Karl Fisher Moisture Titrator

MKA-520 / MKS-520

Operation Manual

Please read this manual carefully before you use the instrument.

Ver.07
A/N 69-001-0401-48

Table of Contents Page

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-520 is twin buret titrator that can perform back titration and automatic factor calibration with water-methanol standard.
The MKS-520 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.

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

- 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

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

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

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

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

2. Where there exists a danger of property damage:

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

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

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

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

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

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

1-3. ⚠ Safety symbols

Always observe these signs and instructions.

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

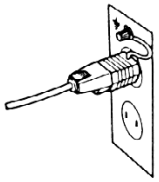
⚠ **Warning** This symbol means "Danger of severe injury or possible death".	This symbol means prohibition of an act.
⚠ **Caution** This symbol means "Danger of injury or property damage".	This symbol means mandatory.

⚠ WARNING!

You must ground earth wire of power cable.

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

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



Danger of electric shock if not grounded to earth.

⚠ WARNING!

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

Danger of fire if a wrong fuse is loaded.

⚠ WARNING!

Do not use volatile chemical or work in flammable gas.

Danger of explosion inside the instrument.

⚠ WARNING!

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

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

⚠ CAUTION!

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

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

⚠ CAUTION!

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

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

⚠ CAUTION!

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

Danger of fire, shock or malfunctioning of the unit.

About place for installation

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

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

About power source

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

About place for storage

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

About use

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

Other caution

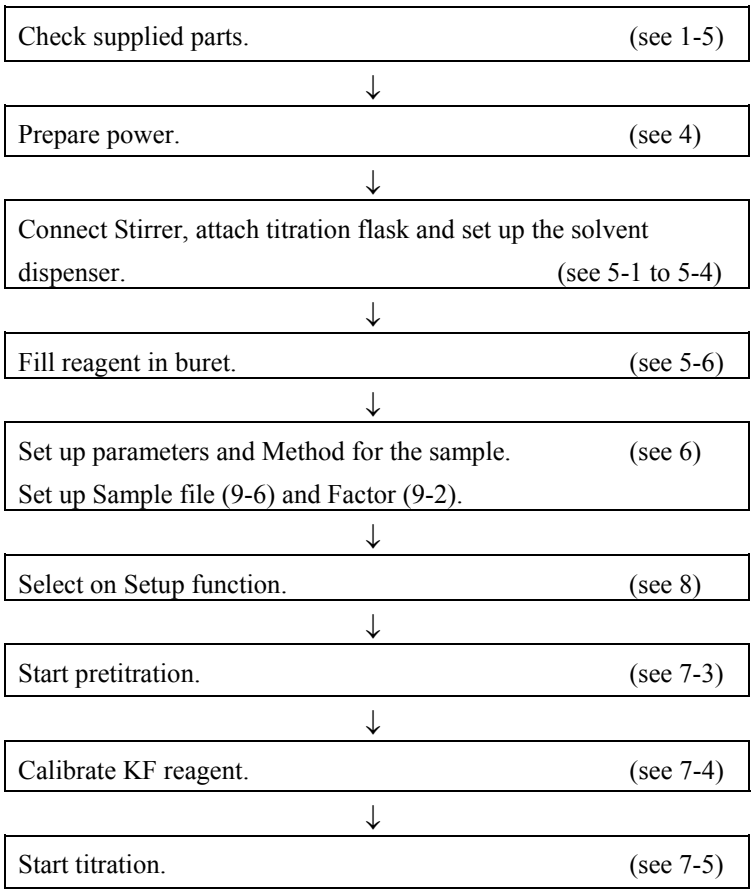
- Do not use such a solvent as alcohol, acetone, thinner or the like for cleaning this instrument. Doing so may adversely affect the instrument, e.g. deformation, discoloration or cracks. When cleaning this instrument, wipe it with a soft cloth or tissue paper, after applying detergent diluted with water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

Environmental condition

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

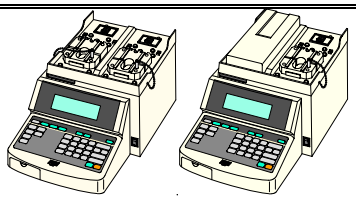
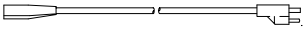
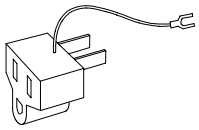
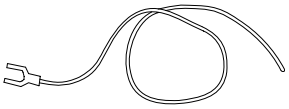
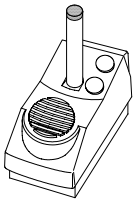
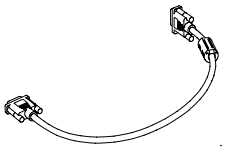
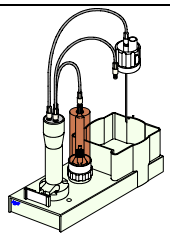
1-4. From unpacking till starting titration

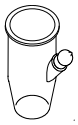
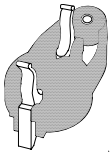
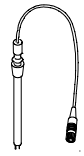
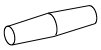
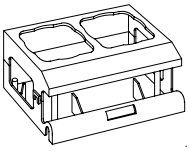
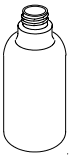
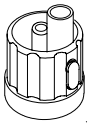
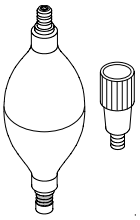
The below chart shows the flow from unpacking the carton box until the first measurement is started.

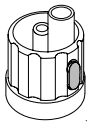
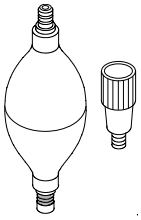
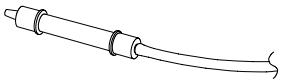
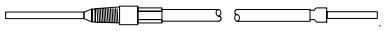
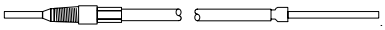
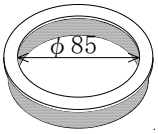
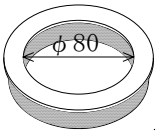
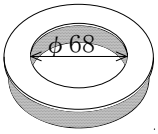
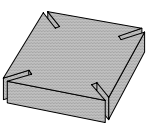


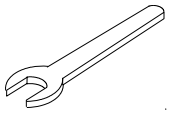
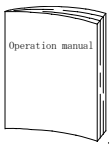
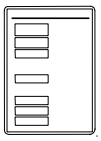
1-5. Supplied parts

The carton box that has been delivered to you contains the following items including the MKA-520 / MKS-520, the parts and Users manual. Please check them with the below parts list:

Part name	Part code	Qty	Sketch
Main unit	—	1 unit	 (MKA-520) (MKS-520)
Power cord with earth wire (AC 100/120V area) (AC 220/230/240V area) (for UK) (for China)	 98-320-3198 98-320-3461 98-320-4199 64-000-1800-48	1 pce	
Adapter for power connector (AC 100/110V only)	98-320-3199	1 pce	
Ground wire (AC 100/110V only)	98-433-3331	1 pce	
Magnetic stirrer	12-001-8500-48	1 unit	
Stirrer cable	98-428-0031	1 pce	
Burette unit*	EBU-610-KF (MKA-520) (MKS-520)	1 unit	

Part name	Part code	Qty	Sketch
S-type titration vessel	98-740-3001	1 pce	
Titration vessel stopper	98-433-3435	1 pce	
Twin platinum electrode / KF	98-103-M714	1 pce	
Stirrer rotor (25mm)	(98-500-3141)	1 pce	
Desiccant tube A	98-433-3116	1 pce	
Port plug (15/20)	98-550-0074	1 pce	
KF grease (5g)	98-433-3138	1 pce	
Bottle holder	98-560-0017	1 pce	
Polyethylene bottle (1L)	69-000-2800-48	1 pce	
Reagent bottle cap (with plug)	98-430-0052	1 pce	
Rubber globe for drain	98-433-0105	1 pce	

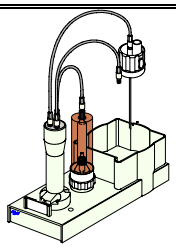
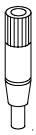
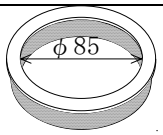
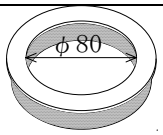
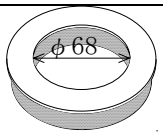
Part name	Part code	Qty	Sketch
Reagent bottle cap	98-430-0058	1 pce	
Rubber globe	98-433-0069	1 set	
Plug for titration flask	98-550-3500	1 pce	
Desiccant tube	(98-444-6542)	1 pce	
Injection tube	98-433-0118	1 pce	
Drain tube	98-433-0119	1 pce	
Bottle holder 1	(98-569-0001)	1 pce	
Bottle holder 2	(98-569-0002)	1 pce	
Bottle holder 3	(98-569-0003)	1 pce	
Bottle stand	(98-569-0004)	1 pce	

Part name	Part code	Qty	Sketch
Piston extraction rod	98-551-5002	1 pce	
Wrench 8mm	98-514-3339	1 pce	
Operation manual	69-001-0401-48	1 copy	
Quick reference	69-001-0405-48	1 copy	

Note:

Parts with parenthesized part code have unique order units or packing forms different from others. Therefore, please refer to the section "16. Parts list" when ordering these parts.

