt1}-\text{Wt2})}{\text{Data}}\times 10$ [mg/mL]
8	Factor calibration of KF reagent by water-methanol standard	$\frac{\text{M.Fct}\times\text{Dose}}{\text{Data}}$ [mg/mL]
9	Back titration Formula selected from 1 to 6	Replace F×1 in 1 to 6 by (Dose×F1-Data×F2)
10	Select 1 to 6 when titration continues after fixed amount of KF reagent is dosed.	When dose and titr buret are same: Data×F1=(Dose+Data)×F1 When dose and titr buret are not: Data×F1=(Dose×F2+Data×F1)

Data (mL) : Titration volume
The amount of the reagent titrated in the titration flask.

Drift (μg/min) : Drift value
The moisture in the air and carrier gas coming into the titration flask.

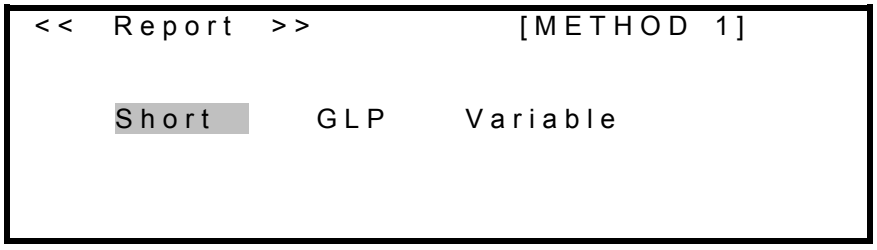
t (min) : Meauring time from start of measurement and sample injected until its finish.

Blank (mg)	:	Blank value The moisture that sneaks into the titration flask and that has to be deducted from titrated water amount.
Wt1 (g)	:	The weight of the sample and sampler before the sample is injected for titration.
Wt2 (g)	:	The weight of the remaining sample and sampler after the sample is injected for titration. The net sample titrated is Wt1-Wt2.
Wt0 (g)	:	The sample amount injected into extracting solvent This is for indirect method where the sample is injected into the solvent and part of it is measured.
B (g)	:	The amount of the part of extracting solvent that is measured after the sample has been injected into the solvent.
A (ppm)	:	Water concentration of extracting solvent before sample is injected into it in indirect method.
V1 (mL)	:	Sample amount in volume that has been injected for measurement.
Dens (g/mL)	:	Density of the sample of which volume is measured before injected for measurement.
V2 (L)	:	Gas volume measured in cubic.
Temp (°C)	:	Gas temperature when it is measured.
F1	:	The factor of the reagent charged in Buret No.1.
F2	:	The factor of the reagent charged in Buret No.2.
C1	:	Water concentration(%) of standard
M.Fct	:	Factor of standard water-methanol(mg/mL)

(2) Parameter for Report format

Set up parameters for print format to make a report of the measurement and calculation results.
Point "1. Report" by cursor on <RESULT> display, and press [↵] key.

The display changes as below. Select the desired item to print by cursor using [←],[→] key and confirm by [↵] key. To exit, press [Result] key.



Short form:(Eq.2) Below items are printed out:

Sample No.
Date & Time
Size
Result

```
*** R e s u l t ***

Sample No.      01-01

Date 10/12/1998 14:52
Wt1         42.5384 g
Wt2         41.2137 g
Net          1.3247 g
Result       1.2232 %
 Bur. No.1   3.165 mL
            16.2039 mg

- Stop by Reset -
```

← Sample number

← Measurement date
← Weight of Sampler + Sample
← Weight of Sampler
← Weight of Sample
← Concentration or water volume
← Titration volume
← Moisture content

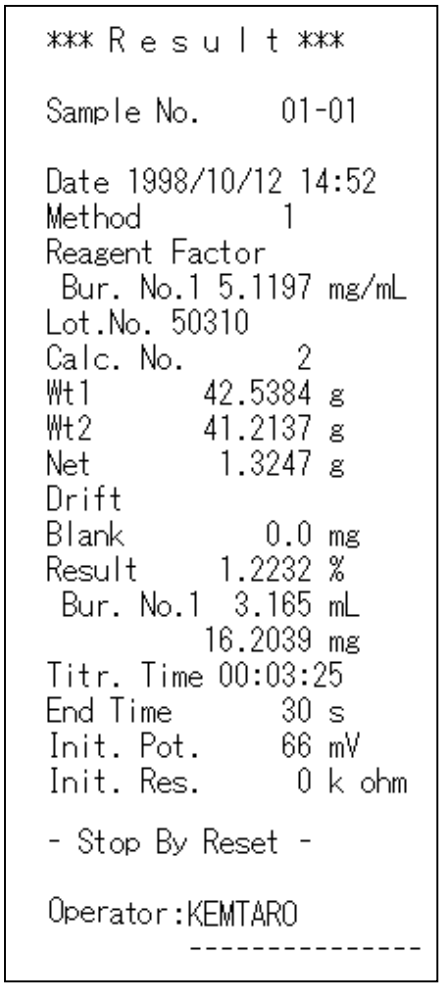
← This will be printed when aborted by [Reset] key.

Note:

1. **Contents of Sample size differ according to Equation No.**
2. **"-Stop by Reset-" is printed out when t(max) on Titration parameter is set up and the titration is aborted by [Reset] key.**

GLP form:(Eq.2) Below items are printed out:

Sample No.
Date & Time
Lot No.
Method
Calc. No.
Size
Factor
Drift
Blank
Result
Titration Time
End Time
I. Potential
I. Resistance
Operator



← Sample number
← Date and time
← Method number
← Reagent factor
← Lot number
← Equation number
← Weight of Sampler + Sample
← Weight of Sampler
← Weight of Sample
} Size
← Drift
← Blank
← Concentration or volume
← Titration volume
← Moisture content
} Result
← Titration time
← EP waiting time
← Initial potential
← Initial resistance
← Printed when aborted by [Reset] key
← Operator's name

Note:

Contents of Size differ according to Equation number.

"-Stop by Reset-" is printed only when [Reset] is pressed while Titration parameter is t (max) and Drift stop is Off.

When Variable is selected:

Point "Variable" by cursor and confirm by [↵] key.

The display will turn on "*" and parameters once entered can be changed, and only selected items are printed out:

Press [Page down] key.([↓],[↵] key also works)

The display changes as below. Point the item by cursor using [←],[→] key and confirm by [↵] key. It prints out by selecting On.

```
  << Report >>              [METHOD 1] ▲▼

Sample No.          : Off     On
Date & Time         : Off     On
Lot No.             : Off     On
Method              : Off     On
Calc. No.           : Off     On
```

Press [Page down] key. ([↓], [↵] key works when the cursor stays at the bottom line)

The display changes as below. Select the item by cursor using [←], [→] key and confirm by [↵] key.

```
  << Report >>              [METHOD 1] ▲▼

Size                : Off     On
Factor              : Off     On
Result              : Off     On
Drift               : Off     On
Blank               : Off     On
```

The display changes as below. Select the item by cursor in the same way as on the third display.

```
  << Report >>              [METHOD 1] ▲

Titration Time      : Off     On
End Time            : Off     On
I. Potential        : Off     On
I. Resistance       : Off     On
Operator            : Off     On
```

To exit, press [Result] key.

(3) Titr. Curve parameter setup

Point "Data List" by cursor and confirm by [↵] key. The graphic chart traces water content per unit time and accumulated volume and is print out. For example, when Evaporator is connected, appropriate titration limit time can be determined from the graphic data list.

The display changes as below.
Select the item by cursor using [↑],[↓],[←],[→] key and confirm by [↵] key after conditions and values are entered.

```
<< Titr. Curve>>          [METHOD 1]

Sampling Interval [   30]s
Print Meas Data  : Off   On
Print Graph      : Off   Form1   Form2
```

Sampling Interval : Time to sample date
Select time to data sample of titration and accumulated volume at desired time interval.

Print Meas Data : Printing Data List
Select printing or not sampled data in real time.

On : Print Data List

Off : Not to print Data List

Print Graph : Graphic printout
Choose or not printout of sampled data in graphic chart and also select its format.

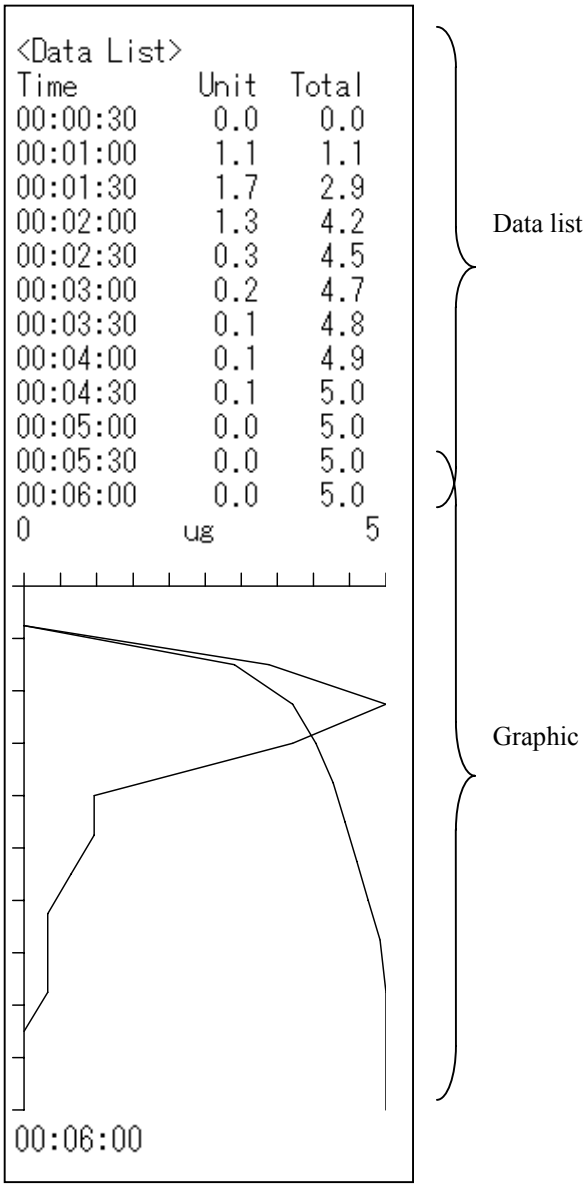
Off : Not to print Graphic chart

Form1 : Graphic chart is printed in titration rate with % axle for accumulated volume and 100% for water content at endpoint.

Form2 : Graphic chart is printed of titration and accumulated volume at preset interval.

Note:

Graphic chart can be printed only when IDP- or DP- Printer is connected and Print parameter (see Setup 0) is set to IDP- or DP-. Graphic chart will not be printed on Other printer or GA printer, or when correct print parameter is not selected.

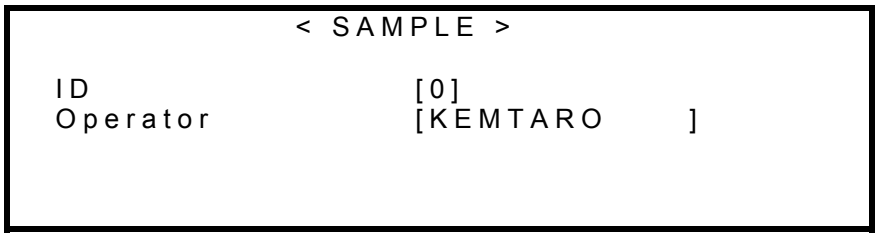


6-1-5. Sample parameter

Enter parameter on Sample including sample number, sample weight,etc. Parameters for Sample File (see Function 4) are also set up by [Sample] key.

Setup items on Sample parameter depends on calculation formula selected on "0.Calculation" of Result parameter.

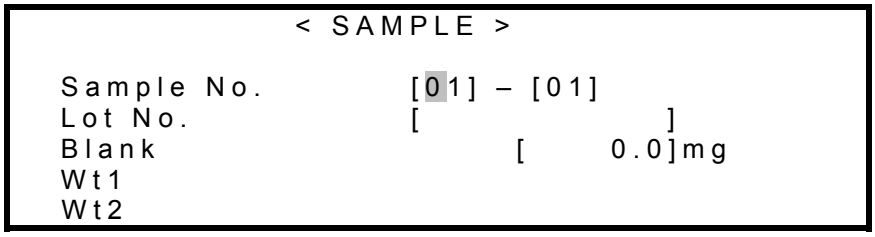
Press [Sample] key.



Enter numerals and alphabetic characters by numeric key and confirm by [↵] key.

The display changes as below to enter each parameter on <SAMPLE> display.
Select the item by cursor using [↑],[↓],[←],[→] key and confirm by [↵] key after conditions and values are entered.

When Calc. No.1:



Sample No. : Enter desired sample number. The number is divided into two orders. High order number 100(00 to 99) is the group number of sample, and low order number 100(00 to 99) is individual number of the sample. If group number is changed, the saved data will be erased. Low order number is incremented automatically.

Lot No. : Lot number
Enter numerals and alphabetic characters by numeric key, [.], or [-/Disp.] key.

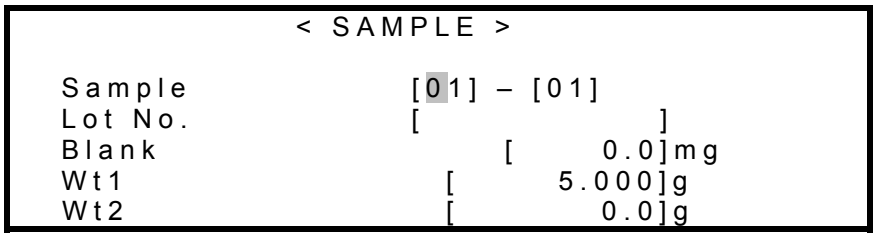
Blank : Blank value

Set up the amount of water to be deducted from measurement results. For instance, for a sample directly injected into the titration flask by opening the stopper, the moisture slipping into the vessel has to be deducted.

To exit, press [Sample] key.

The above ends the description for Calc. No.1.For Calc. No. 2 to 6, enter each parameter for Wt1, Wt2, Wt0, B, A, V1, Dens, V2, Temp which appears under Lot number on the same display according to the Calc. number that has been selected on 0.Calculation of Result parameter (see 6-1-4(1)).

When Calc. No.2:



6-2. Special keys

6-2-1. General

Special keys are as follows:

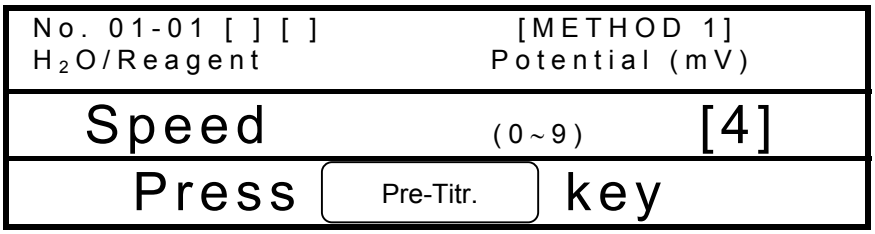
[Stirrer] key	:	Turns On/Off the stirrer. This key has two functions, one to turn On/Off Stirrer and the other to control stir speed.
[Print] key	:	Key to print out.
[-/Disp.] key	:	Key to switch display of titration from volume(mg) to potential(mV). This key also reads data from Balance.
[APB] key	:	Key to set up manual buret and number of purging times.
[▲] key	:	Key to drain out reagent in buret
[▼] key	:	Key to suck in reagent into buret
[▲▼] key	:	Key to purge the buret

6-2-2. [Stirrer] key

(1) Stirrer can be turned On/Off by pressing this key just like other keys. Turn it off when sample is injected directly into the titration vessel.

(2) When pressed for more than 2 seconds, the display changes as below, and stir speed can be adjusted.

Example on initial display (waiting for pretitration):



The middle line of message changes as above, and stir speed can be selected by numeric key. (Normal 4 to 6 and 0 means halt)
To exit, press [Stirrer] key again.

6-2-3. [Print] key

Various printing can be made using [Print] key and other key:

Key combination	Printing
[Method], [Print]	All parameters of preset Method
[Titration], [Print]	Titration parameters of preset Method
[Result], [Print]	Calculation, Report, Data List parameters of preset Method
[Result], [0], [↵], [Print]	Calculation parameter of preset Method
[Result], [1], [↵], [Print]	Report parameter of preset Method
[Result], [2], [↵], [Print]	Data List parameter of preset Method
[Sample], [Print]	Sample parameter of preset Method
[Setup], [Print]	Setup parameter
[Function], [Print]	Function parameter
[APB], [Print]	Parameter of manual buret

Note:

When Sample file is "On" and all the parameters are printed, the contents of Sample File will be printed out, not just sample parameter only.

6-2-4. [-/Disp.] key

The display of titrated water, dosed reagent volume and potential during titration can be switched by this key. When Balance is connected, the sample weight can be read and transferred to Titrator by this key.

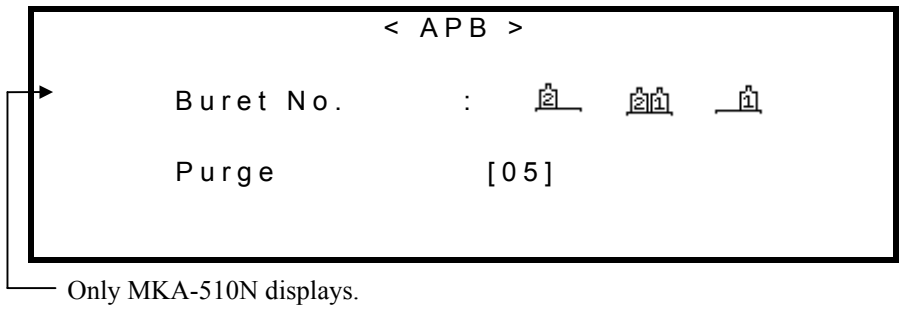
Note:
If Balance is not connected, do not try to input sample weight by this key.

6-2-5. [APB] key

Set up the buret number for manual operation.(MKA-510N only) Also the number of purging times can be set up by this key. The selected buret can be activated by [▲],[▼],[▲▼] key.

Press [APB] key:

The display changes as below to set up each parameter on <APB> display.
Select the item by cursor using [↑],[↓],[←],[→] key and confirm by [↵] key after conditions and values are entered. To exit, press [APB] key again.



Only MKA-510N displays.

Buret No. : Select the buret for manual operation.

: The buret to the right facing the unit.

: The buret to the left facing the unit.

: Both burets can be controlled.

Purge : Select the number of purging times. (0 to 99 and 0 means no limit)

6-2-6. [▲],[▼],[▲▼] key

[▲] key : When this key is pressed, the piston in buret goes up to the upper limit while dosing reagent, and stops. When pressed halfway, it stops immediately. The switching valve is in suction position.

[▼] key : When this key is pressed, the piston goes down to the bottom end while aspirating reagent, and stops. When pressed halfway, it stops immediately. The switching valve stays in reagent side.

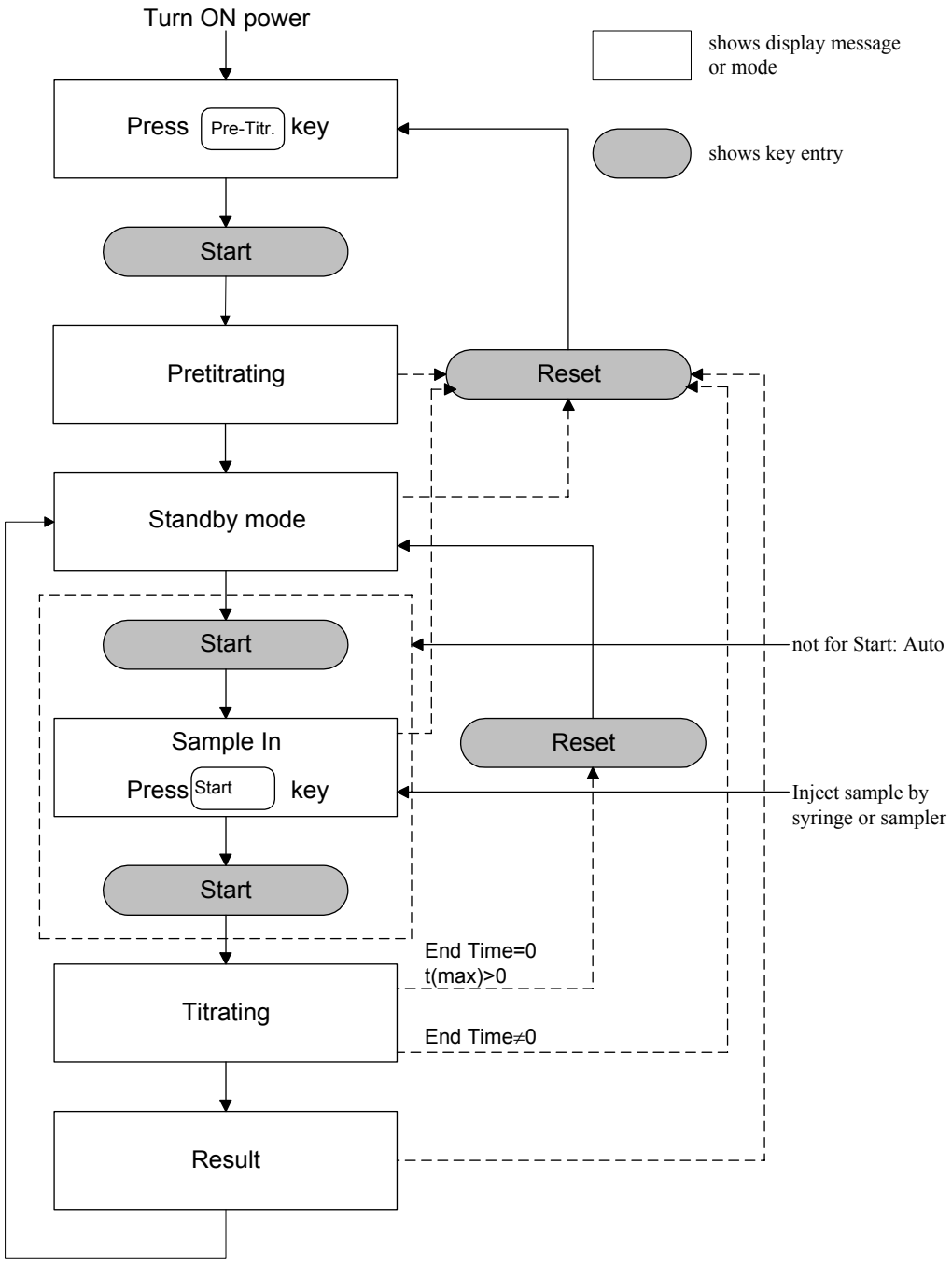
[▲▼] key : Once this key is pressed, it purges for the preset number of times and stops with reagent filled in the buret. When pressed halfway, it stops purging and fills reagent, and stops in delivery position. The switching valve during motion is in reagent side.

7. Measurement procedure

7-1. General

Routine measurement like direct titration of liquid sample by MKA-510N/MKS-510N does not require complex key operation. Just follow the dialog message on display:

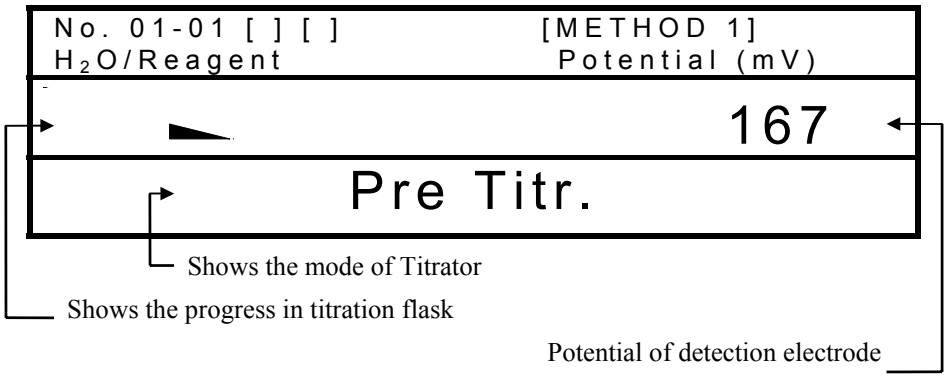
7-2. Measurement sequence



7-3. Pretitration

According to moisture titration by Karl Fischer method, it is necessary to extract water in the dehydrating solvent for accurate measurement of water in the sample. This step is called Pretitration.

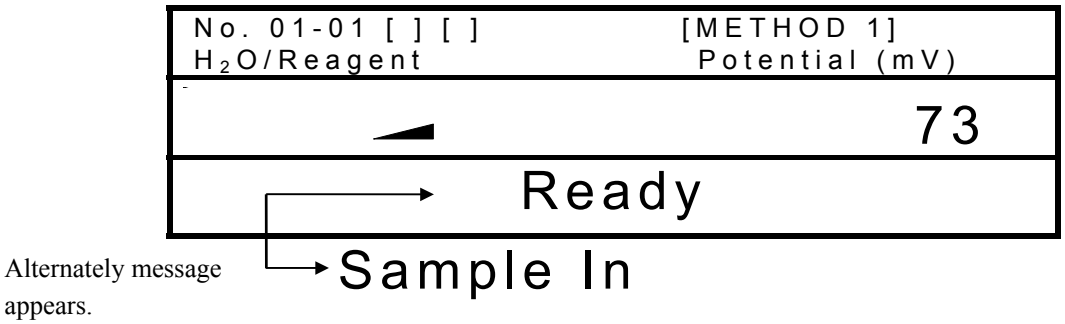
Press [Pre-Titr.] key:



The above shows the display of pretitration. After pretitration is finished, the mode goes to standby mode. (see 7-2)

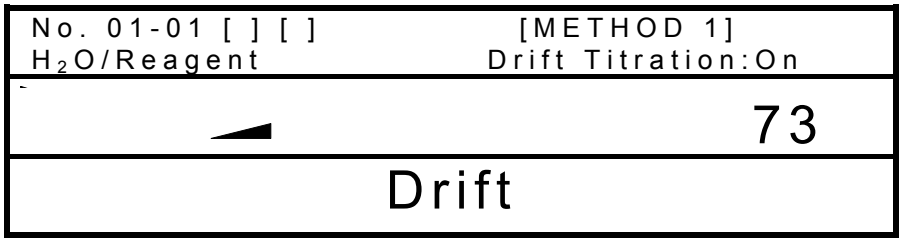
After power is turned on and pretitration is finished, the main display will show the below messages according to the selected Titration parameters:

(1) Drift Titration : On, Start : Auto



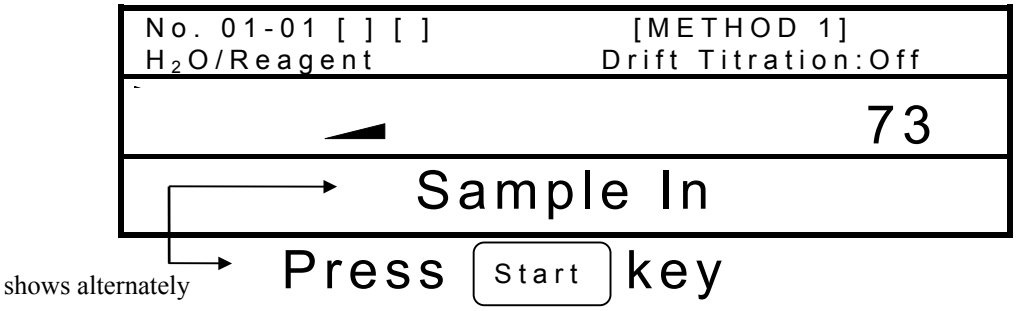
(2) Drift Titration : On, Start : Manu

The below display shows the message when the above parameters are selected:



(3) Drift Titration : Off

The below display shows the message when the above parameter is selected.



7-4. Factor measurement of KF regent

7-4-1. Introduction

Karl Fischer reagent in sealed container keeps concentration of iodine to a certain level, however, once it is opened and transferred to Titrator, it will absorb ambient moisture and its concentration will be lowered. Therefore, it is necessary to determine the concentration of KF reagent(called “Factor”) before sample measurement. Please follow the procedure of Factor measurement according to the standard substance:

7-4-2. Factor measurement with standard water-methanol in buret (MKA-510N only)

(1) Enter the factor value of water-methanol to the buret filled with the solution on Function 0. (see 9-2)

(2) Select Method 5 (see 6-1-2) and enter the buret number with KF reagent in “Titr.Buret No.” on Titration parameter. Then, select "Dose Mode:On" and enter the buret number filled with water-methanol, and the dose volume of water-methanol in “Dose Volume”. (see 6-1-3)

(3) On sample Parameter setup, enter a number of high order sample number instead of the preset number, and confirm by return key. (the stored statistical data is erased by this procedure)

(4) Select Formula 8 on Calculation parameter and select Manu or Auto on “F.Meas.”

(5) When Manu is selected, factor measurement will start after pretitration. The measurement is automated by pressing [Start] key on standby mode. When measurement is finished, it will set in standby mode again. Continue measurement for desired number of times.

(6) After desired number of factor measurement is finished, process the results by statistics on “Function 2”. The results will be printed out and the factor of titrated buret will be stored in memory.

(7) When Auto is selected, enter the number of measuring times(1 to 5) on "F.Meas.No.". After pretitration is finished, factor measurement will start by [Start] key. When factor measurement starts, it will continue until it finishes the preset number of measurements automatically, and goes to batch calculation. The factor will be read and stored in memory.
Everything is processed automatically during these steps.

7-4-3. Factor measurement by weighing standard

Factor measurement by weighing other standards like pure water or sodium tartaric acid:

(1) Enter the buret number filled with KF reagent in "Titr. Buret No." on Titration parameter. (MKA-510N only, see 6-1-3)
(2) Select the formula on Calculation parameter. (see 6-1-4)
(3) On sample Parameter setup, enter a number of high order sample number instead of the preset number (the stored statistical data is erased by this procedure), and enter C1 (% moisture of the standard) after the preset number, and confirm by return key.
(4) Weigh the standard using syringe or sampler. (see 7-5)
(5) When it sets in standby mode after pretitration, inject the standard substance into titration vessel and press [Start] key. (see 7-5)
(6) When the titration is finished, the message will ask for input of Wt1 for weight of sampler with sample and Wt2 for weight of sampler after sample is released. (see 7-5)
(7) Repeat step 4 to 6 for desired number of times. After the results are batch processed on Function 2, the factor value of KF reagent will be stored in Function 0. (see 9-4)

Note:

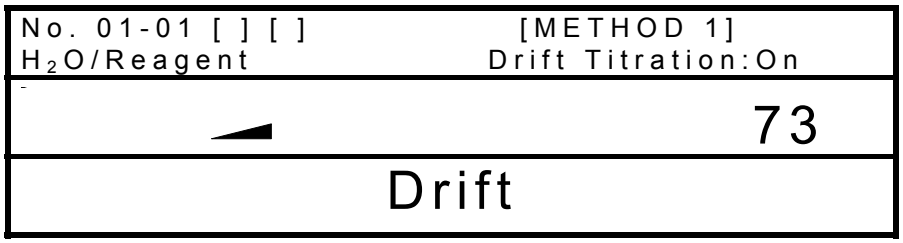
For precise measurement of a sample injected through the inlet by removing the ball stopper, perform measurements without the sample and set up Blank value in advance.

7-5. Routine measurement

Follow the dialog messages on display even though some key entries or displays may differ according to Calculation parameter or Titration parameter. (Drift Titration : On/Off, Start : Manu/Auto)

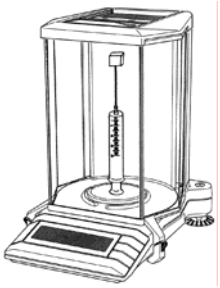
1) Formula 2, Drift Titration : On, Start : Manu

(1) The below shows the Main display after pretitration by " 7-3. Pretitration ".



(2) Transfer the sample into syringe or sampler and measure its weight.

Transfer the sample into syringe or sampler.

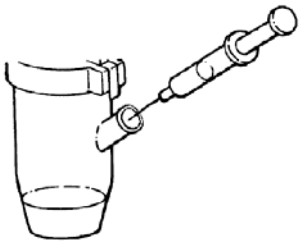


Measure its weight. (Wt1)

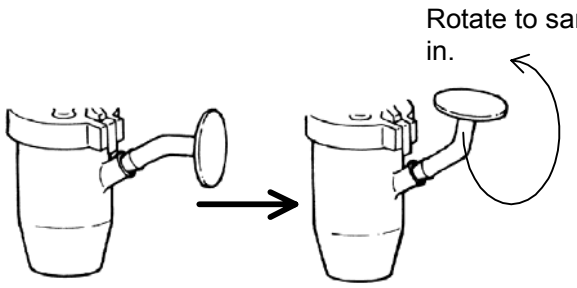
If a sample is volatile, avoid evaporation by a silicone chip on tip of syringe.

(3) Press [Start] key.

(4) Stop stirring by [Stirrer] key and remove the stopper and inject the sample.



Sampling by a syringe

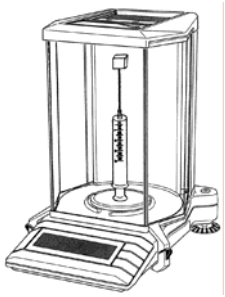


Sampling by a curved sampler

(5) Press [Start] key. After titration starts, the display changes as below showing the progress in the vessel with titration volume. It will start counting down preset t(stir) time.

No. 01-01 [ ] [ ]	[METHOD 1]
H_2O/Reagent	Moisture (mL)
	12.001
Measurement	

(6) Measure the weight of syringe or sampler after the sample is released.



Measure weight(Wt2)of sampler or syringe after sample is released.

(7) When the titration is finished, it will stop by beep showing below message. Input Wt1 for weight of sampler with sample and Wt2 for weight of sampler after sample is released, and confirm by [↵] key.

No. 01-01 [ ] [ ]	[METHOD 1]
	Wt1 [41.9538]g Wt2 [40.6425]g
Input weight	

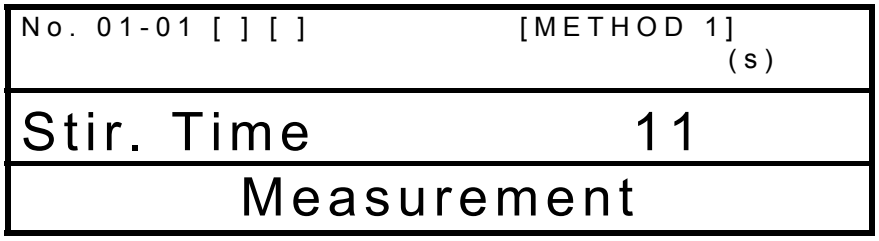
(8) The measurement results will be displayed and printed out.

No. 01-01 [ ] [ ]	[METHOD 1]
H_2O/Reagent	Moisture (mL)
	23.658
Result	

(9) The display will return to Main. Repeat measurement.

Note:

1. **The weight of Wt2 can be input by pointing Wt2 on Sample Parameter even during titration. If Calc. No.3 - 10 is selected, input other value than Wt1, Wt2.**
2. **Time will start counted down in below display when t(stir) is set up on Titration parameter.**



7-6. When Balance is connected

The MKA-510N/MKS-510N can read sample weight(Wt1, Wt2) measured by Balance. Connect the cable from Balance to the plug-in port(see 3) on the rear panel of Titrator, and set up protocol on Setup 0 for digital connection to the manufacturer's specification. (see 8-2-3)

Simply follow the below steps which are basically the same as routine measurement procedure:

(1) Place the sample on syringe or sampler and transfer it to Balance.
(2) Press [Sample] key and point the cursor to Wt1.
(3) When Balance reading is stable, press [-/Disp.] key to input Wt1.
(4) Stop stirring by [Stirrer] key, and remove the ball stopper and inject the sample.
(5) Press [Start] key to titrate.
(6) Place the syringe or sampler after the sample is released.
(7) When titration terminates with beep, the message will ask for Wt2. When the balance reading is stable, press [-/Disp.] key to read the weight.
(8) Measurement results will be shown on display and printed out.

Note:

1. The weight of Wt2 can be input by pointing Wt2 on Sample Parameter even during titration. If Calc. No.3 – 10 is selected, input other value than Wt1, Wt2.

2. Absolute value will be taken even if Wt1 – Wt2 < 0.

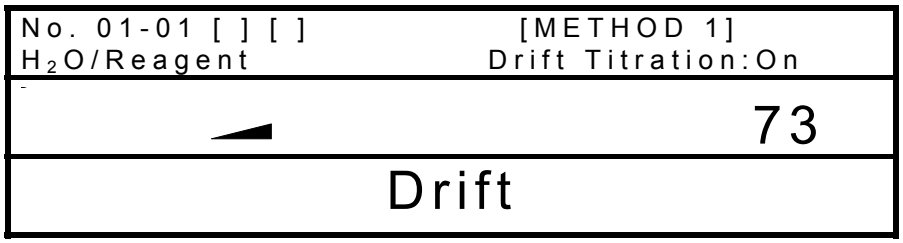
7-7. When Evaporator is connected

The MKA-510N/MKS-510N when connected to Evaporator can measure moisture of solid sample or samples hard to dissolve in solvent by heating and evaporating the sample material.

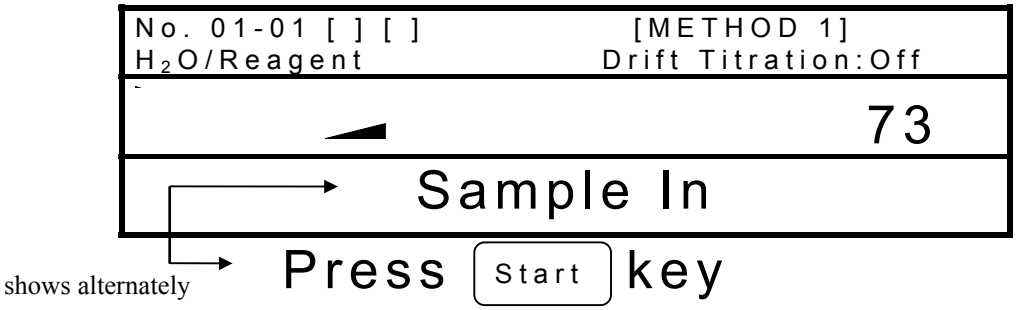
(1) Set up the connection of Titrator and Evaporator according to the instruction of Evaporator.
(2) Perform ageing of Evaporator on Function 5. (see 9-7)
(3) Select “Oven : ADP-“ on Titration parameter, and set up “Oven Temp”, “Pre Titr”, “Back Purge”, “Cell Purge”, “Sampler Purge”, etc. (see 6-1-3)
(4) Perform pretitration.

The above steps are basic and common procedure before going to measurement. Sample measurement slightly differs according to the parameters preset on Titration parameter.

The below display shows the message after pretitration. Press [Start] key.

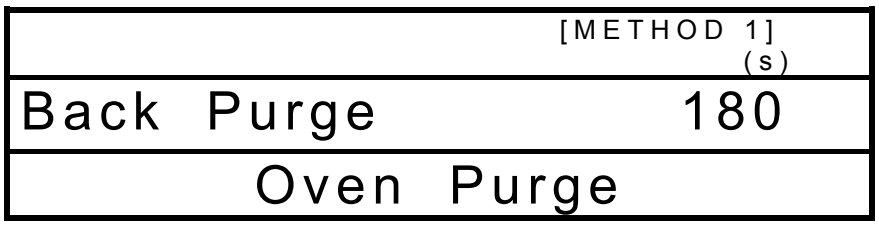


The below display shows the message. Take the sample into the sampler and weigh the sampler.

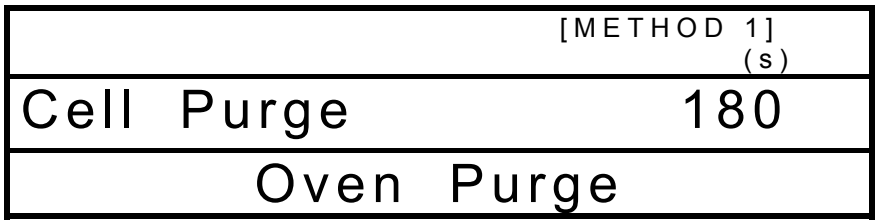


Press [Start] key.

The display changes to the below immediately after it has changed as above, and then shifts to back purge.



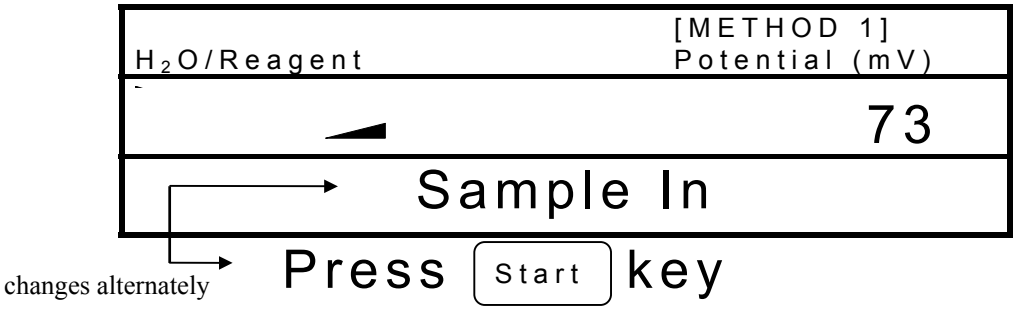
When Back purge begins, time starts counted down.



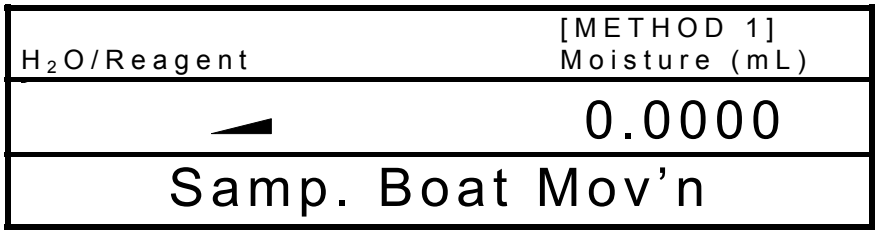
Cell purging time is counted down.

After cell purge, the display waits for pretitration to be finished.

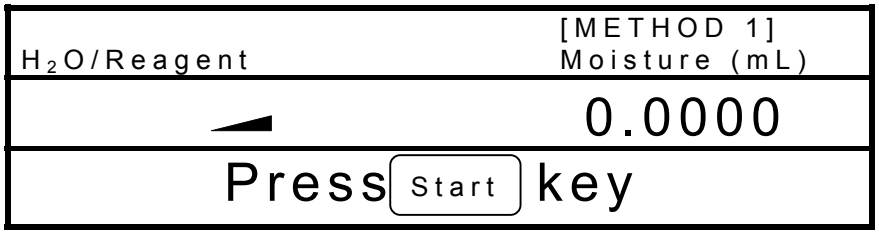
After pretitration, the display changes as above, however, it will soon change to the next display.



Remove the ball stopper, and inject the sample. Insert the ball stopper again and press [Start] key.

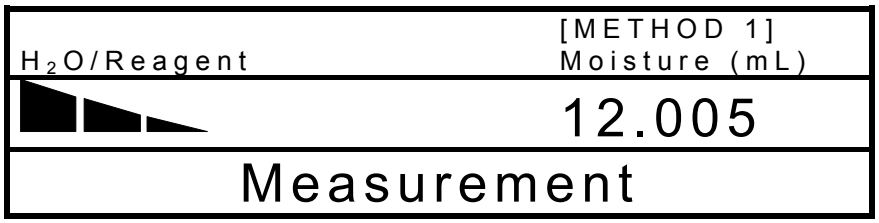


The sample boat moves into Heating unit.