— Components of EBU-610-KF —

Part name	Part code	Qty	Sketch
Burette unit	—	1 set	
Desiccant tube A	98-433-3116	1 pce	
Nozzle cover	(20-040-5200-48)	1 pce	
Joint	20-040-4700-48	1 pce	
Tip of diffusion proof nozzle	12-006-4900-48	1 pce	
Nozzle (for ME)	20-040-5100-48	1 pce	
Bottle holder 1	(98-569-0001)	1 pce	
Bottle holder 2	(98-569-0002)	1 pce	
Bottle holder 3	(98-569-0003)	1 pce	
Seal	(98-594-0010)	1 pce	

Note:

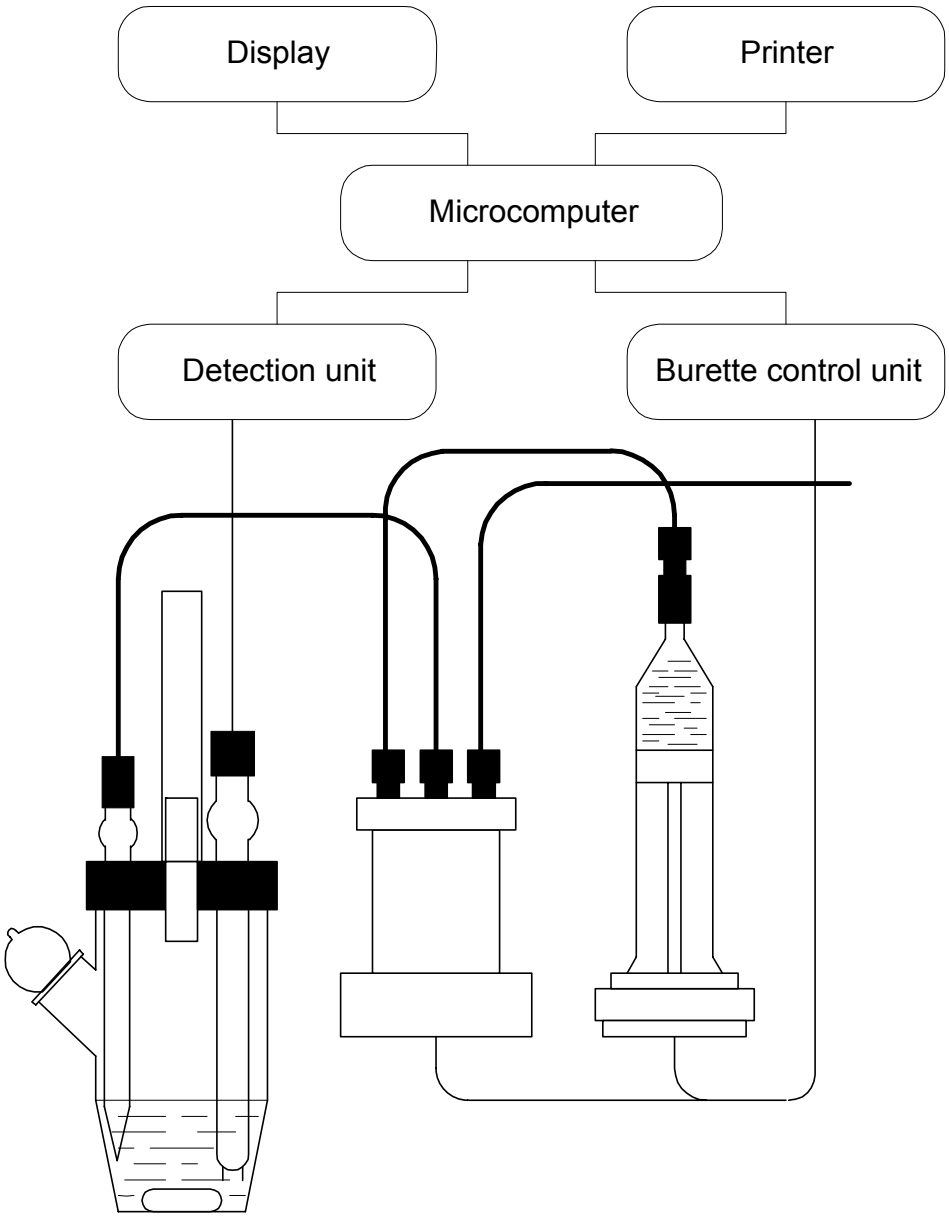
Parts with parenthesized part code have unique order units or packing forms different from others. Therefore, please refer to the section "16. Parts list" when ordering these parts.

2. Principle of measurement

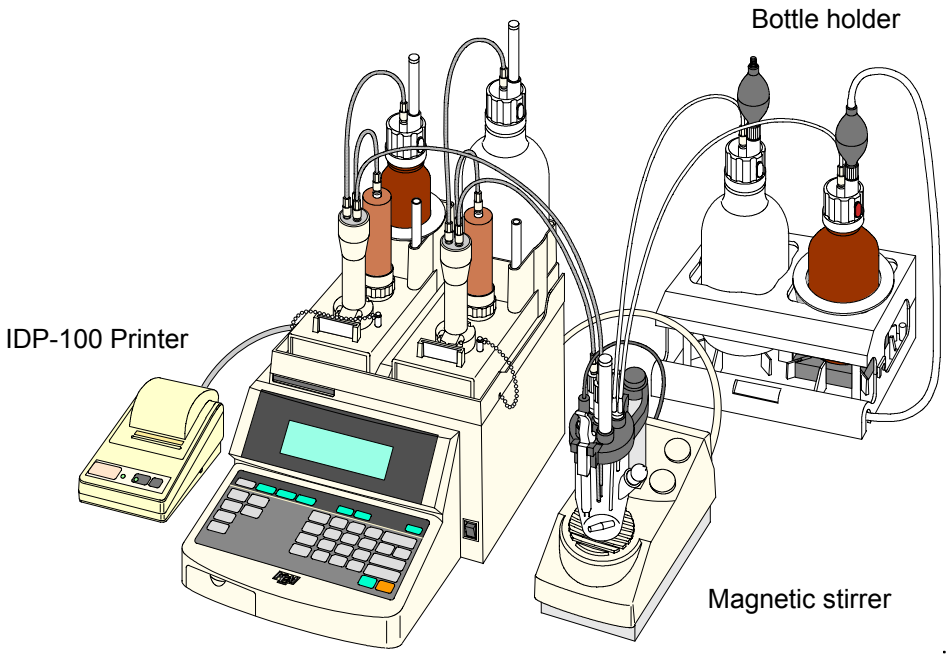
Water content in the presence of base and alcohol reacts with iodine and sulfur dioxide quantitatively as follows:

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

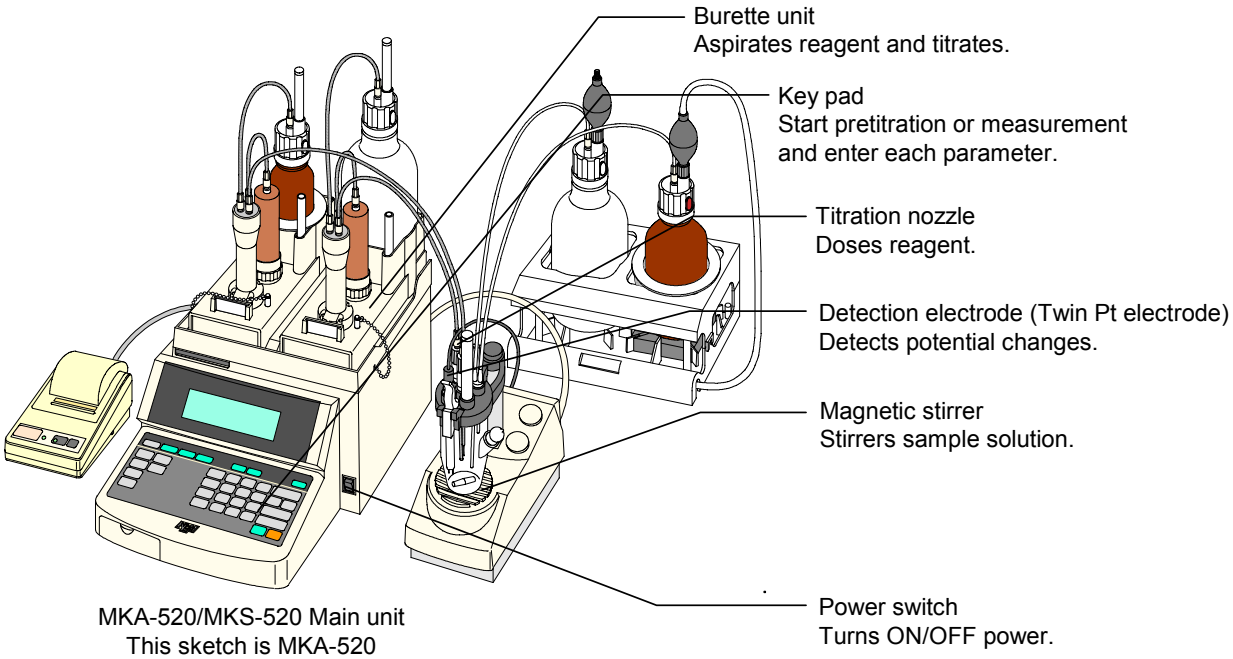
Karl Fischer moisture determination is based on this reaction. Add sample solution after the solvent in titration vessel is dehydrated by KF reagent. Quantitative titration of water is complete with KF reagent, of which factor is determined in advance (mg H2O/mL) by standard water-methanol. Titration is progressed by detecting polar potential of the electrode while controlling titration speed.