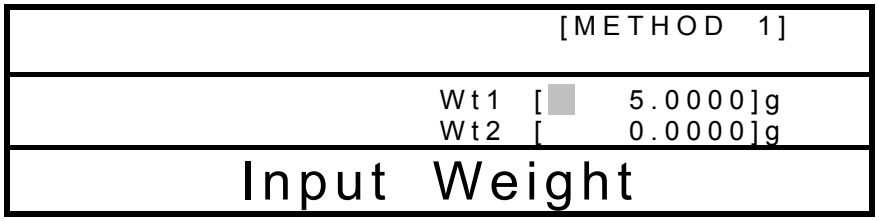


After the boat has moved in, the display changes as above.

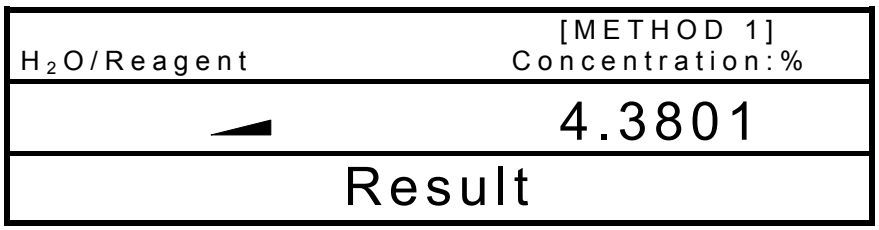
Press [Start] key.



The display changes as above and it starts titration.



After titration is finished, the boat returns to sample inlet, and the display will change to the above. Input Wt1 and Wt2.



The display shows measurement results. (print out when Printer is connected)

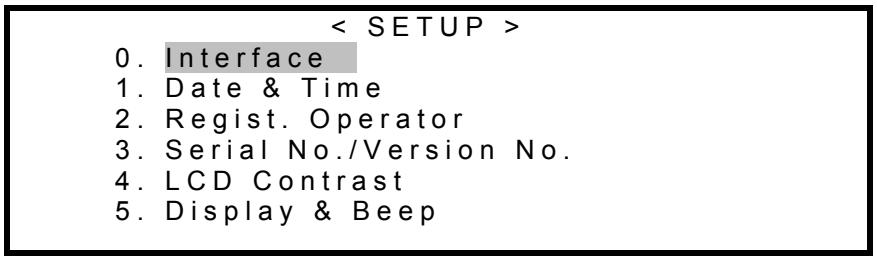
8. Setup Function

8-1. General

This function has the following six functions:

Setup 0	Interface setup
Setup 1	Setup calendar date
Setup 2	Register operator's name
Setup 3	Check serial number and version number
Setup 4	Adjust brightness of LC display
Setup 5	Setting display and beep

Press [Setup] key to show the menu display as below.
Select the item by cursor using [↑],[↓] key and confirm by [↵] key, and then, set up each parameter.



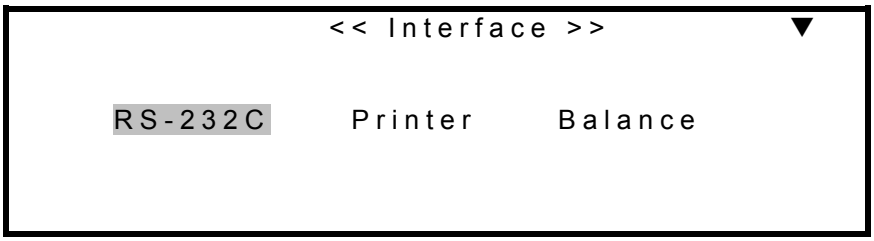
8-2. Interface setup (Setup 0)

Set up protocol of digital configuration for the built-in three kinds of interface for RS-232C, Printer and Balance.

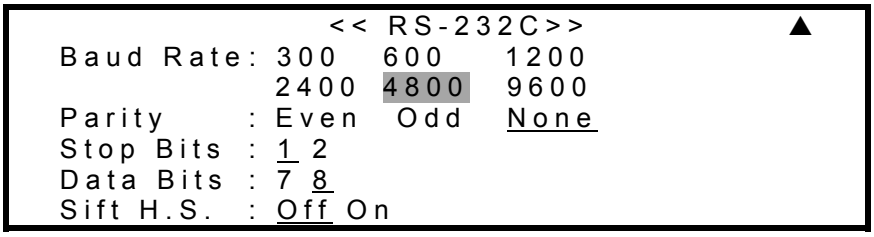
8-2-1. RS-232C

The MKA-510N/MKS-510N can be controlled by an external computer through RS-232C cable.

Press [Setup],[0],[↵] key one after another. The following display will appear. Point “RS-232C” by cursor using [↑],[↓] key and confirm by [↵] key.



The display changes as below, and set up protocol by cursor using [↑],[↓],[←],[→] key and confirm by [↵] key after parameters are entered.

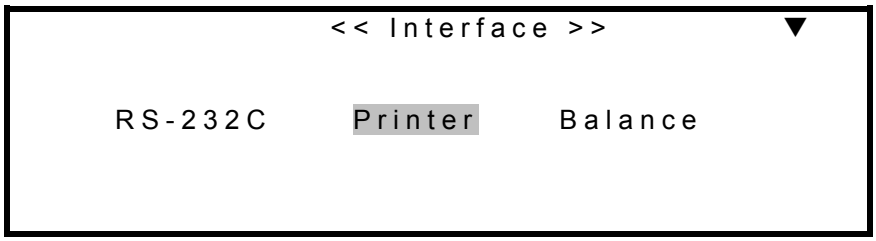


To exit, press [Setup] key.

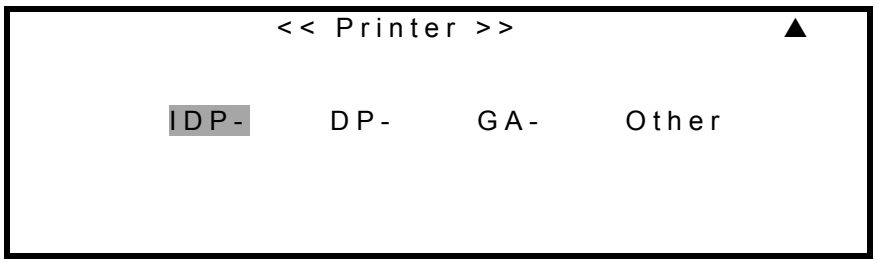
Note:
For details of software by RS-232C, refer to the separate brochure of "MKA-510N/MKS-510N RS232C Communication Software".

8-2-2. Printer

Press [Setup],[0],[↵] key one after another. Select “Printer” by cursor using [←],[→] key and confirm by [↵] key.



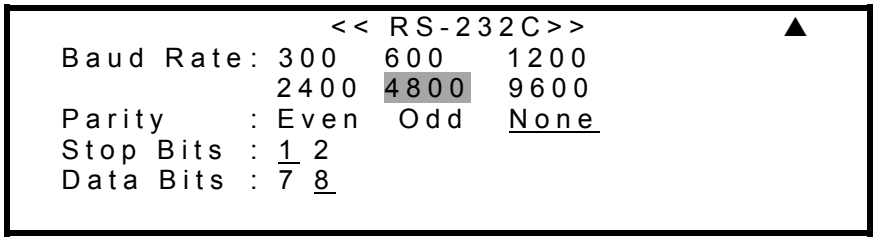
The display will change as follows, and select the type of your printer by cursor using [←],[→] key and confirm by [↵] key.



IDP-	: Select this when supplied IDP-100 Impact dot matrix printer is used.
DP-	: Select this when DP-500 Thermal printer(KEM) is connected.
Other	: Other printer than the above

For "Other" printer, point "Other" by cursor and press [↵] key.
The display will show the below page to enter parameter settings on <PRINTER> second display.
Select each parameter by cursor using [↑],[↓],[←],[→] key and confirm by [↵] key.

To exit, press [Setup] key.

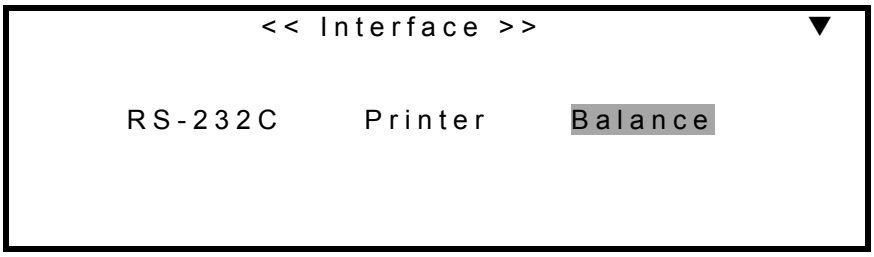


Note:
For digital configuration of other printer you are going to use, refer to the users manual of your printer.

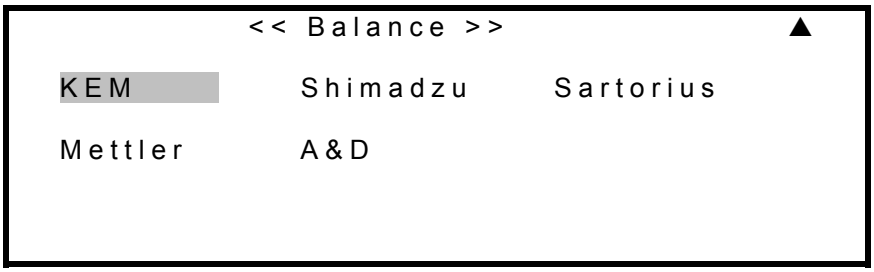
8-2-3. Balance

When Balance is connected, the weight of a sample can be read and stored in MKA-510N/ MKS-510N simply by pressing [-/Disp.] key.

Press [Setup],[1],[↵] key one after another, and select “Balance” by cursor using [←],[→] key and confirm by [↵] key.



The display changes as follows and select the name of manufacturer of your balance by cursor using [←],[→] key and confirm by [↵] key.
To exit, press [Setup] key.



KEM	: Kyoto Electronics
Shimadzu	: Shimadzu S.S.
Sartorius	: Sartorius
Mettler	: Mettler Toledo
A&D	: A&D

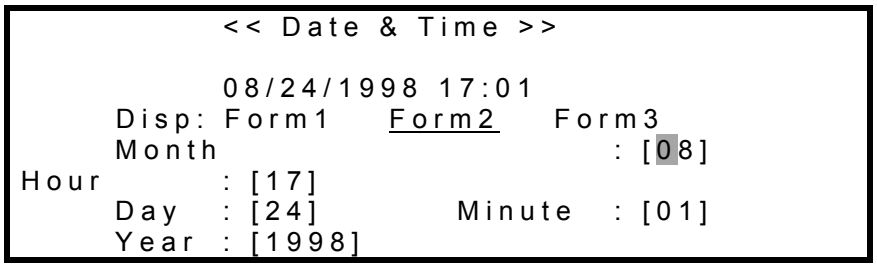
Note:

For balance setting, refer to the manual of the balance.
Use default value for communication between the balance and the unit.
Set the balance to send the data continuously to match digital configuration with the unit.

8-3. Calendar date (Setup 1)

The MKA-510N/MKS-510N has the built-in clock function.
When current date and time are correctly input, it will keep correct local calendar date and time until the battery runs down.
Current date and time can be shown on display and also printed out.

Press [Setup],[1],[↵] key one after another. Select the item by cursor using [↑],[↓] key and confirm by [↵] key after the correct date and time are entered.
To exit, press [Setup] key.



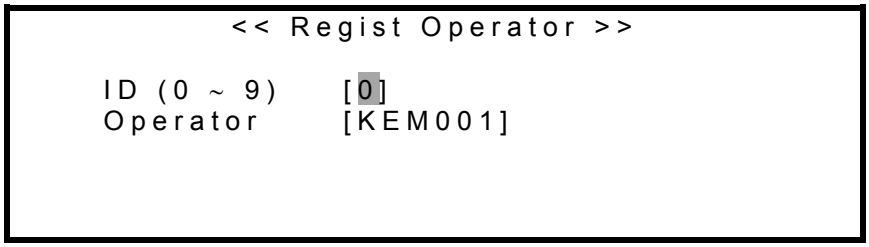
Disp : Select the display form of the date

Form 1	YYYY:MM:DD
Form 2	MM/DD/YYYY
Form 3	DD/MM/YYYY

8-4. Register operator's name (Setup 2)

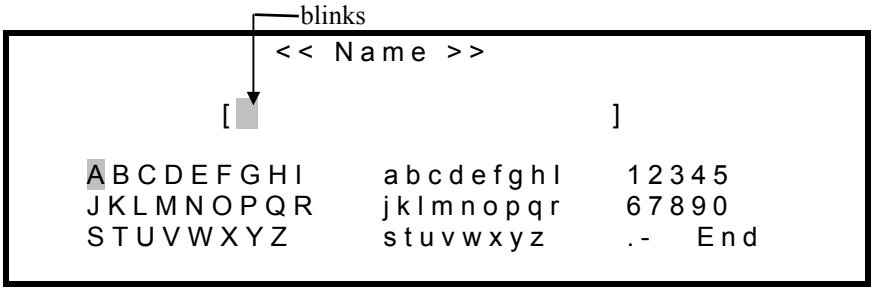
Up to ten operator names can be registered in order to conform to GLP/GMP requirement. The operator's name is automatically printed with resulting data. (Alphabetic large and small characters, and numerals only)

Press [Setup],[2],[↵] key one after another.



Enter the ID by numerous key or [←],[→] key and confirm by [↵] key.
The cursor moves to "Operator". Press [-/Disp] key for setting operator.

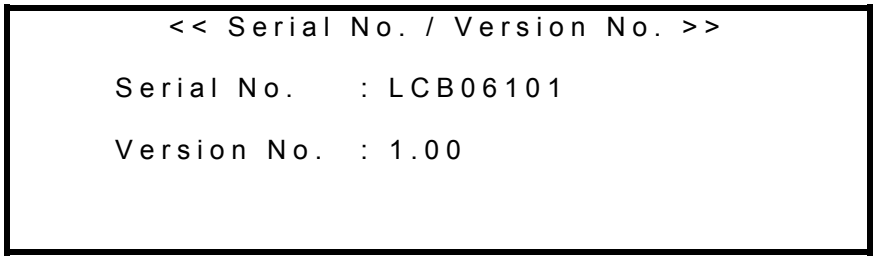
Select the desired character by cursor using [↑],[↓],[←],[→] key and confirm by [↵] key. The blinking cursor shifts by one letter after another. Use [Bs] key to erase the preceding character, and if you wish to erase all the entered letters, use [clr] key. To confirm the entry, point "End" by cursor and press [↵] key. The display will return to <SETUP>. Press [Setup] to return to Main display.



8-5. Serial number and Version number (Setup 3)

In order to identify your product, the production number and version number are registered in MKA-510N/MKS-510N, and you can check those numbers by yourself.

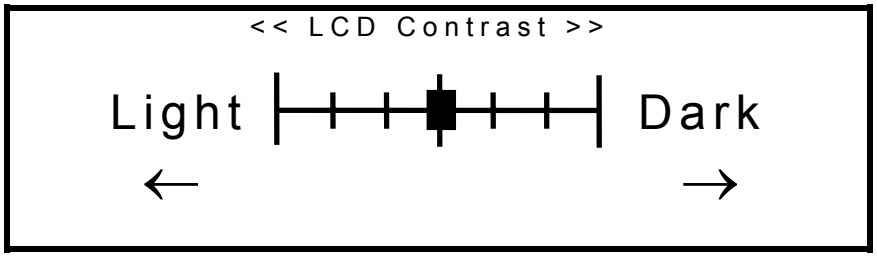
Press [Setup],[3],[↵] key one after another. The display will show the numbers.
To exit, press [Setup] key.



Serial No. : Production number
Version No. : Version number

8-6. Adjust brightness of LC display (Setup 4)

The brightness of the screen can be adjusted.
Press [Setup],[4],[↵] key one after another.
Select desired contrast by cursor using [←],[→] key.



To exit, press [Setup] key.

8-7. Setting display and beep (Setup 5)

By this function, you can select the message in English or Japanese, time length of showing measurement results and sample number, and sound volume of beep.

Press [Setup],[5],[↵] key one after another.
The display will change to the below. Select item by cursor using [↑],[↓] key and enter each parameter using numeric key or [←],[→] key, and confirm by [↵] key.

```
<< Display >>

Result Time      [ 0]s
Sample No.       :Off   On
Language         :Japanese   English
Beep             :Off   On
      (1 ~ 4)    :[1]
```

To exit, press [Setup] key.

Result Time : Time length of showing the results on display
Select how long the measurement results stay on display by 0 to 99 seconds. Zero second means the display continues unless any key is pressed. To return to Main display, press [↵] key.

Sample No. : Display of sample number
Select to display or not Sample number on Main display and Measurement display. On Main display, the number of the sample being measured and the next sample will be shown.

Language : Language used for message on display.
Select English or Japanese for message on display.

Beep : Select beep or not.

Tone (1 to 4) : Sound pattern of beep
Desired beep sound can be selected. This can be adjusted when “Beep:On” is selected.

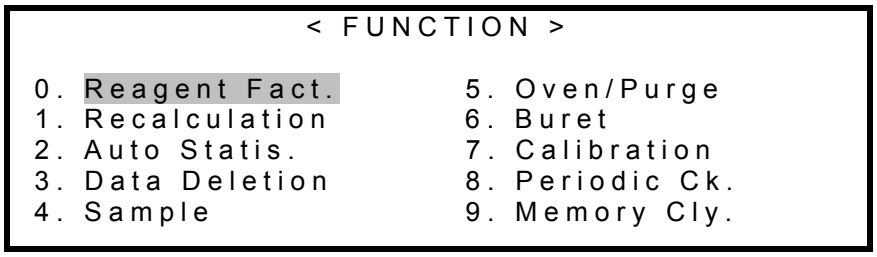
9. Special function

9-1. General

Special function has the following ten functions:

Function 0	: Input of reagent factor and confirmation
Function 1	: Recalculation
Function 2	: Statistics
Function 3	: Deletion of data
Function 4	: Auxiliary function for Sample
Function 5	: Evaporator and ageing
Function 6	: Auxiliary function for buret
Function 7	: Calibration
Function 8	: Setting Check day and check record
Function 9	: Initialization of Memory

Press [Function] key. Select the item by cursor using [↑],[↓] key and confirm by [↵] key to show the desired menu.



9-2. Input of reagent factor and confirmation (Function 0)

Reagent factor can be input manually. And the measuring history of reagent factor can be confirmed.

Press [Function], [0], [↵] key in order to show the display as below.
Move the cursor using [↑],[↓],[←],[→] key and confirm by [↵] key and show the each display.

```
<< Reagent Factor >>

APB        1       2

1. Factor
2. History
```

APB	: Select the buret. (MKA-510N only)
Factor	: Enter the reagent factor manually.
History	: Show the measuring history of reagent factor

a) Enter the Factor

```
<< Factor (APB-1) >>

Factor        [ 4.9542]mg/mL
```

Enter the factor by numerous key and confirm by [↵] key.

b) Confirm the measuring history of reagent factor

```
<<History (List) (APB-1)>>      ▲▼
 Date          Factor
1999/12/29    4.9805>4.8827 mg/mL
1999/12/15    4.9865>4.9805 mg/mL
1999/11/30    4.9982>4.9865 mg/mL
1999/11/15    5.0042>4.9982 mg/mL
1999/10/29    4.9542>5.0042 mg/mL
```

Measuring history of regent factor can be confirmed by [↑],[↓] key. (Max. 10 histories)

9-3. Recalculation (Function 1)

You can recalculate the data when wrong Lot number or sample weight is input. Recalculated results will be displayed on the screen and can be printed by pressing [Print] key, with the header "[Recalculation]" instead of *** Result *** and (#) marking to Sample number for identification.

Press [Function],[1],[↵] key one after another, and select the item by cursor using [↑],[↓] key and confirm by [↵] key after correction is made.

```
        << Recalculation >>                ▼

    Sample No.        : 01 – [01]
    Lot No.           [xxxxxxxxxx]
    Moisture          : 21.653  mg
    Titr. Volume      :         mL
    Clac. No.2     Unit: %
```

Sample No.	:	Sample number Sample number for recalculation
Lot No.	:	Lot number Lot number of the sample for recalculation
Moisture	:	Water content The amount of water of measurement results for recalculation
Titr. Volume	:	Titration volume The amount of dispensed reagent of measurement results for recalculation
Calc. No.	:	Calculation formula Equation for recalculating the measurement results
Unit	:	Unit for the results for recalculation

Note:
Only parameters in [ ] can be changed.

```
[Recalculation]

Sample No.     01-01 (#)

Date 1998/10/12 14:52
Method          1
Reagent Factor
 Bur. No.1 5.1197 mg/mL
Lot.No. 50310
Calc. No.       2
Wt1        42.5384 g
Wt2        41.2137 g
Net         1.3247 g
Drift
Blank          0.0 mg
Result      1.2232 %
 Bur. No.1  3.165 mL
           16.2039 mg
Titr. Time 00:03:25
End Time        30 s
Init. Pot.      66 mV
Init. Res.       0 k ohm

- Stop By Reset -

Operator:KEMTARO
         ------------
```

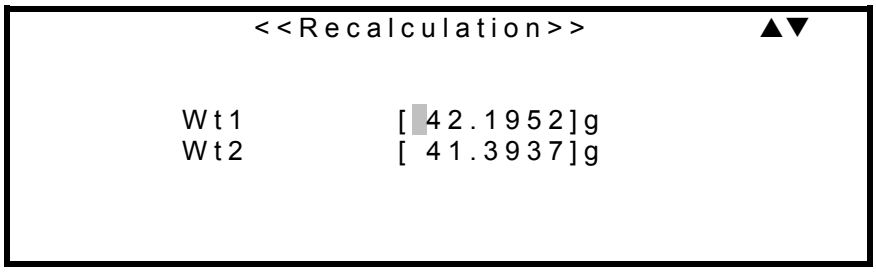
For Calc. No.2, when [page down] key is pressed, the display will change as below.
Set up the Blank value and confirm by [↵] key.

```
              <<Recalculation>>                ▲▼


     Drift              :        0μg/min
     Blank                [      0]mg
```

Drift	:	Drift level The corrected value of drift level for recalculating the results.(This parameter cannot be changed)
Blank	:	Blank value Blank value for the results for recalculation

Press [page down] key, the display will change as below.

Set up the weight and confirm by [↵] key.

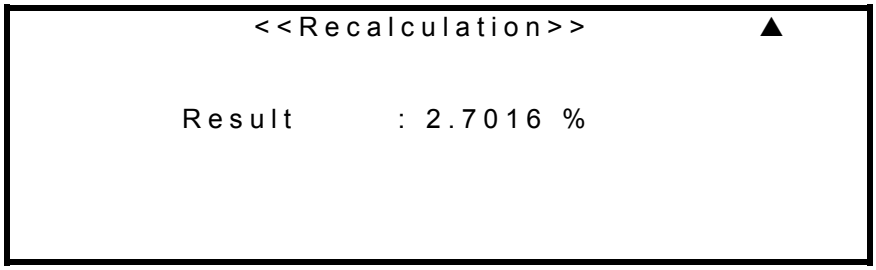


Note:

1.The parameters that can be changed for recalculation are other parameters than Lot number and the drift.

2.The contents of display differ according to calculation formula.

The recalculated results are shown. Press [Print] key to print out the results.



To exit, press [Function] key.

9-4. Statistics (Function 2)

The MKA-510N/MKS-510N can process statistical calculation automatically. The MKA-510N/ MKS-510N can batch calculate the data according to the group by high order sample number. (If a high order number on Sample parameter is changed, the corresponding data will be erased)

Press [Function],[2],[↵] key one after another. The statistical results of batch calculation is shown. Press [Print] key to print out the results.

```
<< Auto Statistics >>

Data Print      : Off   On
  Results       :       7
  Mean          : 2.6814 %
  SD            : 0.0015 %
  RSD           : 0.0559 %
```

To exit, press [Function] key.

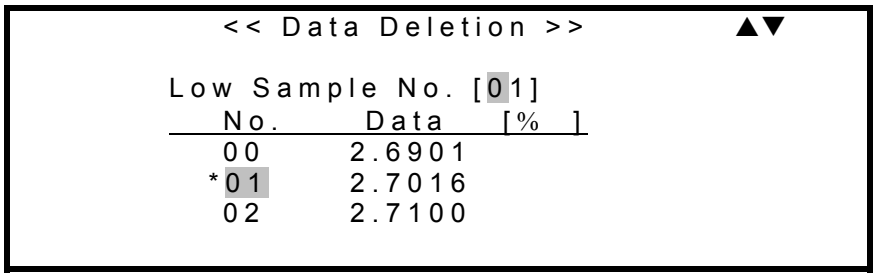
Data Print	:	Printout the data Select or not to print out each statistical data that has been batch processed.
Result	:	Number of data The number of data that have been batch processed for statistics.
Mean	:	Average value of data
SD	:	Standard deviation of data
RSD	:	Relative standard deviation of data

```
<Auto Statistics>

Date 1998/10/12 14:52
Sample No.(High) 01
Method          1

Result          5
Mean      1.2232 %
SD        0.0029 %
RSD       0.2371 %

Operator:KEMTARO
          ----------
```

9-5. Deletion of data (Function 3)

There may be some data you wish to delete from the statistical record. Those data that were deleted will be printed with "*" mark when each data record is printed out.

Press [Function],[3],[↵] key one after another.
The display will change as below. Either enter the sample number low order by numeric key or point the number which you want to delete by cursor using [↑],[↓] key, and press [-/Disp] key. "*" mark will appear on top of the sample number and the data will be deleted.
To exit, press [↵] key to return to <Function> display.



The deleted data can be recalled by [-/Disp.] key, and the "*" mark will disappear.

9-6. Auxiliary function for Sample (Function 4)

9-6-1. General

This function can fasten parameter setup on Sample or reduce the reagent used in titration.

Press [Function],[4],[↵] key. The display changes as below and select the item by cursor using [↑],[↓],[←],[→] key and confirm by [↵] key.

```
< Sample >

Sample File          : Off   On
Size Only            : Off   On
Weight Conc.         [        ]%
      Weight         :  xxxxxxxxg
```

9-6-2. Sample File

Sample parameter can be input in advance for each sample.
After a sample is titrated, the parameters for the next sample will be applied to the measurement.

Select “Sample File: On” and press [Sample] key and enter operator.
The display changes as below and set up each parameter using [↑],[↓],[←],[→] key and confirm by [↵] key.

```
< SAMPLE >                    ▼

Meas. No.       [100]
Next Meas.      [  1]
Method          : Fixed   Variable
Statistics      : Off     On
Blank           [   0.0] mg
```

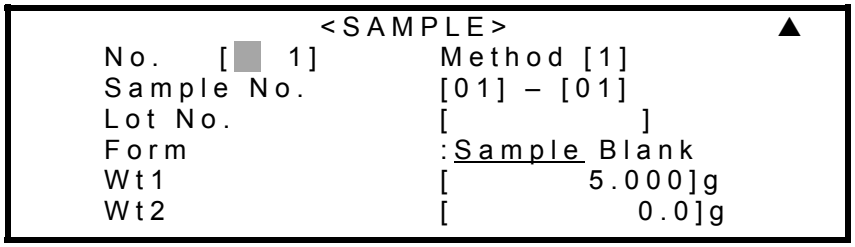
Meas. No. : The number of sample to be measured.(1 to 100)

Next Meas. : Next measurement number
The number of the next sample to be measured. (1 to 100)

Method : Select Method to be fixed or variable.
Select or not to fix a Method for multiple measurements. If Variable is selected, individual Method for each measurement can be set up.

Statistics	:	Statistical data processing When a high order number is changed during measurement using Sample File function, it can be selected or not to batch process the measurement results that have been stored under the same high order number.
Blank	:	Blank value

Press [Page down] key. When the formula for the Method is Eq. 2, the display will change as below. Set up each parameter by cursor using [↑],[↓],[←],[→] key and confirm by [↵] key.



To exit, press [Function] key.

No.	:	Measurement number The number of measurement
Method	:	The number of Method, which appears when Variable is selected for Method on previous display.
Sample No.	:	The number of sample
Lot No.	:	The lot number of the measurement Select the measurement for Sample or for Blank
Form	:	Sample form Select Sample or Blank that is going to be measured.
Sample	:	Sample measurement The measurement will be performed as routine and the results will be displayed.

Blank : Blank measurement

When Blank is set up, 0.0mg blank value will be taken in the measurement. When measurement by Sample File changes from "Blank" to "Sample", the average blank value will be input to calculation.

When it changes from "Sample" to "Blank", the blank will be replaced by 0.0mg.

Note:

1. **Parameters differ according to the formula for preset Method.**
2. **While Sample File is On, [Sample] key works as parameter setup key for Sample File.**

9-6-3. Size only

When sample weight is going to be input before or during measurement, the cursor starts from top line of display if [Sample] key is pressed. Unless sample number and lot number are changed, the cursor has to be moved from the top line. On the other hand, if "Size Only: On" is selected, the cursor blinks on weight input position, thus skipping unnecessary items and saves time in case sample number and lot number remain unchanged.

9-6-4. Sampling amount

For precise measurement by MKA-510N/MKS-510N, it is recommended to control sampling amount to be 3mL for titration volume.

If moisture concentration of a sample can be anticipated, the sampling amount can also be determined in advance.

This function displays sampling amount for 3mL by input of anticipated water concentration, using KF factor value in buret.

(1) Weight ← Enter Conc. [ ]% and press [↵] key.

(2) Weight shows :*****g the best sampling amount

Note:

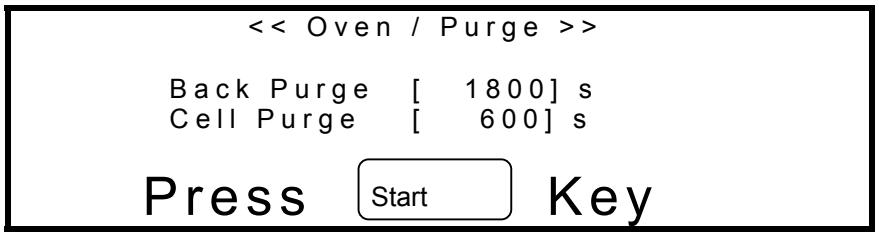
1. **The unit for the anticipated water content is the same as for the formula selected for the Method.**
2. **The sampling size by this function is only for reference, and whether to apply the value or not depends on your evaluation.**

9-7. Evaporator and ageing (Function 5)

When Evaporator is connected to Titrator, it is necessary to age the heating system before going to measurement. The ageingprocess for ADP-511S or ADP-351 can be controlled by MKA-510N/ MKS-510N. Also refer to the manual for Evaporator.

Press [Function],[5],[↵] key one after another.
The display will show the below message.
Set up time for “Back Purge” and “Cell Purge”, and confirm by [↵] key. (Normal 1800s for Back Purge, 600s for Cell Purge)

Press [Start] key to start ageing.
To return to Main display without ageing, press [Function] key.

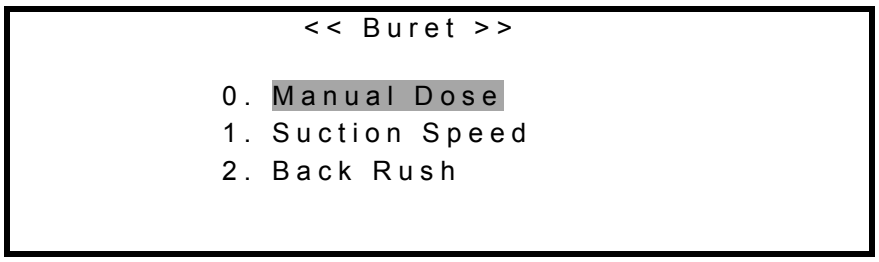


9-8. Auxiliary function for buret (Function 6)

9-8-1. General

This function controls the amount of fixed manual dose, speed of reagent dispensing and the amount of backlash by piston in buret.

Press [Function],[6],[↵] key one after another.
The display changes as below, and select menu by cursor using [↑],[↓] key and confirm by [↵] key, and set up each parameter to execute.

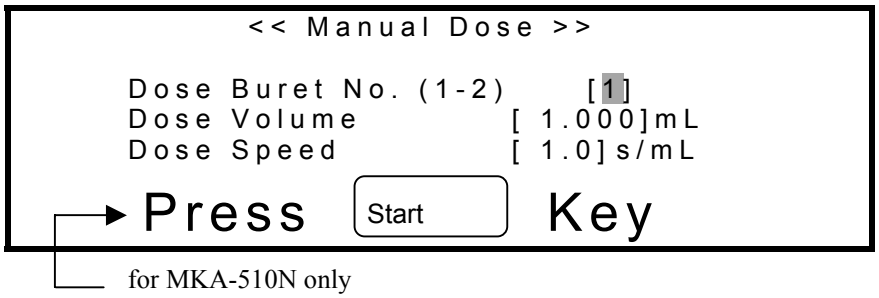


0. Manual Dose	: Fixed amount by manual dose
1. Suction Speed	: Control reagent dispensing speed
2. Back Rush	: Select amount for backlash

9-8-2. Fixed manual dose

Fixed amount of reagent can be dosed manually from the buret.
This is effective when the reagent at the tip of nozzle has absorbed moisture right after power is turned on or when checking capacity of a buret.

Press [Function],[6],[↵],[0],[↵] key one after another.
The display changes as below, and select the item by cursor using [↑],[↓] key and enter parameter by numeric key, and confirm by [↵] key.



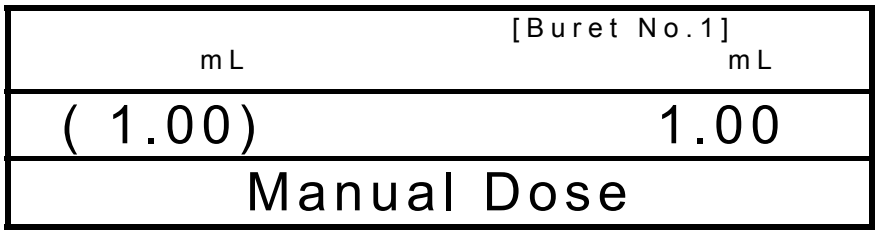
for MKA-510N only

Dose Buret : Buret setup for fixed volume dose (MKA-510N only)

Dose Volume : The amount of volume to be dosed
Select the volume to dose (mL).

Dose speed : Select a speed to dose from 1.0 to 300s/mL.

Press [Start] key to dose with message on below display.
Each time [Start] key is pressed, the selected amount is dosed.
To exit, press [Function] key.

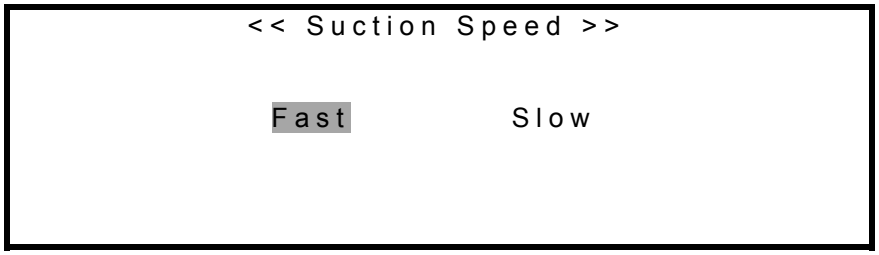


Note:
Manual fixed dose works only on Standby mode (“Waiting for Pretitration”).

9-8-3. Control reagent dispensing speed

Reagent dispensing speed can be changed by this function.
The speed has to be lowered, for instance, when piston head is deteriorated over long time use and air bubbles tend to sneak into the buret. Normal setting is “Fast”.

Press [Function],[6],[↵],[1],[↵] key one after another.
Select Fast or Slow by [←],[→] key and confirm by [↵] key.

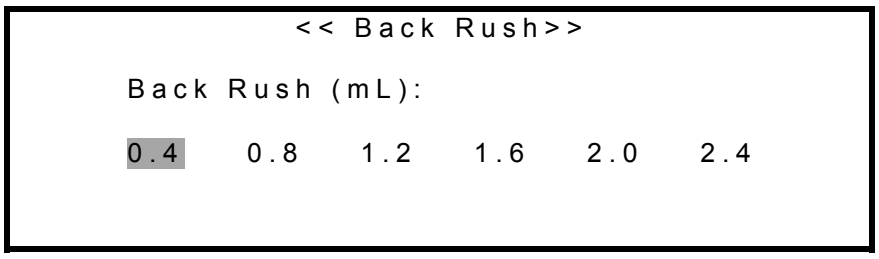


To return to Main display, press [Function] key.

9-8-4. Select amount for backlash

If the piston head of buret is deteriorated over long time use, air bubbles may sneak into the buret when reagent is sucked. Such bubbles have to be removed for precise moisture measurement, and they are pushed out back to the reagent bottle by backlash of the piston head. The amount of reagent delivered back to the buret by backlash can be selected.

Press [Function],[6],[↵],[2],[↵] key one after another.
Select the amount for backlash by cursor using [←],[→] key .
To exit, press [Function] key.



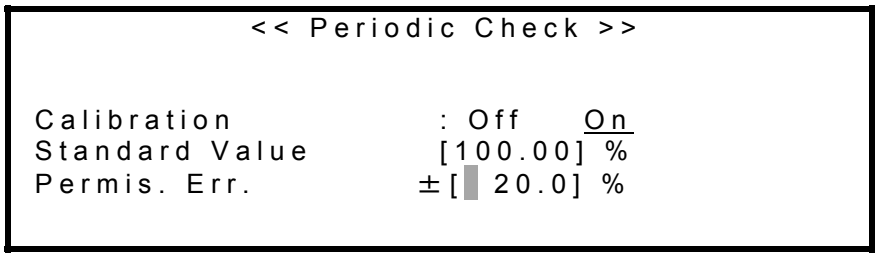
Note:
If amount of backlash is set to more than 0.8mL, the maximum dispensed volume by piston will be reduced by more than 10mL.

9-9. Check measurement precision

9-9-1. Precision check by water standard

This function checks reproducibility of titration to secure precise measurement by the MKA-510N/MKS-510N using standard water solution.

Press [Function],[7],[↵] key one after another.
Select the item by cursor using [↑],[↓],[←],[→] key and confirm by [↵] key after conditions and values are entered.



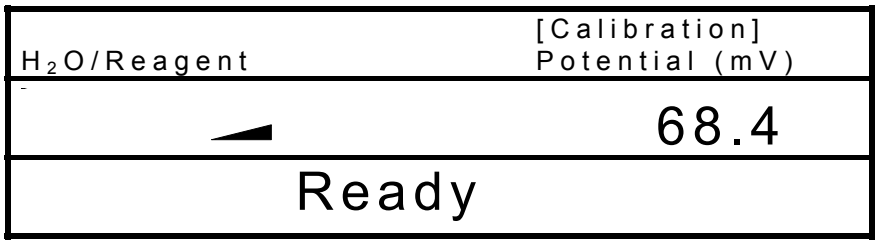
Calibration : Select this mode or not.

Standard Value : The amount of water of standard substance
Enter the amount of water standard.

Permis. Err. : The criterion of range in comparison with standard water content
Criterion by water standard.

To exit, press [Function] key.

When Calibration is set to On, “METHOD” on display is replaced by “Calibration”.



9-9-2. Operating Calibration

Measurement of water standard by Calibration is exactly in the same way as routine measurement. The results will be batch processed, and criterion for precision check will be output.
(see 7-5 Routine measurement)

After measurement is finished (at least 3 times), batch process by Function 2. The batch processed results are recorded on Function 8 as a check record file for criterion.

Check the results on Function 8. The last 10 records are stored on Function 8, where the past results can be checked and reviewed.

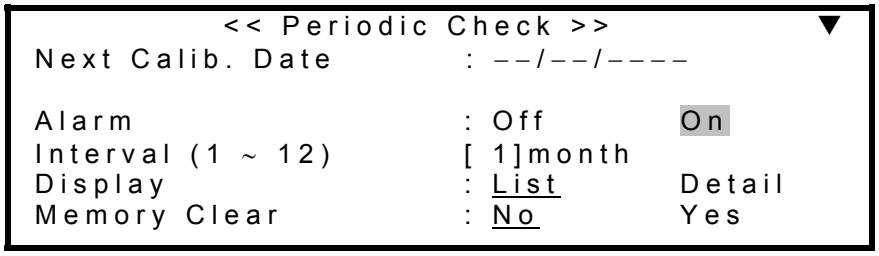
Also the date when a precision check is made is recorded as Check Day on Function 8, and next Check Day is renewed.

To return to Method, select Calibration: Off on Function 7.

9-10. Setting Check Day and Check record (Function 8)

Periodical check of measurement precision assures the reliability of measurement results by MKA-510N/MKS-510N.
Set up Check Day and review the check record by this function.

Press [Function],[8],[↵] key one after another.
Select the item by cursor using [↑],[↓],[←],[→] key and confirm by [↵] key after parameters are entered.



Next Calib Date : The next date for periodical check.
The date is renewed with the preset number of days is added after precision check is made.

Alarm : Select or not alarm message with beep sound.

Interval (1 to 12) : Enter a number of months for check period

Display : Select Periodic check record of the last 10 checks.

List : Display of a list of the last 10 checks

Detail : Display of detailed record of the last 10 checks

Memory Clear : Select or not to delete the record of last 10 checks. If "Yes" is chosen, all past records are erased.

Press [Page down] to show the past record of precision check.

When “List” is selected:

<< Periodic Check >> ▼▲

No.	Date	Std.	Mean	OK/NG
1.	09/10/1998	10.0	9.565	NG
2.	08/10/1998	10.0	9.785	OK
3.	07/10/1998	10.0	9.650	NG
4.	06/10/1998	10.0	9.805	OK
5.	05/10/1998	10.0	10.05	OK

When “Detail” is selected:

<< Periodic Check >> ▼▲

No.	: 1
Date	: 04/10/1998
Standard Value	: 10.0 %
Permis. Err.	: ± 0.3 %
Mean (n= 5)	: 9.856 %
Result	: OK

To exit, press [Function] key.

No. : Serial number of check for identification

Date : The date showing when the check was done.

Standard Value : The amount of water of the standard substance

Permis. Err. : The range of criterion in comparison with standard
For example, suppose the Standard Value were set to 10.0% and Permis. Err. to ±0.3%, the permissible range would be 9.7% to 10.3%.

Mean : The average of results of a series of measurement

OK/NG Result : The results after checked by criterion
“OK” is shown if the mean value of measurements falls within the permissible range compared to the water content of standard substance, or “NG” is shown if out of the range.

9-11. Initialization of data (Function 9)

All the stored data can be erased and the setup parameters initialized to default value by this function except Setup parameter.

Press [Function],[9],[↵] key one after another.
Press [↵] key, and after beep, turn Off the power, and then, turn it On in 5 seconds later.

```
< Memory clear >

Press Return, turn OFF Power
and turn ON again.
All parameters can be
initialized by those steps.
```

The display changes as below. Press any key. (ex. [↵] key)
Beep will sound and the display shows the initial message of start-up (see 5-5.(1)), and then, it shifts to Main display (5-5.(2)).

```
Memory Initialized

Hit Any Key
```

10. Initialization of parameter to default

Below list shows the default value of each parameter after the memory chip is initialized according “9-11. Initialization” except Setup Function, which will not be changed due to the nature of the function.