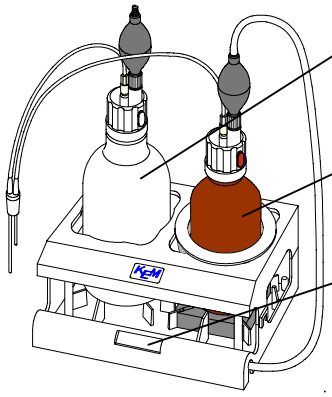
3. Parts name and function



MKA-520/MKS-520 Main unit
This sketch is MKA-520



MKA-520/MKS-520 Main unit
This sketch is MKA-520

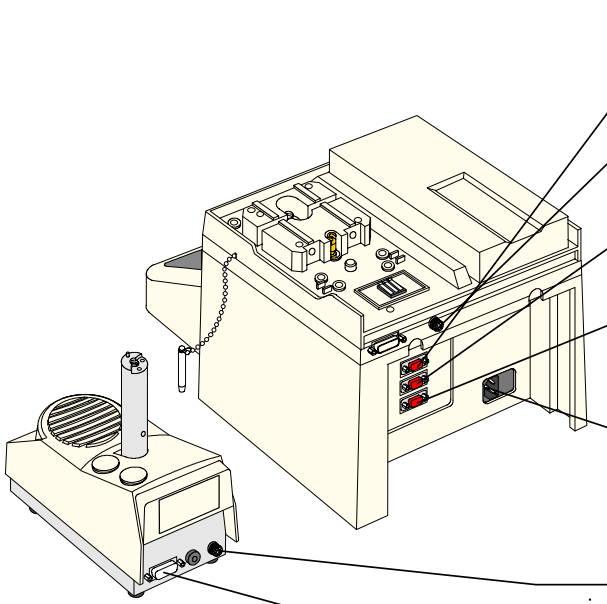


Waste bottle
This bottle keeps the used liquid after measurement.

Reagent bottle
Use a commercially sold solvent bottle.

Desiccant tube
Absorbs moisture of solvent.

Bottle holder



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.

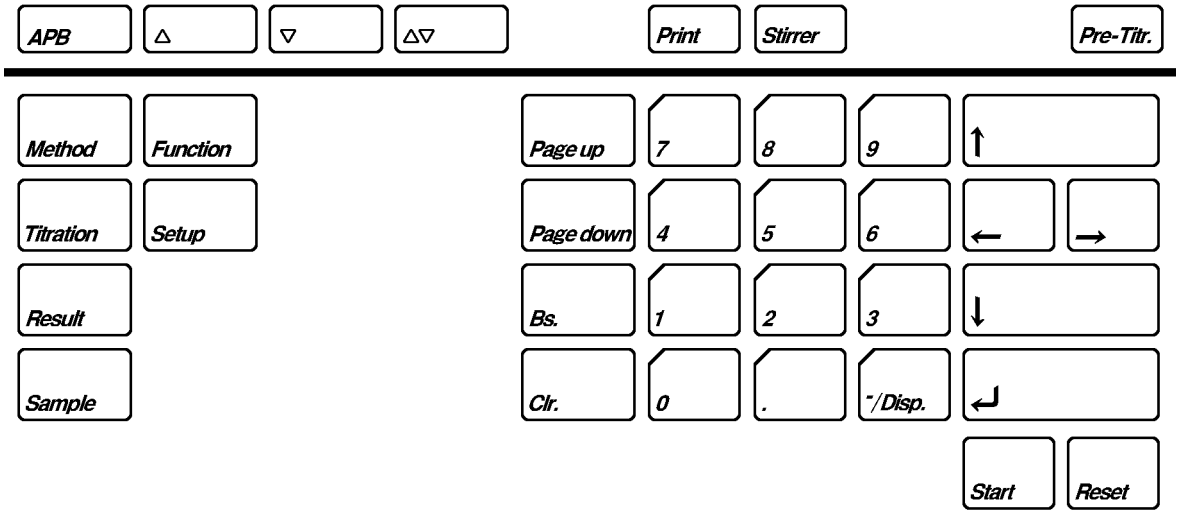
Power receptacle
Power cable is plugged here.

Electrode connector

Main connector
Connect Main unit.

Rear view of MKS-520

Key configuration



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-520 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

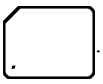
Pre-Titr. ..... Key to pretitration

Start ..... Key to start titration

Reset ..... Key to stop titration

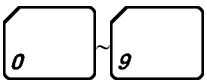
"/Disp. ..... Display Key

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

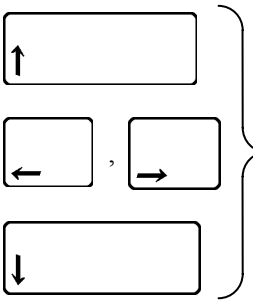


.....Period key

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



.....Numeric Key



.....Key to move the cursor


.....Enter Key

Key to confirm key entry

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

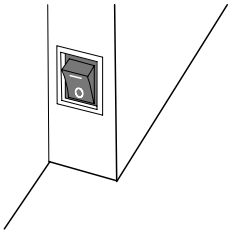
.....Key to move the ▼ marked display to the next page.

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

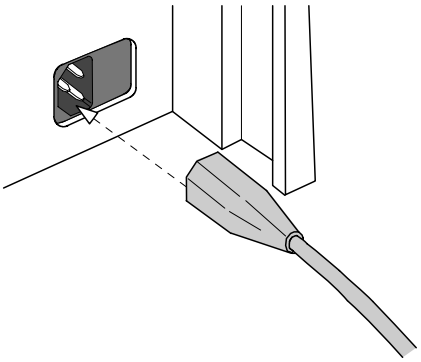
. .....Key to erase all the entered characters or numerals

4. Power source

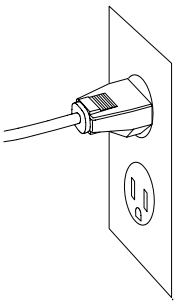
1) Make sure the power switch is in OFF position.



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

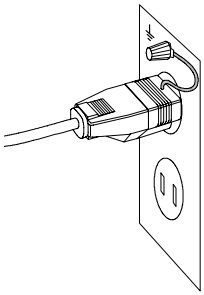


3) Plug in the other end of the cord to the power outlet.



< 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 adapter for power connector and ground the green wire to earth.

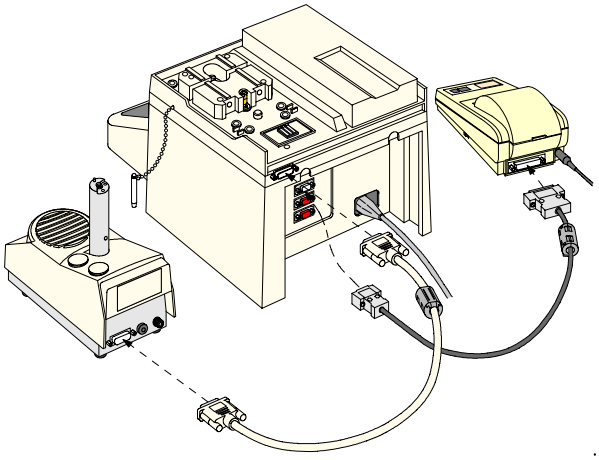
⚠ Warning!

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

5. Preparation before measurement

5-1. Connect with Magnetic stirrer

Connect the magnetic stirrer to Main unit.

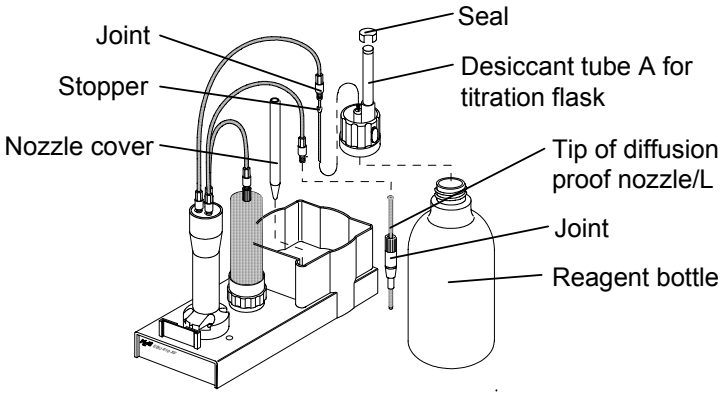


⚠ Caution!