MKA-510N

Parameter		Default
Method		1
Protect		Off
Titration	Titr. Mode	Normal
	Titr. Buret No. (1-2)	1
	End Time	30s
	Final Volume	0.01mL
	Titr. Speed (1-6)	3
	Detector Mode (1-2)	1
	t(stir)	0s
	t(wait)	0s
	t(max)	0s
	t(interval)	0s
	Drift Titration	Off
	On	
	Start	Manu.
	Max. Volume	10mL
	Dose Mode	Off
	On	
	Dose Buret No. (1-2)	2
	Dose Volume	3.0mL
	Oven	Off
	ADP-	
	Oven Temp.	150°C
	Pre Treat (1-3)	2
	Back Purge	180s
	Cell Purge	120s
	Sampler Purge	180s

Parameter		Default
Result		Calculation
Calculation	Calc. No.	2
	Back Calc. No.	2
	Dose Calc. No.	2
	Unit	%
	Weight	Variable
	Drift Comp.	Off
	Manu.	
	Drift	0.0µg/min
Report		Short
Variable	Sample No.	On
	Date&Time	On
	Lot No.	On
	Method	On
	Calc. No.	On
	Size	On
	Factor	On
	Drift	On
	Blank	On
	Result	On
	Titration Time	On
	End Time	On
	I. Potential	On
	I. Resistance	On
	Operator	On
Titr. Curve	Sampling Interval	30s
	Print Meas. Data	Off
	Print Graph	Off
Sample	ID	0
	Operator	
	Sample No.	01-01
	Lot No.	-
	Blank	0.0mg
	Wt1	5.000g
	Wt2	0.0g
	Wt0	5.000g
	B	0.0g
	A	0.0ppm
	V1	1.000mL
	Dens	1.000g/mL
	V2	1.000L
	Temperature	25.0°C
	C1	100.0%
Parameter		Default

Function		Reagent Fact.
Reagent Fact.	Buret No.1	1.000mg/mL
	Buret No.2	1.000mg/mL
Sample	Sample File	Off
	Size Only	Off
	Weight ← Conc.	1000
Oven/Purge	Back Purge	1800s
	Cell Purge	600s
Buret		Manual Dose
Manual Dose	Dose Buret No. (1-2)	1
	Dose Volume	1.000mL
	Dose Speed	1.0s/mL
Suction Speed		Fast
Back Rush		0.4mL
Calibration	Calibration	Off
	Standard Value	0.00%
	Permis. Err.	±20.00%
Periodic Check	Next Calib Date	--/--/----
	Alarm	Off
	Interval	1month
	Display	List
	Memory Clear	No
APB	Buret No.	1
	Purge	05
Stirrer		4

Default of each parameter

MKA-510N

Sample measuring method	Normal titration	Normal titration	Back titration	Evaporation	Factor measurement	Calibration
Method / Parameter	1	2	3	4	5	(Function 7)
Titration						
Titr. Mode	Normal	Normal	Back	Normal	Normal	Normal
Titr. Buret No.	1	1	2	1	1	1
End Time	30s	30s	10s	0s	30s	30s
Final Volume	0.01mL	0.01mL	0.01mL	0.01mL	0.01mL	0.01mL
Titr. Speed	3	3	3	3	3	3
Detector Mode	1	1	1	1	1	1
t(stir)	0s	0s	120s	0s	10s	0s
t(wait)	0s	0s	0s	0s	0s	0s
t(max)	0s	0s	0s	1200s	0s	0s
t(interval)	0s	0s	0s	0s	0s	0s
DriftTitration	Off	Off	On	On	Off	Off
Start	–	-	Manu	Auto	–	–
Max. Volume	10mL	10mL	10mL	10mL	10mL	10mL
Dose Mode	Off	Off	Auto	Off	On	Off
Dose Buret No.	–	–	1	–	2	–
Dose Volume	–	–	–	–	3.0mL	–
Oven	Off	Off	Off	ADP-	Off	Off
Oven Temp.	–	–	–	150°C	–	–
Pre Treat	–	–	–	2	–	–
Back Purge	–	–	–	180s	–	–
Cell Purge	–	–	–	120s	–	–
Sample Purge	–-	–	–	–	–	–
Result						
Calc.lation						
Calc. No.	2	2	9	2	8	(2)
Back Calc. No.	–	–	2	–	–	–
Dose Calc. No.	–	v	–	–	–	–
Unit	%	%	%	%	(mg/mL)	(%)
Weight	Variable	Variable	Variable	Variable	–	Variable
Drift Comp.	Off	Off	Off	Off	–	Off
Drift	–	–	–	–	–	–
F. Meas.	–	–	–	–	Auto	–
F. Meas. No.	–	–	–	–	3	–
Sample measuring method	Normal titration	Normal titration	Back titration	Evaporation	Factor measuremen t	Calibration
Method / Parameter	1	2	3	4	5	(Function 7)

Report	Short	Short	Short	Short	Short	Short
Titr. Curve						
Sampling Interval	30s	30s	30s	30s	30s	30s
Print Meas. Data	Off	Off	Off	Off	Off	Off
Print Graph	Off	Off	Off	Off	Off	Off
Sample						
ID	0	0	0	0	0	0
Operator						
Sample No.	01-01	01-01	01-01	01-01	01-01	01-01
Lot No.	–	–	–	–	–	–
Blank	0.0mg	0.0mg	0.0mg	0.0mg	–	0.0mg
Wt1	5.000g	5.000g	5.000g	5.000g	–	5.000g
Wt2	0.0g	0.0g	0.0g	0.0g	–	0.0g

Note:

Parameters in ( ) are fixed parameters. Other parameters can be changed.

MKS-510N

Parameter		Default
Method		1
Protect		Off
Titration	End Time	30s
	Final Volume	0.01mL
	Titr. Speed	3
	Detector Mode (1~2)	1
	t(stir)	0s
	t(wait)	0s
	t(max)	0s
	t(interval)	0s
	Drift Titration	Off
	On	
	Start	Manu.
	Max. Volume	10mL
	Oven	Off
	ADP-	
	Oven Temp.	150°C
	Pre Treat (1~3)	2
	Back Purge	180s
	Cell Purge	120s
	Sampler Purge	180s
Result		Calculation
Calculation	Calc. No.(0~7)	2
	Unit	%
	Weight	Variable
	Drift Comp.	Off
	Manu.	
	Drift	0.0μg/min
Report		Short
Variable	Sample No.	On
	Date&Time	On
	Lot No.	On
	Method	On
	Calc. No.	On
	Size	On
	Factor	On
	Drift	On
	Blank	On
	Result	On
	Titration Time	On
	End Time	On
	I. Potential	On
	I. Resistance	On
	Name	On
Titr. Curve	Sapling Interval	30s
	Print Meas. Data	Off
	Print Graph	Off

Parameter		Default
Sample	ID	0
	Operator	
	Sample No.	01-01
	Lot No.	–
	Blank	0.0mg
	Wt1	5.000g
	Wt2	0.0g
	Wt0	5.000g
	B	0.0g
	A	0.0ppm
	V1	1.000mL
	Dens	1.000g/mL
	V2	1.000L
	Temperature	25.0°C
	C1	100.0%
Function		Reagent Fact.
Reagent Fact.	Buret No.1	1.000mg/mL
Sample	Sample File	Off
	Size Only	Off
	Weight ← Conc.	1000
Oven/Purge	Back Purge	1800s
	Cell Purge	600s
Buret		Manual Dose
Manual Dose	Dose Volume	1.000mL
	Dose Speed	1.0s/mL
Suction Speed		Fast
Back Rush		0.4mL
Calibration	Calibration	Off
	Standard Value	0.00%
	Permis. Err.	±20.00%
Periodic Check	Next Calib Date	--/--/----
	Alarm	Off
	Interval	1month
	Display	List
	Memory Clear	No
APB	Purge	05
Stirrer		4

Default of each parameter

MKS-510N

Sample measuring method	Normal titration	Normal titration	Normal titration	Evaporation	Factor measurement	Calibration
Method / Parameter	1	2	3	4	5	
Titration						
Titr. Mode	Normal	Normal	Normal	Normal	Normal	Normal
End Time	30s	30s	30s	0s	30s	30s
Final Volume	0.01mL	0.01mL	0.01mL	0.01mL	0.01mL	0.01mL
Titr. Speed	3	3	3	3	3	3
Detector Mode	1	1	1	1	1	1
t(stir)	0s	0s	0s	0s	10s	0s
t(wait)	0s	0s	0s	0s	0s	0s
t(max)	0s	0s	0s	1200s	0s	0s
t(interval)	0s	0s	0s	0s	0s	0s
Drift Titration	Off	Off	Off	On	Off	Off
Start	–	–	–	Auto	–	–
Max. Volume	10mL	10mL	10mL	10mL	10mL	10mL
Oven	Off	Off	Off	ADP-	Off	Off
Oven Temp.	–	–	–	150°C	–	–
Pre Treat	–	–	–	2	–	–
Back Purge	–	–	–	180s	–	–
Cell Purge	–	–	–	120s	–	–
Sample Purge	–	–	–	–	–	–
Result						
Calculation						
Calc. No.	2	2	2	2	7	(2)
Unit	%	%	%	%	(mg/mL)	(%)
Weight	Variable	Variable	Variable	Variable	Variable	Variable
Drift Comp.	Off	Off	Off	Off	Off	Off
Drift	–	–	–	–	–	–
Report	Short	Short	Short	Short	Short	Short
Titr. Curve						
Sampling Interval	30s	30s	30s	30s	30s	30s
Print Meas. Data	Off	Off	Off	Off	Off	Off
Print Graph	Off	Off	Off	Off	Off	Off

Sample measuring method	Normal titration	Normal titration	Normal titration	Evaporation	Factor measurement	Calibration
Method / Parameter	1	2	3	4	5	
Sample						
ID	0	0	0	0	0	0
Operator						
Sample No.	01-01	01-01	01-01	01-01	01-01	01-01
Lot No.	–	–	–	–	–	–
Blank	0.0mg	0.0mg	0.0mg	0.0mg	–	0.0mg
C1	–	–	–	–	100.00	–
Wt1	5.000g	5.000g	5.000g	5.000g	5.000g	5.000g
Wt2	0.0g	0.0g	0.0g	0.0g	0.0g	0.0g

Note:

Parameters in ( ) are fixed parameters. Other parameters can be changed.

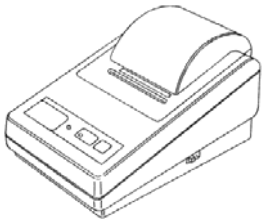
11. Connecting Printer

When Printer is connected, MKA-510N/MKS-510N can print out measurement results, measured date, user name, etc.

11-1. Printers

The IDP-100 impact dot matrix printer by KEM is the standard supplied printer to MKA-510N/MKS-510N. Also, the DP-500 thermal printer by KEM can be connected by selecting the type on display.
Also, other printers can be connected by matching digital protocol.

Standard	Option
IDP-100	DP-500
(Impact dot matrix)	(Thermal)



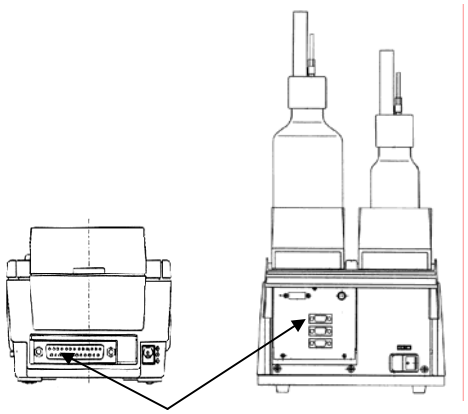
Note:
Thermal dot printer prints on thermal paper.
Therefore, the printings on thermal paper may fade away as the time goes by.

11-2. Connecting Printer

Connecting Printer can be made simply by Printer cable connecting the port on the rear of the instrument.

Plug in the supplied AC adapter to DC jack on the rear of IDP-100 Printer.

Then, make sure the power switch is in OFF position, and plug in the power cord to power outlet. (see the users manual of your printer)



Note:

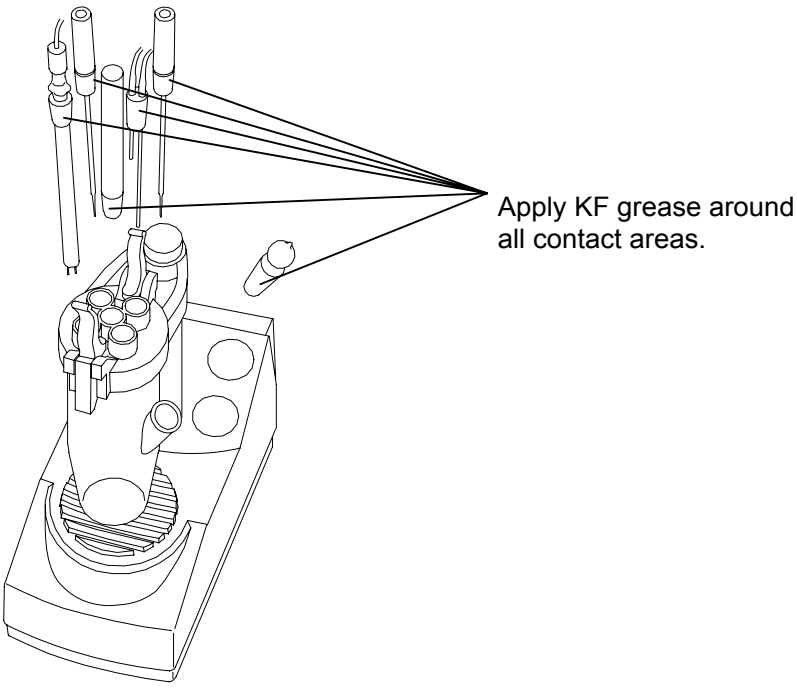
For detailed information about your printer, refer to the users manual of your printer.

12. Maintenance

It is recommended to practise the following maintenance procedure for the safety and maintained performance of the instrument.

12-1. Application of KF grease

Apply thinly KF grease around all contact areas including titration flask and electrode, sample inlet of the vessel and stopper.



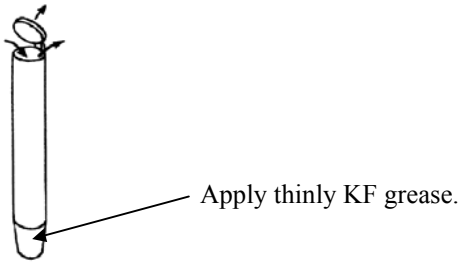
Check the contact area once a week to see the area if it is in smooth contact with grease.
If found not smooth, apply KF grease thinly, however, do not paste too much to avoid moisture in the grease, which will affect the drift later on.

⚠CAUTION!

If the contact area is not checked from time to time, the greased area may be solidified. If solidified, follow the step 14-10 to remove the solids.

12-2. Replacement of silica gel

When silica gel becomes reddish, its moisture absorbent runs down. Apply KF grease around the contact area of desiccant tube on its top and bottom after silica gel is replaced with new one.



12-3. Replacement of KF reagent

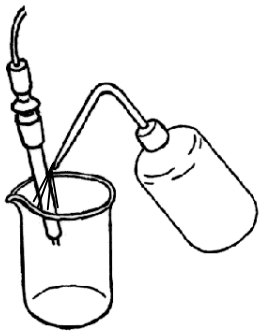
Once reagent factor is determined before measurement, it will not be necessary to replace it until all of it is dispensed, however, it is recommended to replace the reagent if its factor is reduced significantly. (see 5-6-1)

12-4. Replacement of water-methanol (MKA-510N only)

Replace water-methanol from time to time since its factor goes down by absorbing ambient moisture once the bottle is opened.
It is recommended to determine factor by comparing factor with commercially available standard. (see 5-6-2)

12-5. Cleaning the electrode

Clean the electrode if potential is unstable or measurements results fluctuate due to the stained electrode. Rinse by concentrated nitric acid and then, by methanol. wipe off with gauze and dry it.

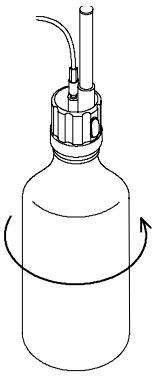


12-6. Cleaning Titration vessel

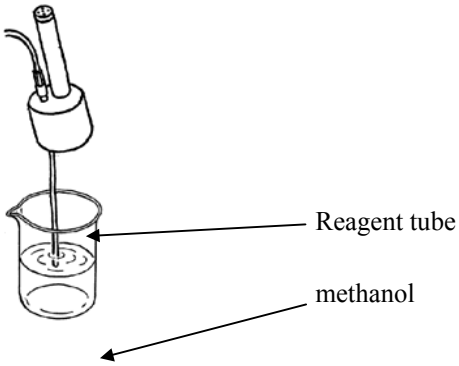
(1) Drain out solvent in the flask.
(2) Turn the top 90 degrees to the right and open the holding lever, and remove the flask.
(3) Remove the ball stopper and rinse by neutral detergent.
(4) Dry it in a dryer and cool it down in a desiccator.

12-7. Cleaning the buret

(1) Remove the bottle after discarding the remaining reagent.

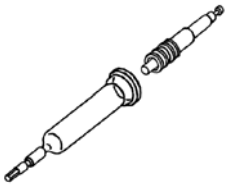


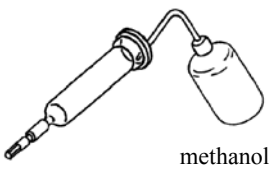
(2) Fill methanol in the buret and drain it out, and repeat.

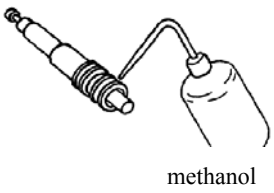


(3) Remove the buret from the unit and pull out the piston, and clean by methanol.

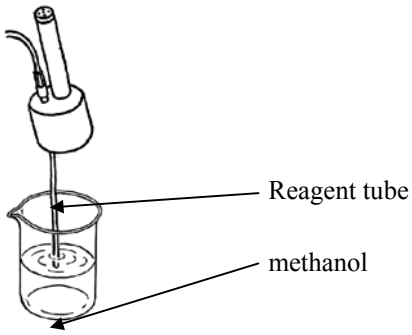
a) b) c)



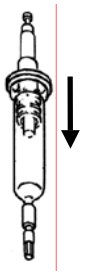




(4) Assemble the buret unit and fill methanol, then drain out.



(5) Drain out the methanol in buret completely.

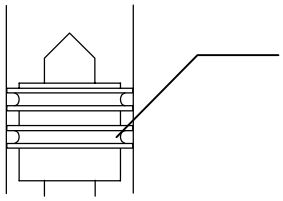


⚠CAUTION!

If the buret is left filled with KF reagent for more than one week, the nozzle and tubes will be clogged by crystallization, thus causing leaking. Remove the reagent in buret and clean, and then, store it to avoid crystallization. If crystallized, follow the step 14-9.

12-8. Replacement of piston head

The piston head may be deteriorated over long time use, thus causing leaking between the piston head and buret wall.
Replace piston head if it soaks out within a few times measurements after the buret unit is cleaned and reagent is renewed.



(1) Undo the piston screw from the head.

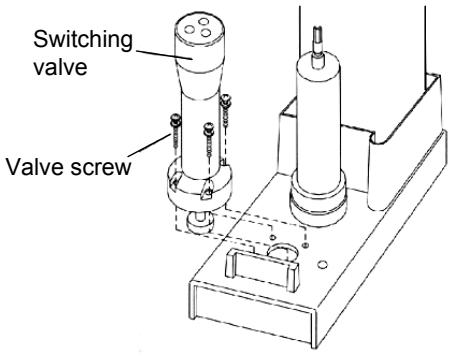
(2) Screw in the new head securely.

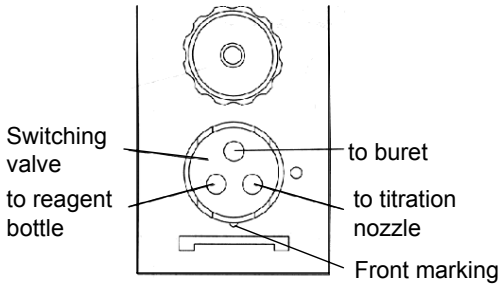
(3) Return the piston back into the buret gently not to damage piston head.

12-9. Replacement of Switching valve

Replace the switching valve if reagent leaks due to crystallization after long non-use.

(1) Disconnect the tube lines by the supplied wrench.
(2) Undo the screw holding the valve case.
(3) Undo the four screws holding the switching valve and remove it.
(4) Install the new switching valve with the marking line in front, and fasten by the screw.
(5) Place the cover and fasten by the screw.
(6) Connect the tube lines back to the position.(see.5-2)





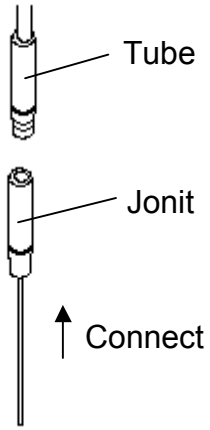
⚠CAUTION!

Install the switching valve with the marking line in front as shown in the figure in order to dispense solution properly and also to avoid leaking.

12-10. Replacement of Titration nozzle

Replace the nozzle as illustrated below:

(1) Disconnect the tube from the joint.
(2) Disconnect the joint from the nozzle.
(3) Insert the new nozzle into the joint.
(4) Connect the joint.



12-11. Replacement of tubing

Replace the tube if it is bent or leaking from its connection.

Use the supplied wrench to fasten the joint, and tighten other joints by hand.

⚠CAUTION!

When replace the tube, insert the tube straight into the joint fitting without bending. Avoid any dust or dirt around joint area to prevent leaking later on.

It may cause leaking of reagent.

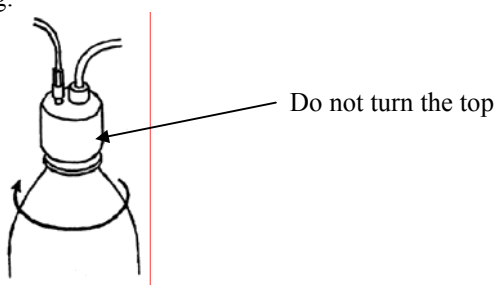
12-12. Drain disposal

Dispose the drain stored in the drain ressel, following the steps below:

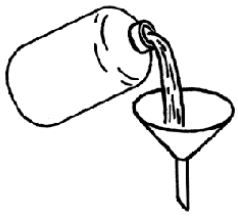
> **⚠Caution!**
> **Dispose drain in the drain bottle at earlier time so that the level of drain in the bottle should be lower than the upper-limit marking of the bottle.**
> **In case where the level becomes higher than the marking, overflowing drain can go into the magnetic stirrer, damaging it.**

Waste solution has to be disposed of before it fills up the bottle.
If it exceeds the upper limit line, the waste solution may contact the
dispenser unit housed in the stirrer.
Discard the waste in the following manner:

(1) Remove the cap of waste bottle by turning the bottle.
Do not twist the tubing.