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

5-2. Installation of burette unit

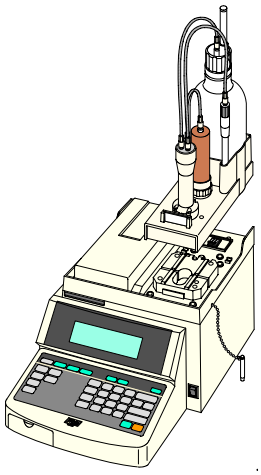
1) Insert the tube from burette unit through the reagent bottle cap, and settle the reagent bottle it in place as shown below. (Please check that the joint and the stopper are attached to the tube.)
2) Install the desiccant tube A onto the reagent cap. At this point, remove the seal attached to the desiccant tube A.
3) Put the nozzle cover in place.
4) Squeeze the tip of diffusion proof nozzle/L into the joint, and connect it to the tube. For the unit of Water Standard-Methanol, connect the nozzle (for ME) with the tube.

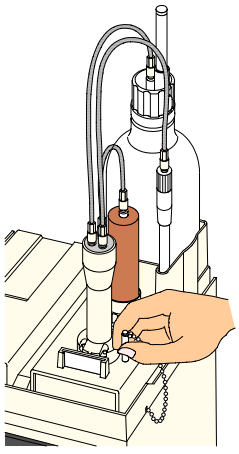


Note:

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

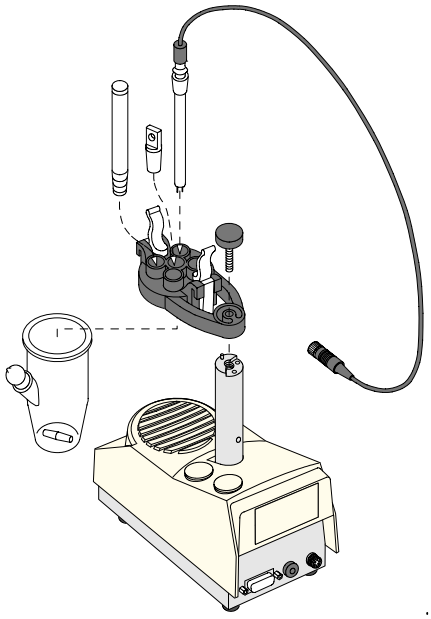
5) Place the burette unit onto the main unit, and push it towards you to set it in. Place the buret on top of Main unit, and fasten by pulling it to the front. The buret to the right is Burret 1 for KF reagent and the buret to the left is Burret 2 for water-methanol. (for MKA-520).
6) Insert the lock pin into the unit until it reaches the bottom.





5-3. Assembly of titration flask

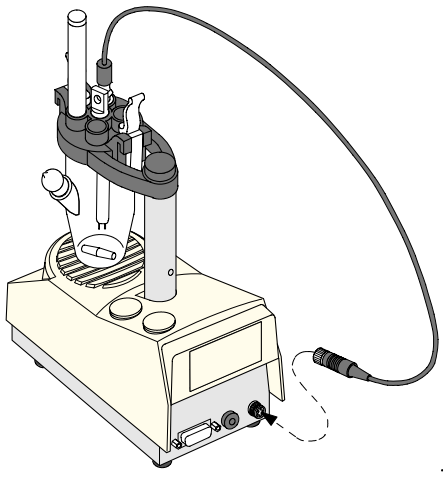
1) Fix the titration vessel stopper onto the magnetic stirrer with the screw.
2) Pull the lever on the titration vessel stopper to put the titration flask (S-type titration vessel) with a stirrer rotor in it in place. At this point, apply a small amount of KF grease on contact area between flask top and lid.
3) Install the twin platinum electrode/KF, desiccant tube A and the port plug (MKS-520 only) on the lid for titration flask. The position for installation is shown below. At this point, apply a small amount of KF grease on slide contact area.



Note:

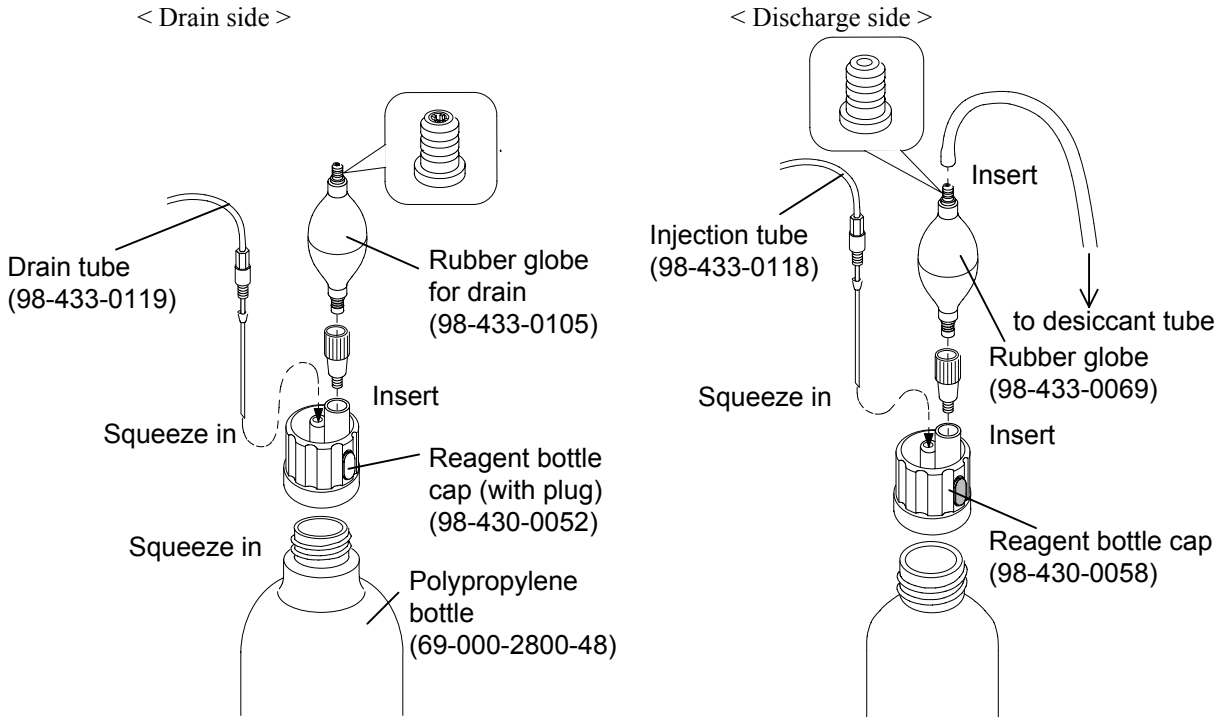
KF grease must be applied on all the slide contact areas.
The seal on desiccant tube A on titration flask must be removed before using.

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



5-4. Installation of KF reagent dispenser

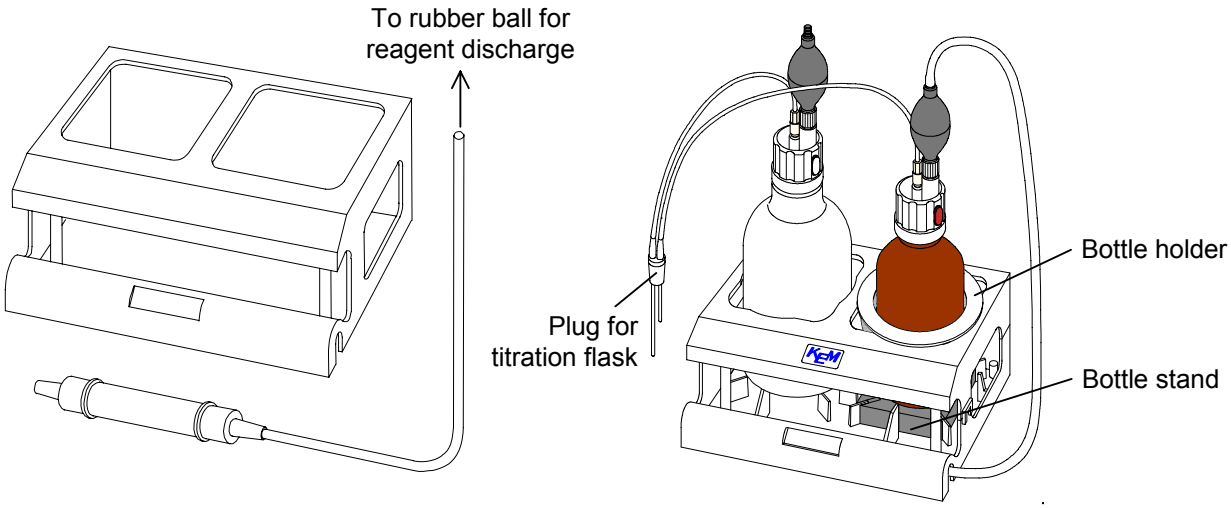
1) Insert the rubber globe onto the reagent bottle cap.
2) Connect the drain tube to the reagent bottle cap (with rubber stopper), and the injection tube to the reagent bottle cap.
3) Fix the cap (with plug) to the polypropylene bottle.
4) Fix the desiccant tube to the rubber globe.
5) Connect the reagent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



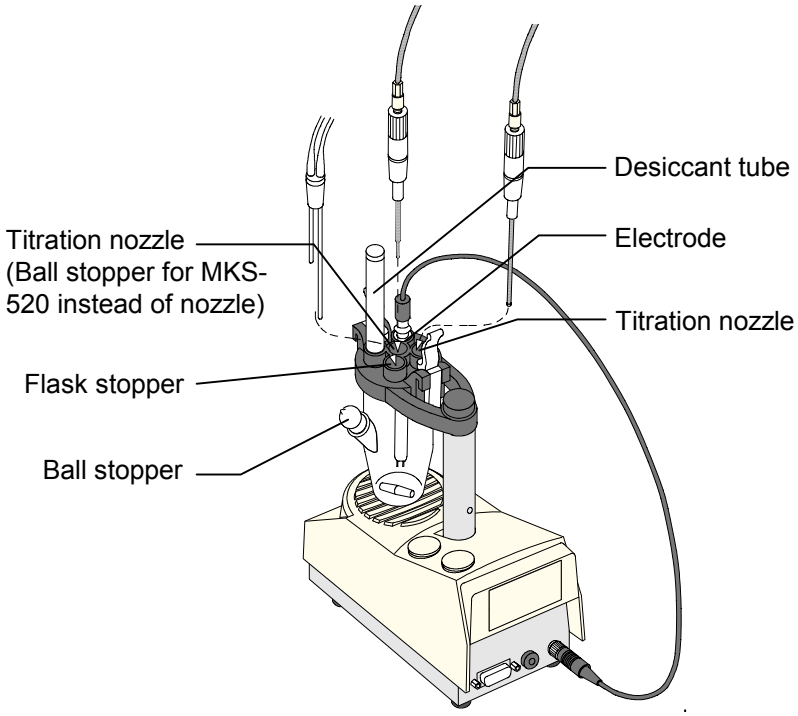
Note:

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

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



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

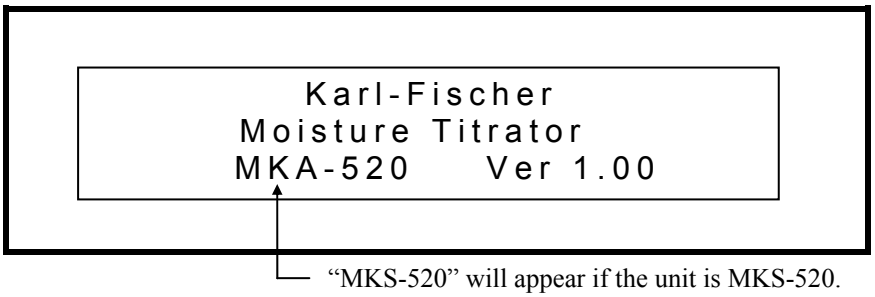


5-5. Initial displays

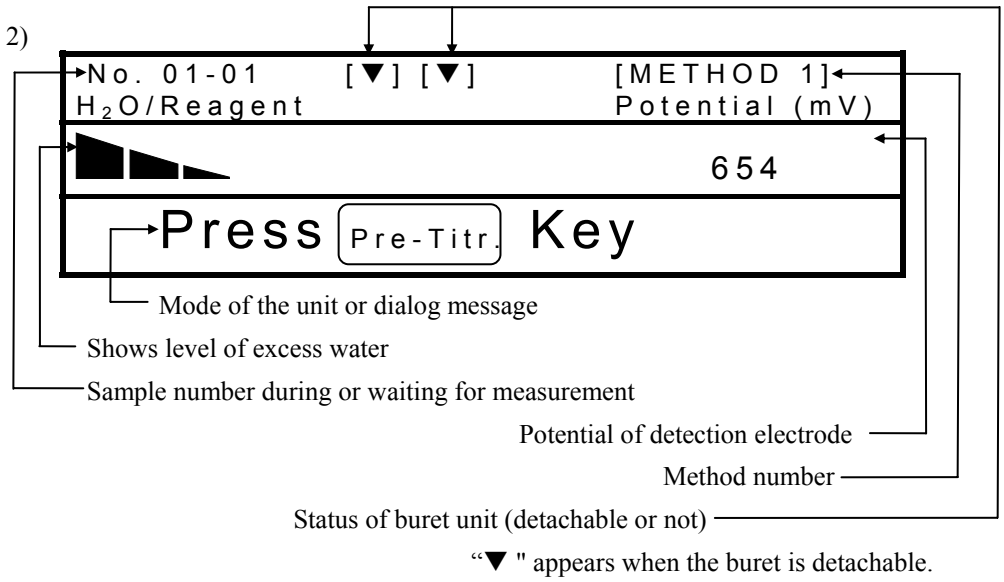
When the power of MKA-520 / MKS-520 is turned on, the initial displays will appear in the following sequence:

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)



2)

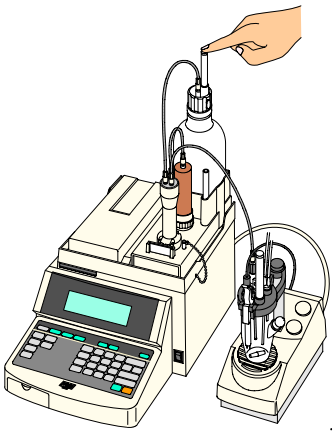


5-6. Filling reagent in the buret

Fill KF reagent and water-methanol in the buret. (Water-methanol is for MKA-520 only)

5-6-1. Filling KF reagent

1) Press [APB] key and enter the working buret number. (for MKA-520 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.

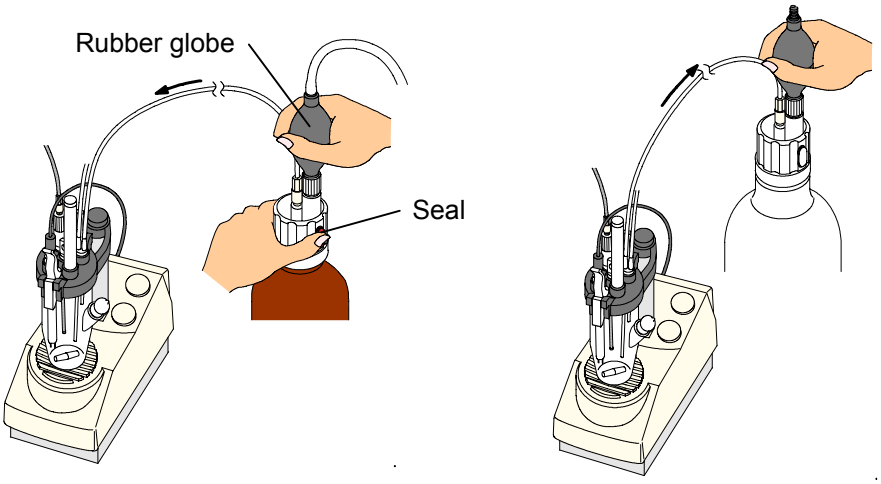
5-6-2. Filling water-methanol (MKA-520 only)

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) Press [▼] key to degas air bubbles sticking around piston head.
6) Press [▲] key to push out the bubble and reagent in the buret into Titration flask.
7) 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. To fill the dehydration solvent, pump the rubber globe with fingers while holding the seal of reagent bottle cap. Allow to fill it with dehydration solvent till the bottom portion of an electrode soaks in the reagent. To stop filling, detach your finger which is holding the seal.
To drain it out, pump the rubber globe of drain bottle a few times. The used reagent in the flask transfers to the waste bottle.



< To fill the reagent > < Drain out >

⚠ 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-520 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-520 / MKS-520 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 to 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-520

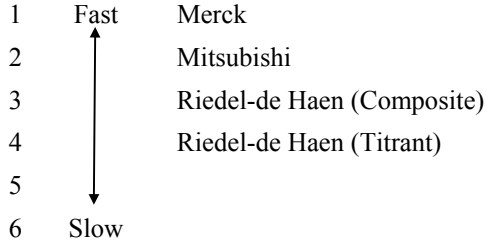
```
   < TITRATION >        [ METHOD 1 ]  ▼

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-520

```
   < TITRATION >        [ METHOD 1 ]  ▼



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

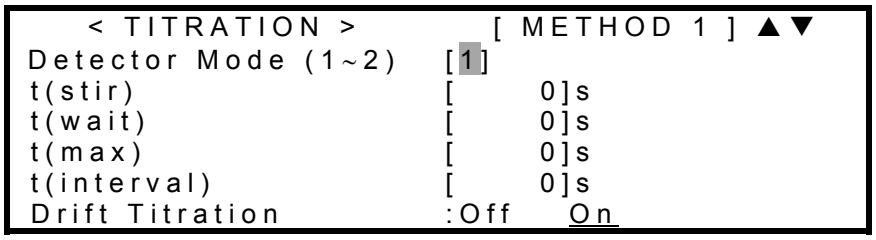
Titr. Mode (Normal Back)	:	Select Titration mode. (“Titr. Mode” is not displayed for MKS-520)
Normal	:	Normal titration for routine measurement
Back	:	Back titration (MKA-520 only) for slow water extraction by dehydration solvent or slow reaction of KF reagent and water.
Titr. Buret No. (1to2)	:	Select buret number for titration (MKA-520 only)
End Time	:	Endpoint is determined when titration continues around in flection point in excess of reagent past preset time. (Normal 30s)
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.