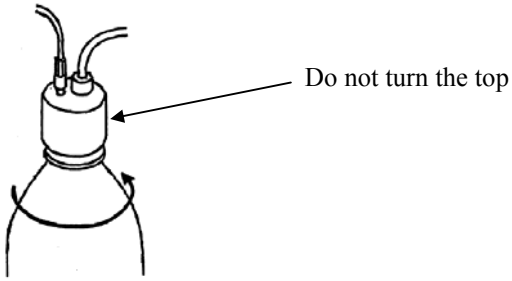


(2) Transfer the waste out of the bottle into a polyethylene bottle, and discard as an organic waste.



(3) Clean the waste bottle neck using tissue paper if it is dirty by the waste.

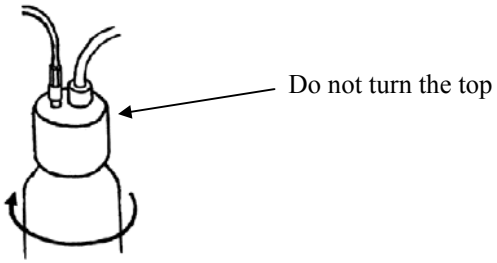
(4) Attach the top of waste bottle by turning the bottle securely to prevent it from leaking. Do not twist the tubing.



12-13. Replacement of extracting solvent

When the dehydrating solvent runs out or the solvent has to be changed by a different type of solvent, the bottle has to be replaced in the following way:

(1) Remove the attachment from the bottle by turning the bottle.
Do not twist the tubing.



(2) Attach the new bottle by turning the bottle securely to prevent it from leaking. Do not twist the tubing.

(3) If necessary, self clean the titration flask by the solvent for a few times.

12-14. Replacement of print paper and printing cartridge

Load a new roll of print paper when the paper runs out and SEL switch blinks.
Also replace the cartridge when printing ink ribbon runs out.
Refer to the users manual of your printer for maintenance.

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

<Merck AG>

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

Note:

When the titration reagents and dehydrating 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.)

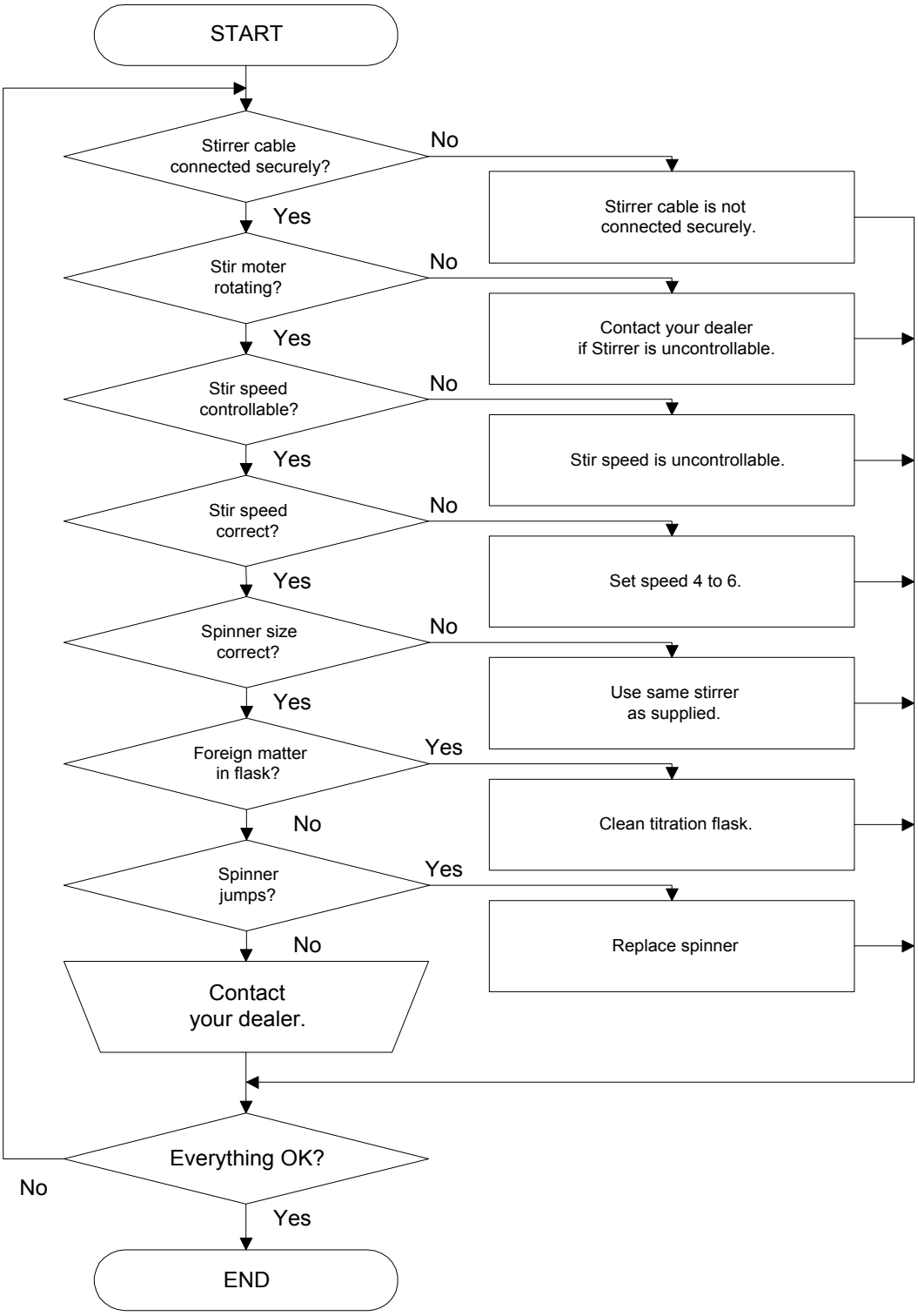
14. Troubleshooting

14-1. Error messages and remedies

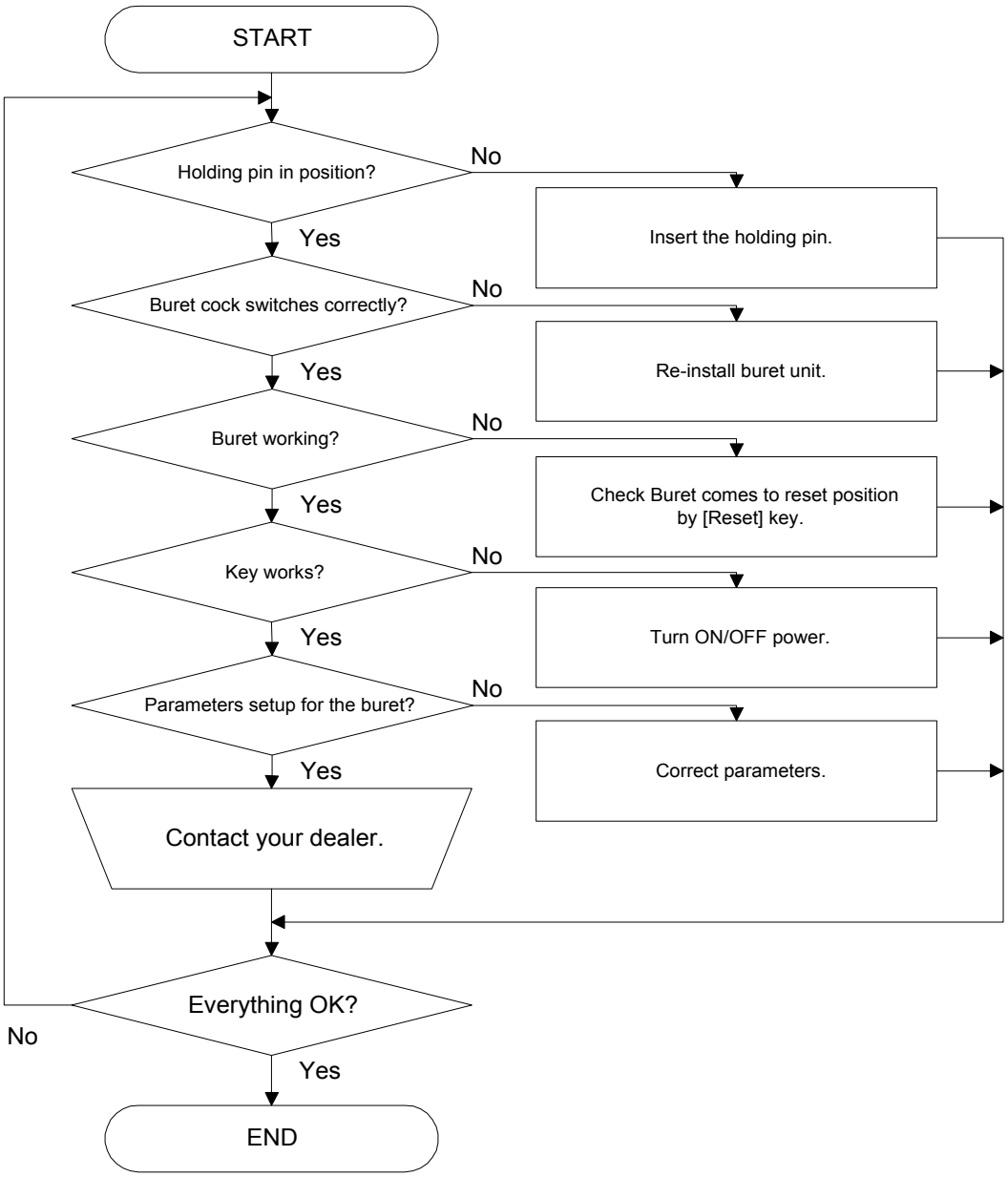
Error message	Cause	Remedies
Resist. Over! ↕ Check Electrode	Electrode is loaded with high voltage.	· Check any stains or dirt around electrode. · Make sure Electrode is dipped in solvent. · Check breaking of electrode lead. · Reduce sample if resistance is too high.
ADP Error! ↕ Check ADP	Attempted to work on Oven without connection to Titrator.	· Check EXT LED to see communication between Oven and Titrator. · Check cable to see contact between Oven and Titrator.
Electrode Open! ↕ Check Electrode	No current is loaded on electrode.	· Check connection of Electrode. · Check any breaking of electrode lead. · Make sure Electrode is dipped in solvent.
Meas. Over! ↕ Check samp. Size	Titration exceeds preset volume.	· Reduce sample size. · Increase titrant factor.
Check Day Past!	The day has passed periodic check date.	· Perform periodic precision check of instrument.
Over Titr.! ↕ Inject water	Excess iodine in solvent	· Raise potential by injecting water. · Slow down speed to avoid excess generation of iodine.
Parameter NG! ↕ Correct Setting	Measurement started with wrong parameters.	· Check if End Time=0, t(max)=0 are set by error at the same time. · Check if t(stir)>t(max) is selected by error. · Check if Eq.8 and Dose mode:Off ore selected by error (MKA-510N only). · Check if Eq.7 or 8 and Oven: On are chosen by error at the same time.

Error message	Cause	Remedies
Buret Error! ↕ Check Buret	Switching valve is not working.	· Check any clogging of the switching valve. · Make sure cock sensor is active and the cock is swinging.
Preamp Error! ↕ Contact Dealer	Built-in amplifier malfunctioning.	· Contact your dealer.
Pretitr Over! ↕ Check solvent	Titration Volume reaches 40mL in Pre-Titr.	· Fill new dehydration solvent. · Re-try Pre-Titr.
D. Mode Error! ↕ Change D. Mode → 2	Detection mode is wrong.	· Change detection mode.
V/F Error! ↕ Contact Dealer	Preamplifier is malfunctioning.	· Contact your local dealer or sales rep.

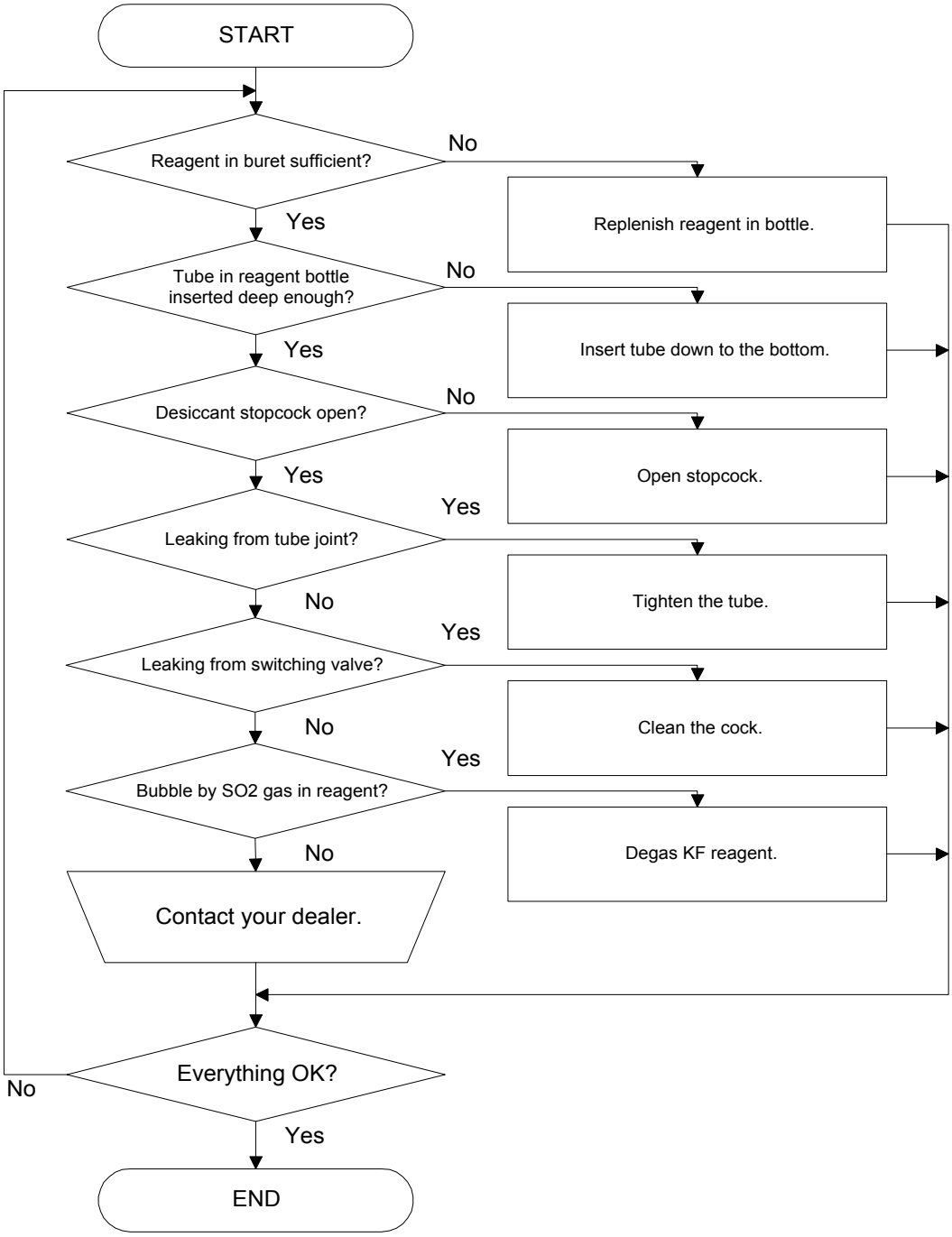
14-2. When Stirrer malfunctions



14-3. When Buret malfunctions



14-4. When air bubble exists in buret

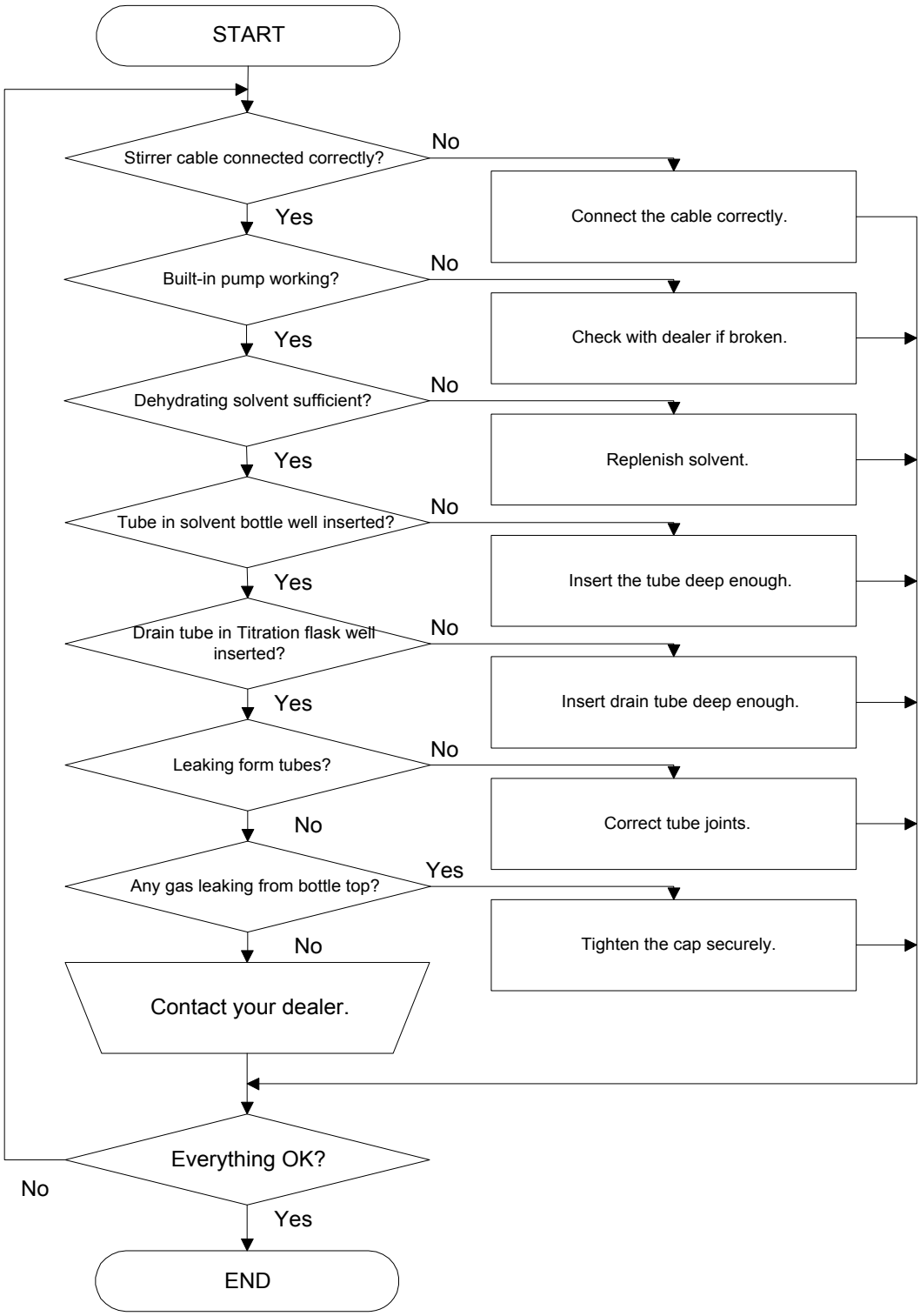


(1) How to degas KF reagent

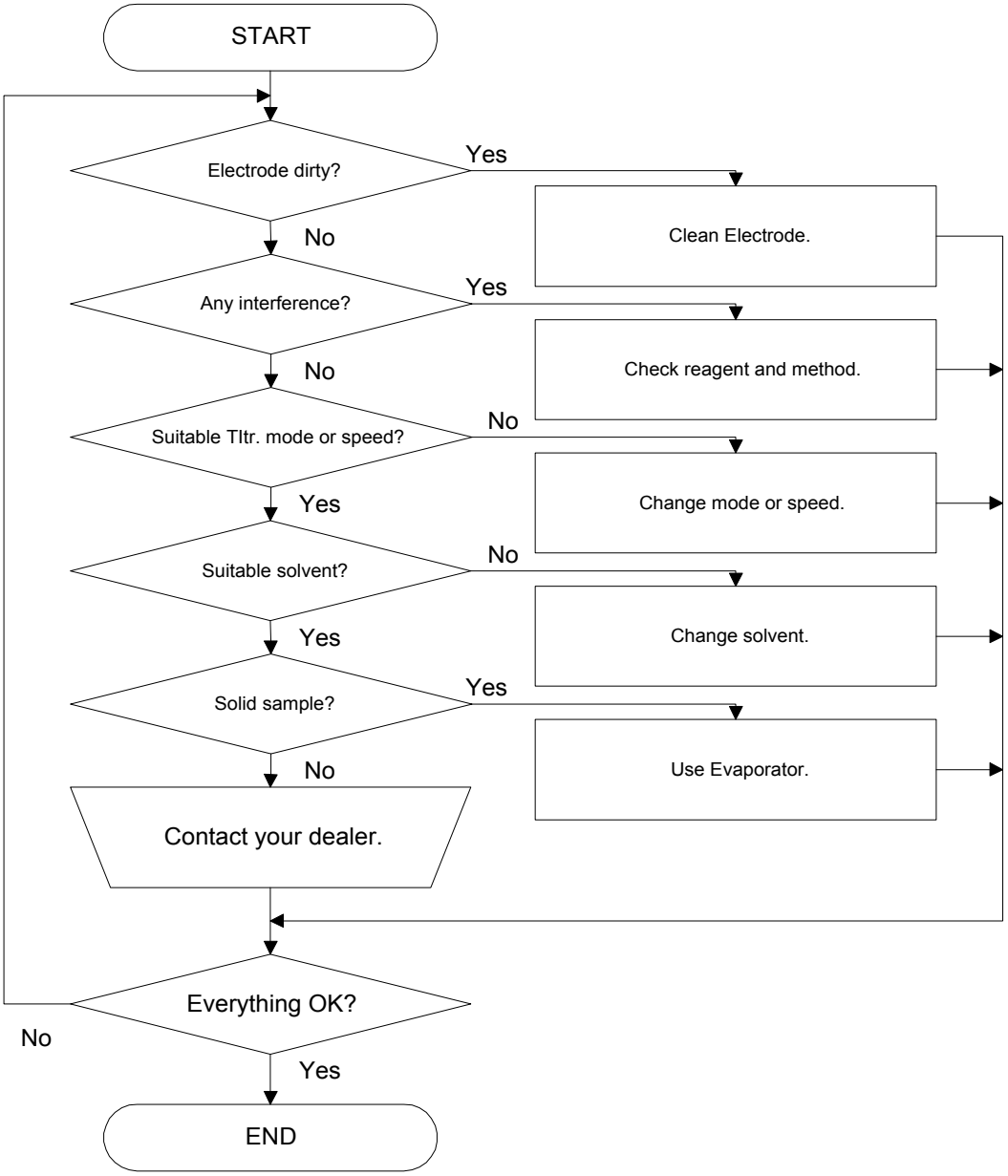
Air bubble appears when KF reagent is moved from a dark place to high room temperature.

Degas the reagent by an aspirator or leaving it at room temperature after shaking it well.

14-5. When Dispenser malfunctions



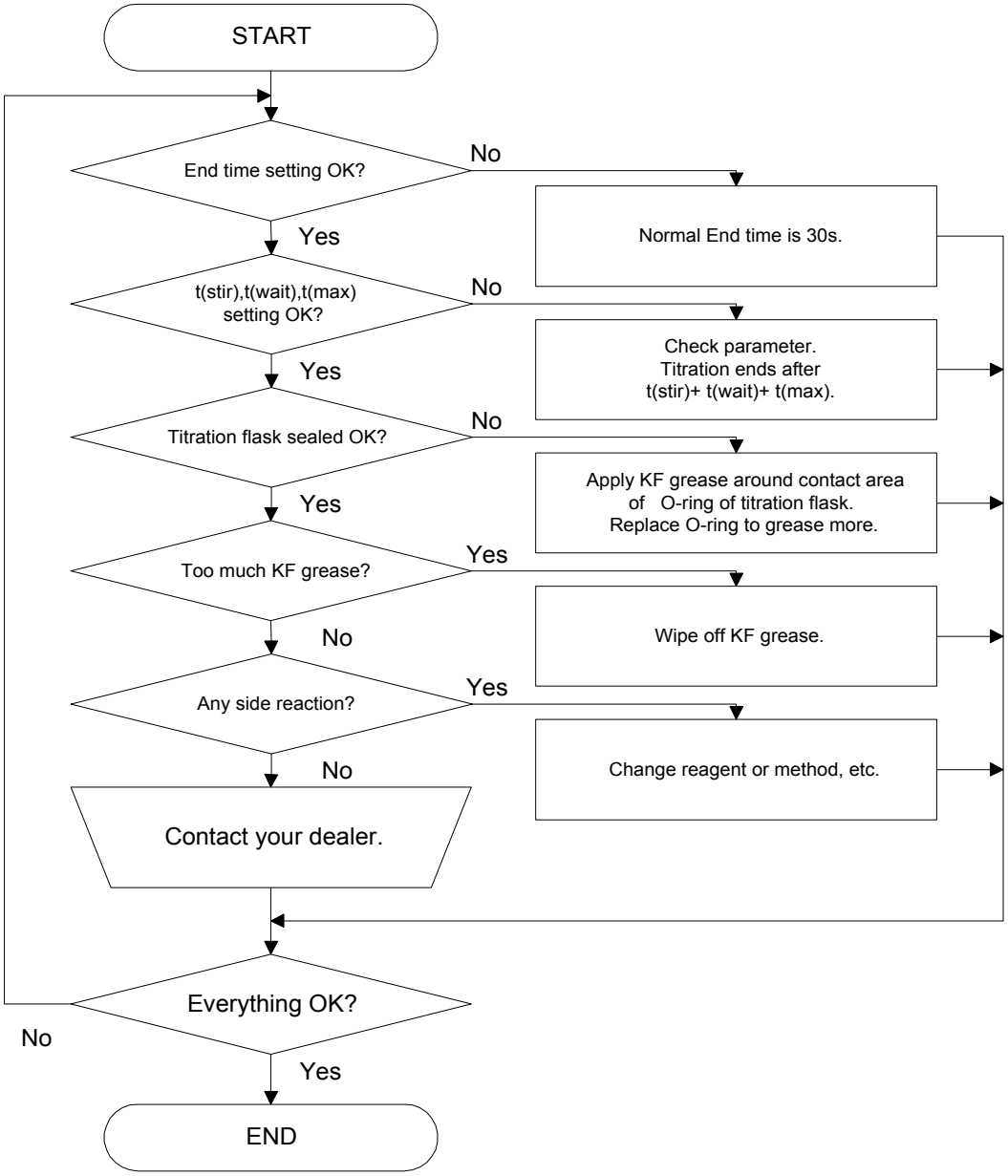
14-6. When titration ends in excess of KF reagent



Note:

For samples which contain interfering substance like ketone, aldehid, amine, etc., change dehydration solvent or add masking reagent.

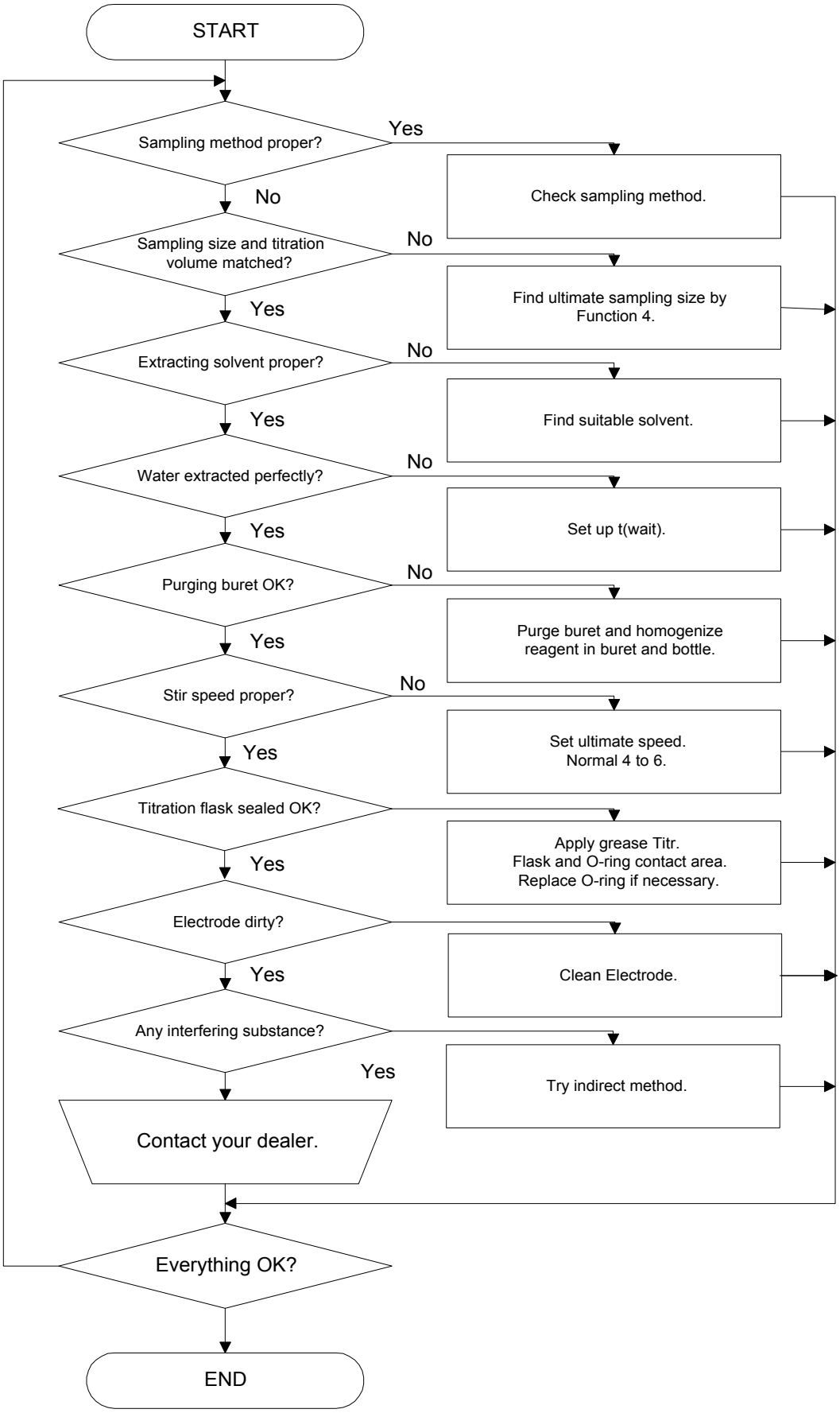
14-7. When Endpoint is not found or takes a long time



Note:

For samples which contain interfering substance like ketone, aldehid, amine, etc., change dehydration solvent or add masking reagent.

14-8. When measurement results in poor reproducibility



14-9. Crystallization of KF reagent and solidification

Karl Fischer reagent may crystallize as time goes by, and cause clogging of titration nozzle or the switching valve.

14-9-1. When the titration nozzle is clogged

(1) Remove the nozzle according to 12-10.
(2) Dip in warm water of 60°C or clean in Ultrasonic cleanser.
(3) After cloggings are removed, clean by alcohol.
(4) Connect the nozzle and tube according to 12-10.

14-9-2. When the switching valve is clogged or jammed

(1) Remove all connections with tubes including titration nozzle, buret and bottle cap.
If KF reagent flows out, wipe it off with tissue paper.
(2) Using a dripping pipette, fill the switching valve with ethanol and leave it for more than 30 minutes.
(3) Sack out the ethanol in the cock.
(4) Repeat step (2) and (3) as necessary.
(5) Reassemble the tubing system as before.

⚠WARNING!

Karl Fischer reagents are toxic chemicals. Therefore, please handle in a well ventilated room and be aware of its danger. If it should contact your skin, wash it away under running water.

⚠CAUTION!

Make sure to wash it if crystallization is observed after KF reagent is left filled in the system for a week.
Do not attemp to push out KF reagent. It may cause leaking later on.

14-10. When glass contact area is solidified

When glass contact area is solidified and clogged by KF reagent, follow the below steps to remove.

(1) Drain the solution in titration vessel.
(2) Heat the contact area by a hair dryer and remove.

⚠WARNING!

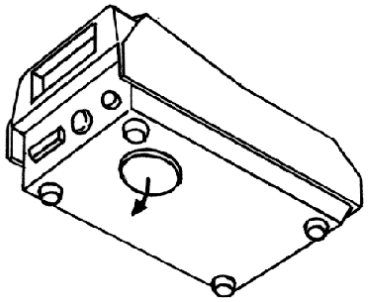
Do not tap or try to remove solidified area by force.
Titration flask or electrode may break and cause injury.

14-11. Replacement of filter of Dispenser

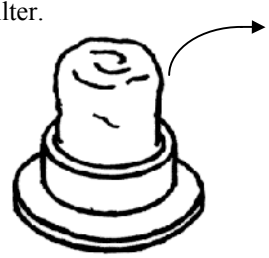
If the waste solution should contact Dispenser unit, replace the filter in the following way:

(1) Remove from Stirrer all belongings including tubings, titration nozzle, electrode, desiccant tube, titration flask, stirrer cable, etc.

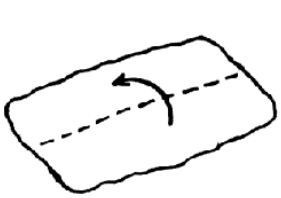
(2) Remove the black rubber filter cap from stirrer base.
Draw by peeling it.



(3) Remove the old filter.

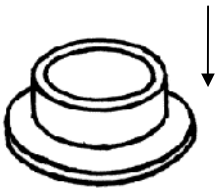


(4) Fold the filter and wind it, and attach to the filter cap.



fold

wind

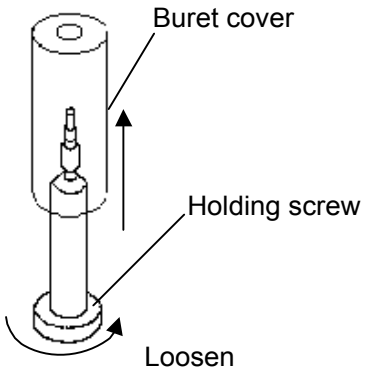


(5) Return the filter cap to Stirrer and reassemble Stirrer.

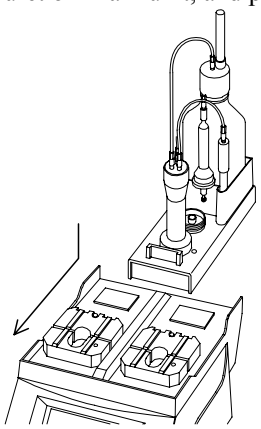
14-12. When the buret unit is hard to be mounted.

(1) Remove buret cover.

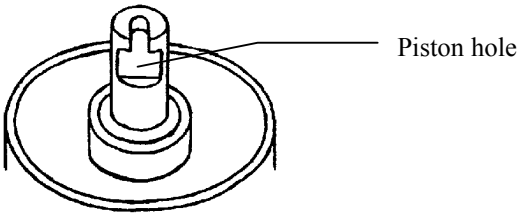
(2) Remove the buret out of the unit by loosening the holding screw.



(3) Place the buret unit without the buret on Main unit, and pull the unit to the front and insert the pin.

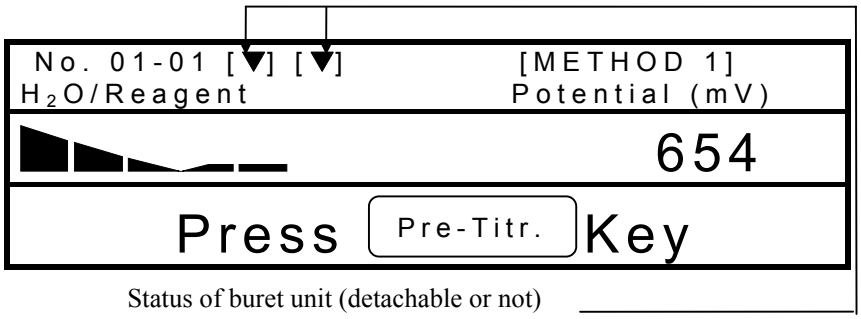


(4) Turn on the power and enter buret number by [APB] key, and press [▲] key until the piston hole on the rod appears. Then, stop the piston rod by pressing [▲] key again.

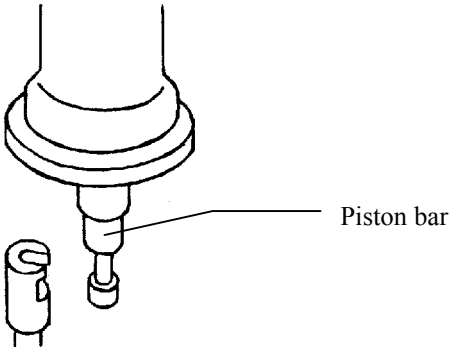


Note:

1. **The buret unit will not activate even after the holding pin is inserted unless both buret units (MKA-510N) are mounted. The MKS-510N has only one buret unit to be mounted.**
2. **Before the buret unit is mounted, turn on the buret power and make sure " [▼],[▼] " are shown on display. If its shows " [ ][ ] ", press [▼] key to display " [▼][▼] ", and then, mount the buret unit. (MKS-510N shows " [▼] " or " [ ] ")**



(5) Apply the piston rod to the bottom of piston and press [▼] key to pull it down. At this point, make sure to hold the buret so that the rod and piston are on the same axle line.
After the piston stops, fasten the buret screw to hold the buret.



CAUTION!

In order to avoid breaking the buret, hold the buret straight to the center of piston rod before moving the piston downwards.

15. Relation of moisture content and sample size

The standard relation of moisture concentration and sample size is shown below when 3mL or more is titrated for anticipated reproducibility in volumetric water measurement.
Sample size for 10ppm to 100% water concentration is shown for reference. Also refer to Function 4 where ultimate sample size can be displayed when anticipated moisture content is input.

Water %	Reagent factor 5mg/mL	Reagent factor 2mg/mL	Reagent factor 1mg/mL
50 ~ 100%	0.03 ~ 0.015g	0.012 ~ 0.006g	0.006 ~ 0.003g
10 ~ 50%	0.15 ~ 0.03g	0.06 ~ 0.012g	0.03 ~ 0.006g
1 ~ 10%	1.5 ~ 0.15g	0.6 ~ 0.06g	0.3 ~ 0.03g
0.1 ~ 1%	15 ~ 1.5g	6 ~ 0.6g	3 ~ 0.3g
100ppm ~ 0.1%	150 ~ 15g	60 ~ 6g	30 ~ 3g
10ppm ~ 100ppm			300 ~ 30g

16. Display messages and glossary

16-1. Display message and meaning

Display	Meaning
A	Water concentration of extracting solvent to dissolve sample in indirect method, necessary in Eq. 3 or 6.
Ageing	Ageing is purging moisture inside the heating system of Evaporator by carrier gas to reduce drift before measurement.
Auto	abbreviation of automatic
Auto Statis. Auto Statistics.	Automatic batch calculation
B	The amount (g) of extracting solvent to dissolve sample in indirect method, necessary in Eq. 3 or 6.
Back Purge	Purge moisture existing between sample inlet and sample boat outlet.
Balance	Electronic weight scaling device
Baud Rate	Rate of communication speed by interface
Blank	Water intentionally added to titratioin flask.
Calc	Abbreviation of calculation or its parameter
Calc. No.	Equation No. of calculation formula
Cell Purge	Purge moisture existing between sample inlet and titration cell
Concentration	The amount of water in percentage
Data	Information including measurement results and parameters
Data Bit	Number of bit in data communication via interface
Data Deletion	To erase stored data
Data not exist!	Error message when out of data
Data Print	Select or not printing individual data of batch calculation
Date & Time	Setting calendar date and present time
Dens	Abbreviation of density necessary for Eq.4
DP-	Model DP-500 thermal dot printer by KEM
Drift	Water permeating into titration flask without knowing.
Drift Comp.	Correction of drift during titration
EEPROM Initialized	Message when ROM chip is in error. Reset by [↵] key.
Even	Even number of parity in protocol
Factor	Factor of reagent
Form 1	Graphic chart of total titration ratio by 100% at EP

Display	Meaning
Form 2	Graphic chart of titration per unit time over total water content
Fixed	Set parameters are fixed.
Function	Menu to process data or activation
GLP	Print out conforming to GLP requirements
Hour	Setting of the hour of the day
IDP-	Model IDP-100 impact dot matrix printer by KEM
Interface	Device for digital communication or its parameter for RS-232C, Balance or Printer
Lot No.	Group number of a sample for measurement
Low Sample No.	Individual sample number (00 to 99)
Manu. Manual	Operation by hand
Mean	Average
Meas. No.	Serial number of measurement
Memory Clear	Initialize stored data to default
Memory Initialized	Data has been initialized to default
Method	Form of titration. MKA-510N/MKS-510N has 5 methods, for which parameters including Titration, Results, Sample, etc. can be set up separately.
Moisture	Water content or its display amount
Next Meas	Sample file number for next measurement
None	No parity for data communication
Odd	Odd number of parity in protocol for data communication
Off	State of negative position or action
On	A mode or program to be activated or activating
Operator	User's name to be registered
Other	Printers other than specified in Manual
Over/Purge	Setting ageing and its time for Evaporator
Oven Temp.	Heating temperature for Oven
Parity	Parity in protocol for data communication
Permis. Err.	Input deviation for criterion of precision
Potential	Voltage of current in titration vessel
Press Pre-Titr key	Message on Main display asking Operator to prompt pretiration
Pre Treat	Pretreatment of sample using Evaporator

Display	Meaning
Printer	Selection of printer and its setup
Print Graph	Select type of graphic chart of titration
Print Time	Sampling time to print titration graphics
Protect	Inhibit to change already input parameter
Recalculation	Repeat calculation by changing equation, sample size or constant of formula, etc.
Report	Selection of print format
Result	Results of measurement and calculation or selection of its display or graphics Also, it shows measurement results.
RSD	Relative standard deviation, same as CV%
RS-232C	Standard protocol for communication by cable
S	Abbreviation of unit time “second”
Sample	Parameter for sample to be measured
Sample File	File to store specification of sample and its measuring conditions that can be preset by [Sample] key in advance
Sample No.	Sample number consisting high order number for grouping and low order number to identify sample by serial number. Batch calculation is computed by group, and if a high order number is changed, its data is deleted as if it were separate group.
Sampler Purge	Blow out moisture in Sampler of Oven by carrier gas
SD	Standard deviation
Serial No.	Production number of Product
Setup	Function to set up data process and its management
Short	A form of printout of data but not GLP
Size	Parameter of sample like weight, volume, capacity or constant, etc.
Soft H.S.	Communication parameter by softhand shake via RS232C cable
Speed (0 - 9)	Stirrer speed setting
Standard value	Specified value of a standard substance for precision check
Start	Set to start measurement or activation
Press Start key	Dialog message asking for [start] key pressed by Operator

Display	Meaning
Stir. Time	Time set up as t (stir), stirring and counting time before titration starts
Stop Bit	The number of stop bit in protocol for digital communication
Temp.	Temperature of gas necessary for Eq. 5
Titr. Curve	Setup printout of titration curve and data
Titration	Parameter for titration
Titration Time	Selection to print time for titration
t (max)	Time to limit titration. Measurement ends after t (max).
t (stir)	Time to stir after start until titration
t (wait)	Titration continues during this time
Unit	Selection of unit to express results of calculation
Variable	Settings or parameters changeable
V1	Injected sample size(mL) for Eq. 4
V2	Injected gas volume(L) for Eq. 5
Weight	Selection of input of sample weight
Wt1	Weight of sampler and sample before the sample is released (g)
Wt2	Weight of sampler after the sample is released (g)
Wt0	Sample(g) injected into solvent in indirect method, necessary for Eq. 3 or 6
Os	Zero second for t(max) means no limit time
Oven Start	Evaporator is preparing Oven to heat.
Oven Purge	Evaporator is purging its system.
Sampler Open, Press Start key	Turn the ball stopper on the eggplant type sampler to open the vent hole, and press [Start] key to ventilate.
Sampler Close, Press Start key	Slide the sampler to close the vent hole and press [Start] key
Input Weight	Input weight of the sample
Samp. Boat Mov'n	The sample boat is moving to Oven.
Sample In Press Start key	Inject sample and press [Start] key
Result	Measurement results after correction and computation
Measurement	Sample is being measured.