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 using oils or ketones de hydrated 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). Therefore, 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.

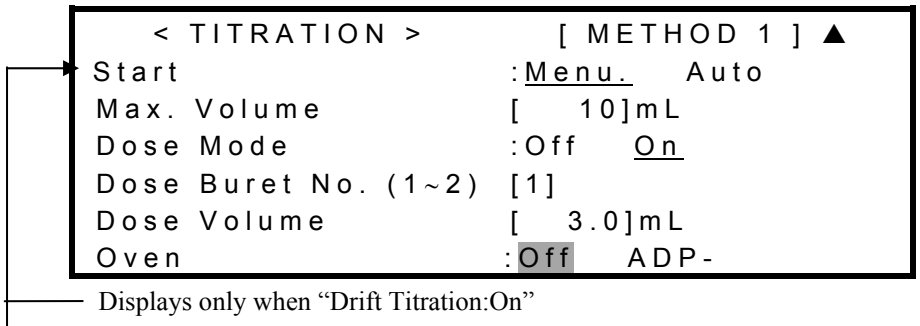
Off : It will not detect moisture even if water is added during waiting for titration. For example, if “Drift Titration :On”, ”Start :Auto” are selected and when a sample of least moisture is injected, it will detect “drift”, and dehydrate instead of titrating. In this case, select “Drift Titration :Off”. 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)

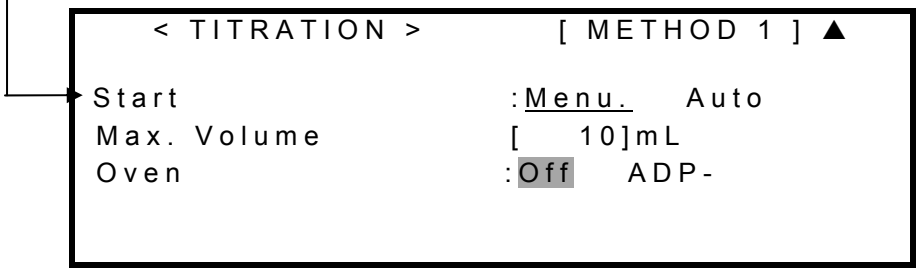
The display changes as below.

MKA-520



Displays only when "Drift Titration:On"

MKS-520



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-520 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-520 only)

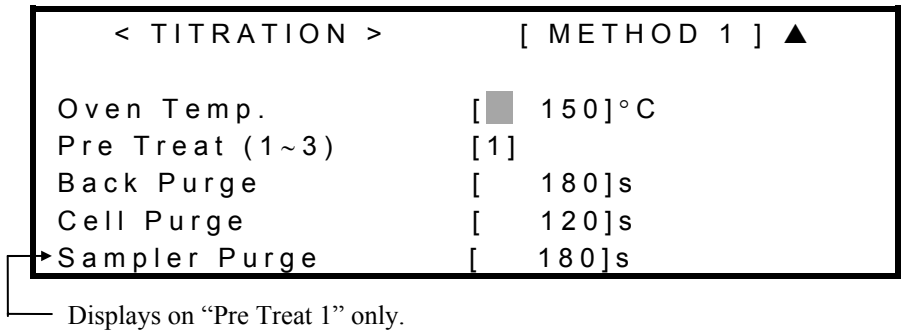
Dose Volume : Enter the amount of fixed volume. (MKA-520 only)

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-511S).
For details, refer to the users manual of ADP-511S.

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.



Displays on “Pre Treat 1” only.

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 120s. 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.

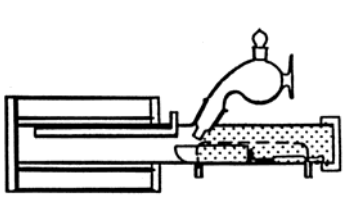


Fig.1 (Back purge)

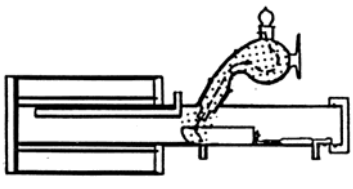


Fig.2 (Sampler purge)

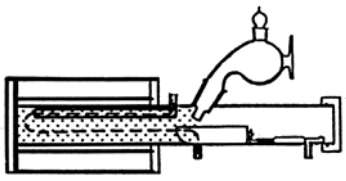


Fig.3 (Cell purge)

- 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-520

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


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

MKS-520

```
<<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-520)
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 next page.

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-520 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.

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

Drift Comp. :   Off     Manu.
Drift           [  0.0 ] µg/min
```

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	$\frac{(\mathrm{Data}\times \mathrm{F1}-\mathrm{Drift}\times \mathrm{t}-\mathrm{Blank})}{\mathrm{V1}\times \mathrm{Dens}}\times 0.1 \quad [\%]$
5	Concentration of gas sample after its volume is measured. Unit: %, ppm, mg/g	$\frac{(\mathrm{Data}\times \mathrm{F1}-\mathrm{Drift}\times \mathrm{t}-\mathrm{Blank})\times 22.4}{\mathrm{V2}\times 18}\times \left[1+\frac{\mathrm{Temp.}}{273}\right]\times 0.1\,[\%]$
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 $\mathrm{X}=\frac{(\mathrm{Data}\times \mathrm{F1}-\mathrm{Drift}\times \mathrm{t}-\mathrm{Blank})}{\mathrm{Wt1}\times \mathrm{Wt2}}\times \left[\frac{\mathrm{B}}{\mathrm{Wt0}}+\frac{\mathrm{X}}{10^2}\right]\times 0.1-\frac{\mathrm{A}\times \mathrm{B}}{\mathrm{Wt0}}\times 10^{-4}$ X: Sample moisture (%)
7	Factor calibration of KF reagent by pure water or standard	$\frac{\mathrm{C1}\times(\mathrm{Wt1}-\mathrm{Wt2})}{\mathrm{Data}}\times 10 \quad [\mathrm{mg/mL}]$
8	Factor calibration of KF reagent by water-methanol standard	$\frac{\mathrm{M.Fct}\times \mathrm{Dose}}{\mathrm{Data}} \quad [\mathrm{mg/mL}]$
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)

A (ppm) : Water concentration of extracting solvent before sample is injected into it in indirect method.

B (g) : The amount of the part of extracting solvent that is measured after the sample has been injected into the solvent.

Blank (mg) : Blank value
The moisture that sneaks into the titration flask and that has to be deducted from titrated water amount.

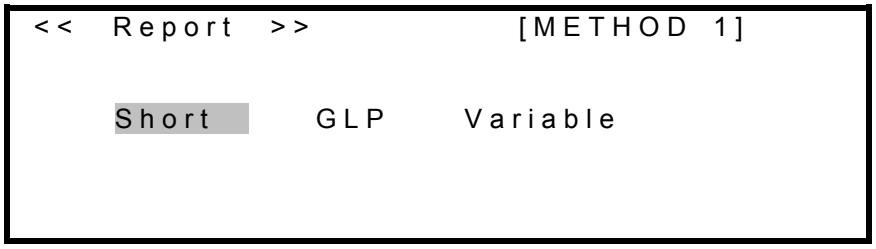
C1 (%) : Water concentration (%) of standard.

Data (mL)	:	Titration volume The amount of the reagent titrated in the titration flask.
Dens (g/mL)	:	Density of the sample of which volume is measured before injected for measurement.
Drift (μg/min)	:	Drift value The moisture in the air and carrier gas coming into the titration flask.
F1	:	The factor of the reagent charged in titration burette.
F2	:	The factor of the reagent charged in dose burette.
M.Fct	:	Factor of standard water-methanol(mg/mL)
t (min)	:	Meauring time from start of measurement and sample injected until its finish.
Temp (°C)	:	Gas temperature when it is measured.
V1 (mL)	:	Sample amount in volume that has been injected for measurement.
V2 (L)	:	Gas volume measured in cubic.
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.