Display	Meaning
APB	APB means Automatic Power Buret,abbreviation of Automatic Power Buret
Buret No.	Selection of buret to work
Balance	Function to select Balance, selection of auto or manual input of weight.
Back Calc. No.	Formula for back titration by Eq. 9. Data×F1 by Eq. 1 to 6 = (Dose×F2 - Data×F1)
Buret No. 1/2	Enter reagent factor for Buret 1 or 2 filled with reagent
Buret	Special function for buret in Function to set up manual fixed dose, dispense speed, backlash amount, etc.
Back Rush	Set up amount of backlash to push out any air bubble back to the reagent bottle.
C1	Water concentration of standard used for factor measurement of KF reagent
Drift Titration	Selection of drift titration to eliminate water by titrating moisture permeating into titration vessel from ambient air.
Dose Mode	Mode to dose fixed volume of solution from working buret. Preset amount of reagent is dosed from the active buret before titration starts.
Dose Buret No.	Select a buret to work on dose mode.
Dose Volume	Setting Fixed dose volume
Detector Mode	Detection by selecting mode. Normal 1 . For sample of high liquid resistance, set mode 2.
Dose Speed	Dosing speed on fixed dose mode.
End time	Setting time to wait for EP, which is reached when dehydration continues for the preset time.
Fast	Fast titration speed
F.Meas.	Select Manual or Auto for factor measurement.
F.Meas.No.	Number of times of factor measurement by auto
I.Potential	Initial potential at start of measurement
I.Resistance	Initial resistance at start of measurement Liquid resistance at start of titration.
LCD Contrast	Adjust brightness of LCD by contrast

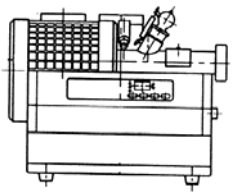
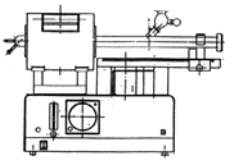
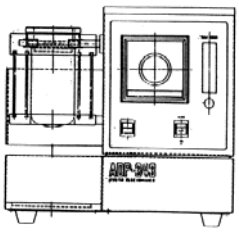
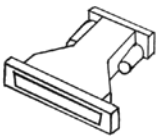
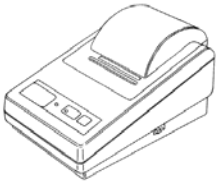
Display	Meaning
Med.	Abbreviation of medium speed
Manual Dose	Setting amount of manually dosed volume. Dose fixed volume manually by [Start] key
H_2O/Reagent	Shows excess of water or iodine in titration vessel by graphic mark of "▟▙▁".
Purge	Setting number of times for purging buret. Press [▲▼] key.
Reagent Reagent Factor	Setup of reagent factor by auto or manual
Slow	Slow titration speed
Suction Speed	Select Fast or Slow speed for dispensing reagent into buret.
Titr. Mode	Titration mode. Normal setting 1. For back titration, select 2. Set 3 if excess iodine by 1.
Titr. Buret No.	Select a buret to work for titration
Titr. Speed	Titration speed depends on reagent. Slow down if excess iodine is generated.
t(interval)	Select time to cut off titration, during which time dosing reagent stops. Cut-off time is the waiting time between doses of KF reagent.
Titr. Volume	Titration volume shown on recalculation. Changing input amount is inhibited.
Max. Volume	Titration ends when preset maximum volume of reagent is dispensed.
Pre titr.	Pretitration is in process before measurement starts
Drift	Drift is being titrated to maintain the cell dehydrated by dosing reagent when excess water is detected.
Manual Dose	The buret is on Manual fixed dose mode.
▲	The display can return to the previous page by this key [page up] or [↑] key. (when the cursor stays at the top line)
▼	The display can go to the next page by this key [page down] or [↓],[↵] key. (when the cursor stays at the bottom line)
(Cursor blinks)	Enter numeral or character by numeric key and [·],[-/Disp.] key.
(Cursor is On)	Select items by [↑][↓][←][→] key.
(under bar)	Active parameter is indicated.

16-2. Glossary

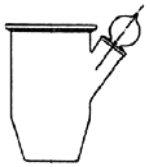
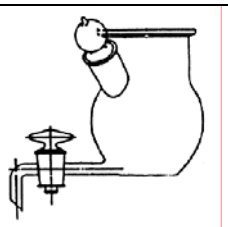
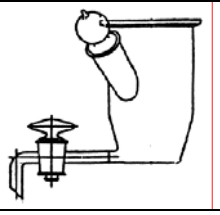
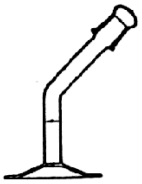
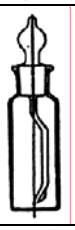
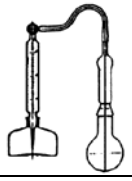
Word	Meaning
Ageing	See “Ageing” on display
Sampler purge	See “Sampler Purge” on display
Evaporator	When moisture sticks around the sample or exists as crystallized, or when a sample cannot be injected into titration cell, such sample is heated to vaporize the moisture in Oven for measurement.
Cell purge	See “Cell Purge” on display.
Drift	See “Drift” on display.
Purge	To push out inside moisture by carrier gas
Back purge	See “Back Purge” on display
Parameter	Each condition or value for titration or calculation
Factor	See “Factor” on display
Blank	See “Blank” on display
Method	Measuring form consisting of parameters

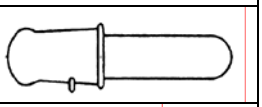
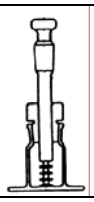
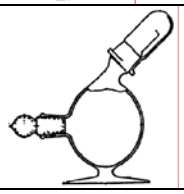
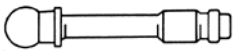
17. Parts list

Optional accessories and peripherals

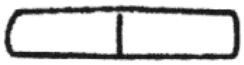
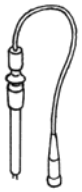
Part code	Part name	Qty	Remark	Sketch
ADP-511S	Evaporator	1	Temperature: Room to 300°C.	
ADP-342S	Evaporator for high heat	1	Temperature: Room to 1000°C	
ADP-343	Evaporator for oil	1	Temperature: Room to 200°C	
ADP-344	Heater for sucrose	1	Temperature: Room to 60°C	
AE-118DR	AE-118DR Balance	1	Conversion module (#350-0001) is necessary for connection to the Balance	
#350-0001	Conversion module	1	9P-25P	
IDP-100-10 IDP-100-11 IDP-100-12	IDP-100 printer	1 1 1	100 V 120 V 230 V Impact dot matrix printer with cable	
DP-500/21 DP-500/22	DP-500 Printer	1 1	100V area 200V area Thermal dot printer with power cable	

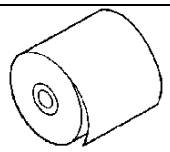
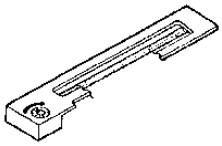
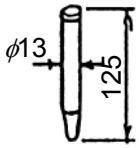
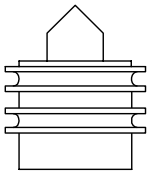
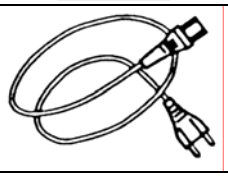
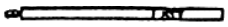
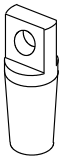
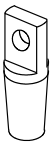
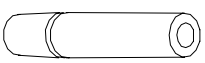
Optional parts

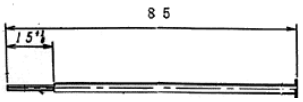
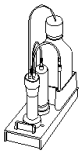
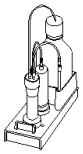
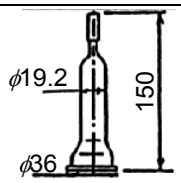
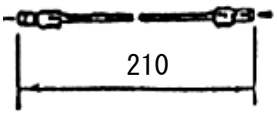
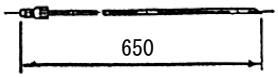
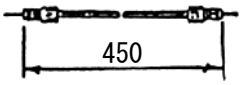
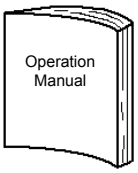
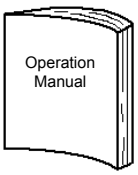
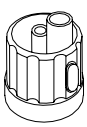
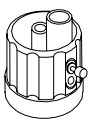
Part code	Part name	Qty	Remark	Sketch
#740-3001	S-type flask	1	Standard supplied Capacity 30 to 80mL	
#740-3002	N-type flask	1	Capacity 50 to 130mL	
#740-3003	C-type flask	1	Capacity 50 to 130mL	
#740-3005	D-type flask	1	Capacity 30 to 80mL	
#740-3011	Bent-type sampler	1	Bent type	
#740-3020	C-bent-type sampler	1	For powder For ADP-511 ADP-351	
#740-3012	Spoon type sampler	1	For viscous sample	
#740-3013	Oil sampler	1		
#433-3014	Liquid gas sampler	1	Pressure vessel SUS 100mL	

Part code	Part name	Qty	Remark	Sketch
#740-3026	Straight light sampler	1		
#740-3030	Sampler for viscous sample	1		
#740-3024	C-eggplant type sampler	1	For powder For ADP-511 ADP-351	
#740-3025	Light type sampler	1		
#740-3031	Pressure sampler for high viscosity	1		

Consumable parts

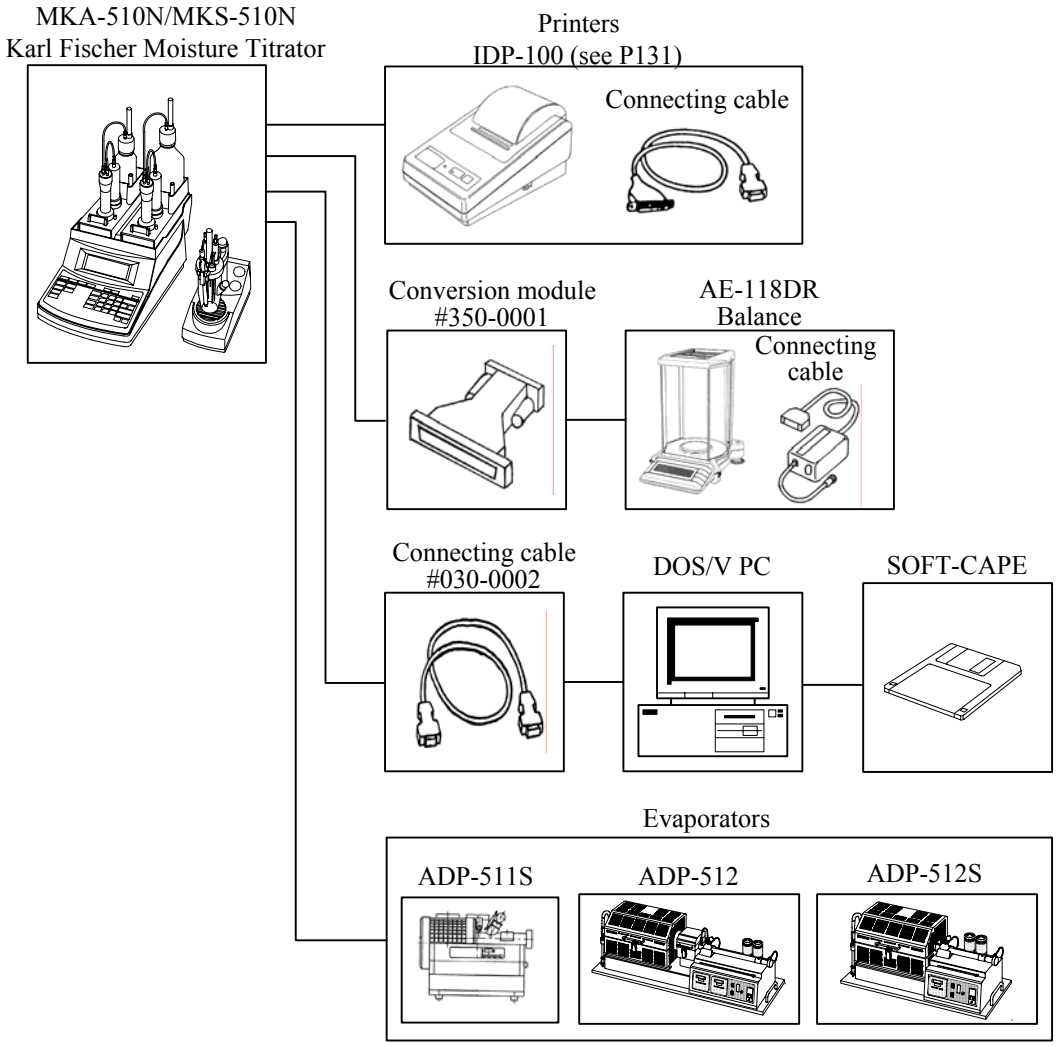
Part code	Part name	Qty	Remark	Sketch
#500-3141S	Stir spinner (25mm)5 pcs/set	1		
#433-3116	Desiccant tube A	1		
#103-M714	2-pin Pt. electrode	1		
#500-3166	Syringe (5mL)	1	for cleaning switching valve	
#500-3225	Syringe (20mL)	1		
#433-3407	Side stopper for syringe	1	with septum	

Part code	Part name	Qty	Remark	Sketch
#829-0001S	Printer Paper	1	4 rolls/1 set	
#829-0002	Ribbon cartridge	1	for IDP-100	
#523-3227S	Silicone pellet 5 pce/set	1		
#523-3161S	Septum 10 sheets/set	1		
#509-0003	Filter	1	for Magnetic stirrer with Dispenser	
#430-0051	Nozzle pocket	1		
#551-5206	Piston buret 10mL	1		
#320-3124 #320-3461 #320-4199	Power cable in accordance with your order	1 1 1	AC 100-120V AC 220V, 230/240V UK	
#551-5002	Piston rod	1		
#520-3129	O-ring for flask	1		
#550-0073	Port plug 19/25	1	for sample inlet	
#550-0074	Port plug 15/20	1	for flask hole stopper	
#550-0055	KF joint	1		

Part code	Part name	Qty	Remark	Sketch
#521-0028	Tip of Diffusion proof nozzle	1		
#521-0040	Titration nozzle (for ME)	1		
APB-510-KF	Buret unit	1	10mL	
APB-510-ME	Buret unit	1	10mL for water-methanol	
#430-0048	Piston buret (10mL)	1	with piston head	
#439-0055	CB5120 tube (black)	1	Cock-Buret 5mL, 10mL for tubing	
#439-0056	CR5120 tube (black)	1	Cock-Bottle 5mL, 10mL for tubing	
#439-5189	CTPT20 tube (black)	1	Cock-Nozzle 5mL, 10mL for tubing	
#595-0246	Operation manual	1	English	
#595-0248	RS-232C Operation manual	1	English	
#433-0066	Reagent bottle cap (for KF)	1		
#433-0067	Reagent bottle cap (for ME)	1		

Part code	Part name	Qty	Remark
#812-4008	Composite 5	1	
#812-4007	Composite 2	1	
#812-4036	Composite 1	1	
#812-4018	Composite 5K	1	for ketone
#812-0016	Composolver	1	1L
#812-4035	Dehydrating solvent ML	1	
#812-4029	Dehydrating solvent MI	1	
#812-4039	Dehydrating solvent MS	1	
#812-4030	Dehydrating solvent CM	1	for oil
#812-4031	Dehydrating solvent FM	1	for sucrose
#812-4032	Dehydrating solvent CE	1	for ketone
#812-4034	Dehydrating solvent ME	1	for gas
#812-4048	Water-methanol 2	1	250mL
#812-4044	Water-methanol 5	1	500mL
#812-0001	Water standard	1	Factor 10 10 pcs/set
#820-3269	Silica gel	1	500g

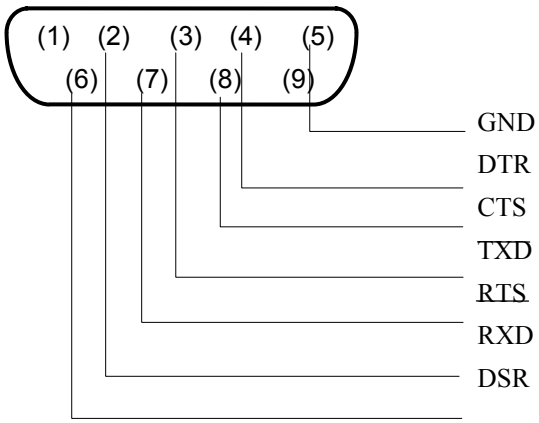
18. System flow chart



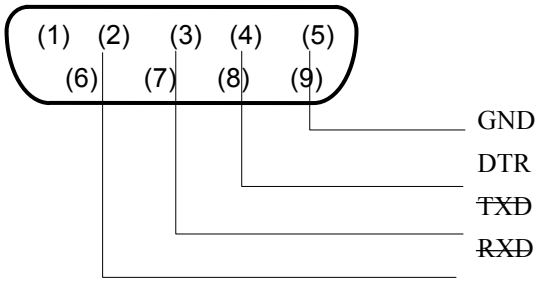
19. External I/O interface pin configuration

The connector confirms to JIS X5101 with 9 pin male type.

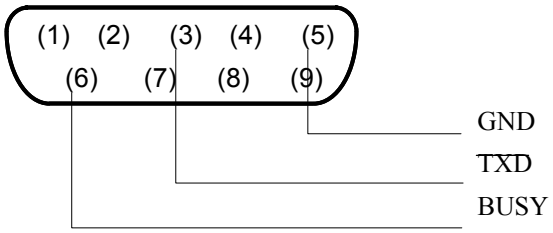
(1) RS-232C



(2) Balance



(3) Printer



20. Basic specification

Type and Model	MKA-510N/MKS-510N Karl Fischer Moisture Titrator
Measurement method	Karl Fishcer volumetric titration
Measuring range	1) Titration: 0.005 to 99.995 mL 2) 0.1~500mg H_2O 3) 10ppm~100% H_2O
Control method	Built-in microcomputer
Endpoint detection	Polarized potential by Pt. 2-pin electrode with liquid resistance compensation
EP wait time	1) Select 1 to 99 seconds 2) Set up potential to maintain EP level
Titration form	1) Normal titration 2) Back titration (MKA-510N only)
Special functions	1) Titration speed control by 6 steps 2) Automatic start by sensing sample 3) Drift titration to maintain dehydration 4) Start delay setting: 0 to 9999 s 5) Continuous titration: 0 to 9999 s 6) Limit titration time: 0 to 9999 s 7) Cut-off titration: 0 to 9999 s
Method	Six Methods individually filed with parameters including normal titration, evaporation, back titration (MKA-510N only), factor measurement, etc.
EP indication	by beep and message on display
Calculation	1) Batch calculation for statistics including concentration, average, standard deviation, etc. 2) Factor computation
Self diagnosis	Error message on erroneous key entry, excess of titration, abnormal polar potential, liquid resistance, etc.
Power buret 2 sets (MKA-510N) 1 set (MKS-510N)	1) Piston with brown cylinder 2) Reagent dispensing with auto switching valve 3) Backlash mechanism and its time setting function 4) Delivery speed: maximum approximately 0.5 mL/second 5) Suction speed: approximately 20s/10mL or 80s/10mL two steps 6) Capacity: 10mL,cumulative titration possible up to preset maximum titrant volume. 7) Accuracy: ±0.015mL, Reproductbility: ±0.005mL

Solvent	For S-type titration flask : 1) Minimum 30mL 2) Maximum 100mL
Additional function	Control ADP-511S Evaporator including heating temperature, aging sequence and measuring conditions with sample boat.
External output	RS232C interface for Printer RS232C interface for Balance and RS232C interface for Computer
Ambient condition	Temperature 5 to 35°C, Humidity less than 85%RH
Power source	AC100 to 120V , AC200 to 240V 50/60Hz
Power consumption consumption	35W
Dimension	1) Main unit: 274(W)×458(D)×575(H)mm 2) Stirrer: 118(W)×225(D)×320(H)mm 3) Dispenser: 240(W)×170(D)×280(H)mm 4) Printer: 106(W)×180(D)×88(H)mm
Weight	MKA-510N 13.5kg MKS-510N 12.5kg

21. Warranty

Warranty is provided by Manufacturer for products, parts purchased or maintenance, installation serviced under the following conditions.

1 Guaranty

The product you have purchased passed factory inspection and testing prior to shipment, and maintenance service is performed under quality system, however, if any defective part or malfunctioning should be found due to Manufacturer's craftsmanship, installation or insufficient description of operating manual, the quality is guaranteed for one year after the date of purchase by free of charge repair except consumable parts, provided the instrument or parts has been in normal use and operation.

2 Waiver

This warranty does not cover any of the following conditions:

(1) Unauthorized modification or specification change by user

(2) Use in range or condition other than specified

(3) Use of parts or reagent other than specified

(4) Negligence of maintenance recommended by Manufacturer

Cost of repair for any of the following causes shall be chargeable to user:

(1) by erroneous handling or use of the instrument by user

(2) Caused by use of an equipment or parts or its combination not in original

(3) Caused by excess use or under extreme condition

(4) Caused during transportation or move after installation

(5) Caused by fire, earthquake, lightning and other act of god

3 Escape clause

Under no circumstances will Manufacturer be liable for any damage, whether incidental or other, or for any other remedy arising from any loss, damage or injury in connection with use of the article.

4 Duration of supply of spare parts and repair service

(1) Parts and repair service will continue for seven years after termination of the product.

(2) Repairs and maintenance service for the product ten years after installation may not be available even if onerous requested by user.