2) Parameter for Report format

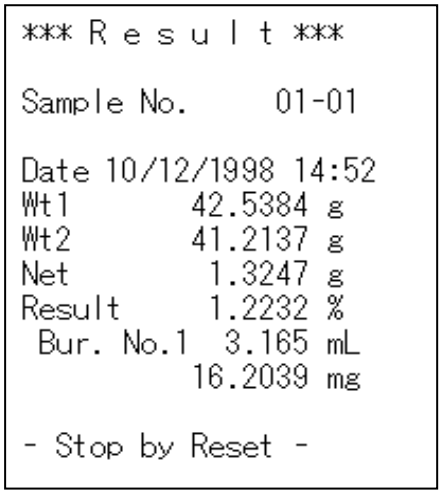
Set up parameters for print format to make a report of the measurement and calculation results. Point "1. Report" by cursor on <RESULT> display, and press [↵] key.

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



← Sample number

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

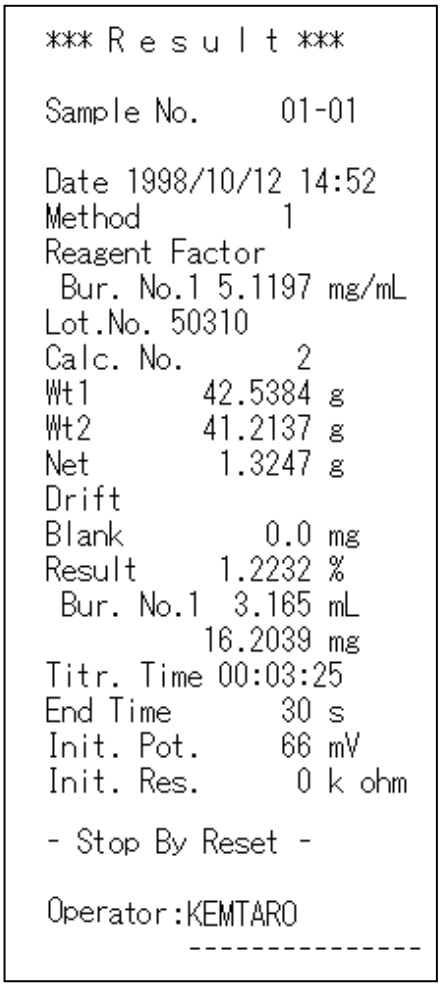
← This will be printed when aborted by [Reset] key.

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:

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.**

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
Drift               : Off     On
Blank               : Off     On
Result              : 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.

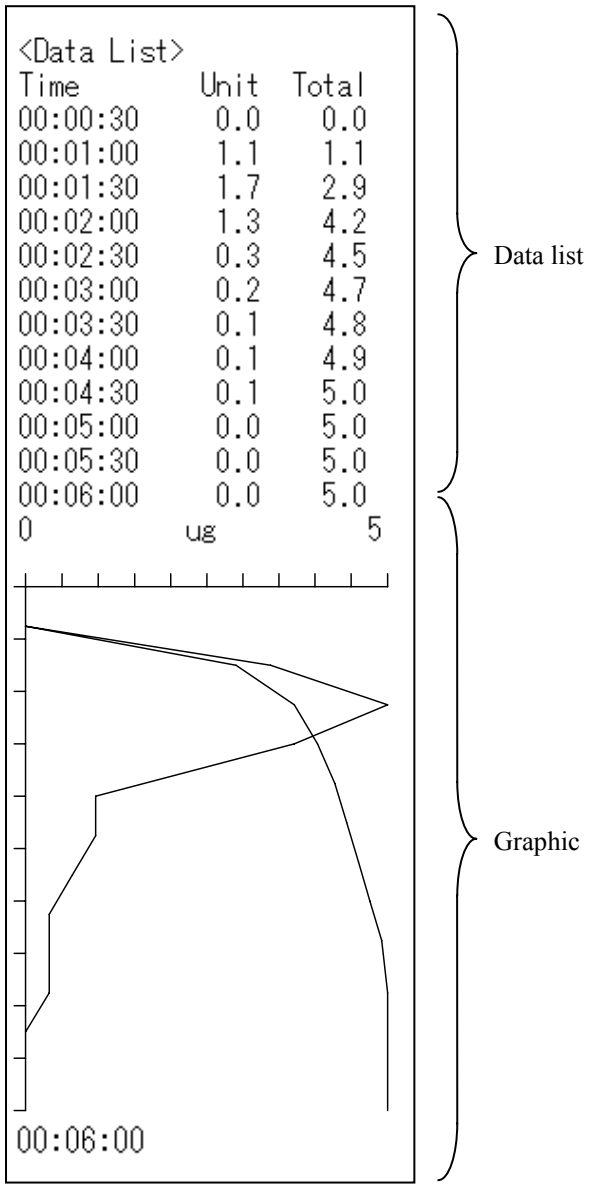
```
<< Titr. Curve>>          [METHOD 1]

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.

Example for print data list and graphic

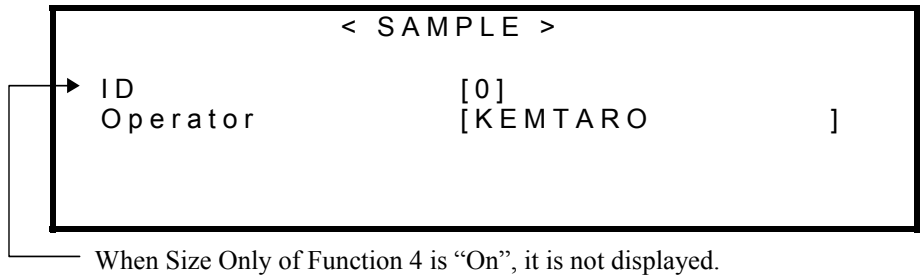


6-1-5. Sample parameter

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.

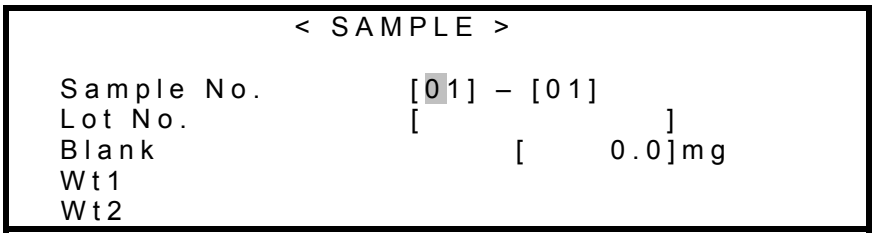
Press [Sample] key.



When Size Only of Function 4 is “On”, it is not displayed.

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:

```
< SAMPLE >

Sample          [01] – [01]
Lot No.         [           ]
Blank                [    0.0]mg
Wt1                [    5.000]g
Wt2                [      0.0]g
```

6-2. Special keys

6-2-1. General

Special keys are as follows:

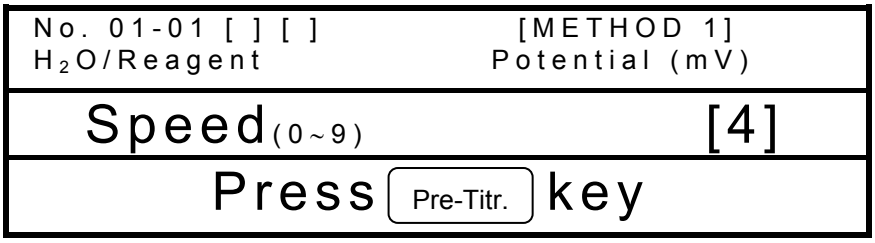
[Stirrer] key	:	Turns On/Off the stirrer. This key has two functions, one to turn On/Off Stirrer and the other to control stir speed.
[Print] key	:	Key to print out.
[-/Disp.] key	:	Key to switch display of titration from volume(mg) to potential(mV). This key also reads data from Balance.
[APB] key	:	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.

Note:

1. **A stirrer will also halt when [RESET] key is pressed.**
2. **Rotational speed cannot be changed on the screen display for parameter settings or the like.**

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.

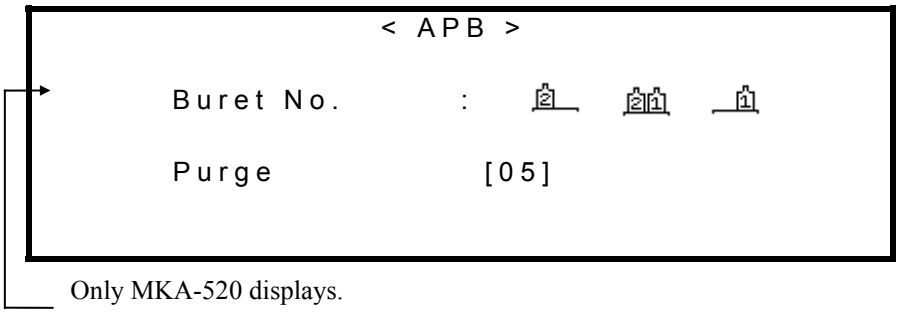
Note:
If Balance is not connected, do not try to input sample weight by this key.

6-2-5. [APB] key

Set up the buret number for manual operation (MKA-520 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-520 displays.

Buret No. : Select the buret for manual operation.

1 : The buret to the right facing the unit.

2 : The buret to the left facing the unit.

2&1 : 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.

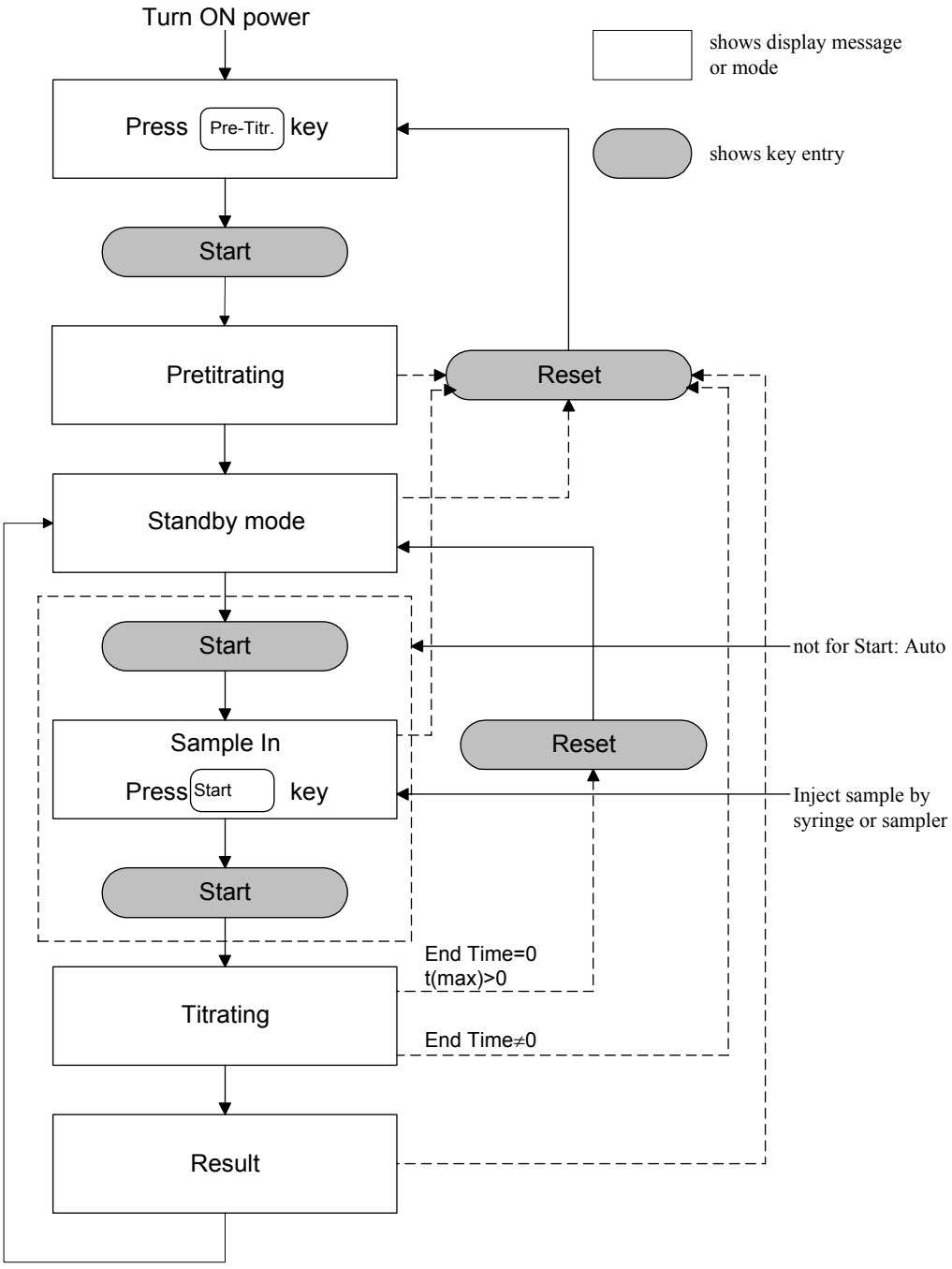
[▲▼] key : Once this key is pressed, it purges for the preset number of times and stops with reagent filled in the buret. When pressed halfway, it stops purging and fills reagent, and stops in delivery position. The switching valve during motion is in reagent side.

7. Measurement procedure

7-1. General

Routine measurement like direct titration of liquid sample by MKA-520/MKS-520 does not require complex key operation. Just follow the dialog message on display:

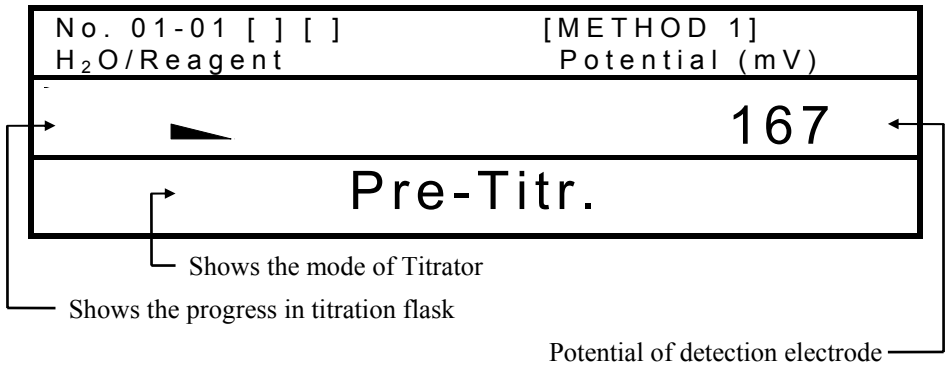
7-2. Measurement sequence



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.

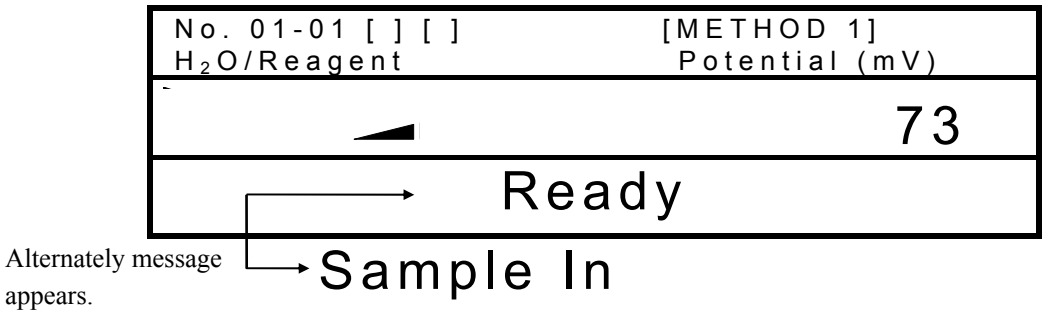
Press [Pre-Titr.] key:



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

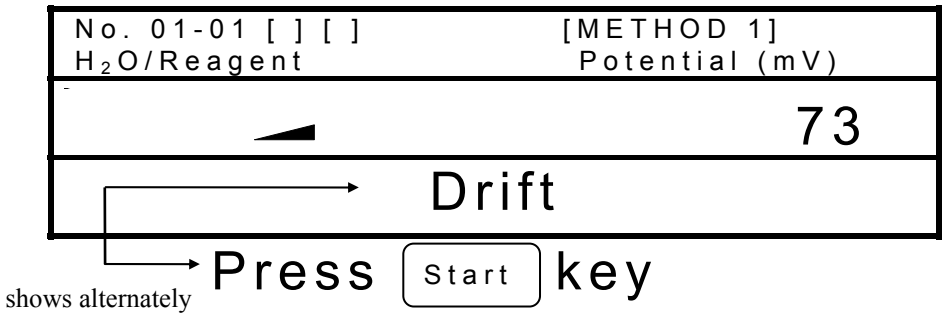
After power is turned on and pretitration is finished, the main display will show the below messages according to the selected Titration parameters:

1) Drift Titration : On, Start : Auto



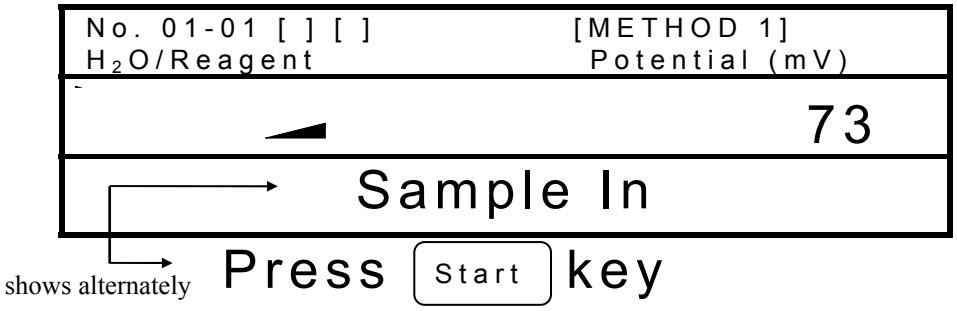
2) Drift Titration : On, Start : Manu

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 burette (MKA-520 only)

1) Enter the factor value of water-methanol to the burette filled with the solution on Function 0. (see 9-2)
2) Select Method 5 (see 6-1-2) and enter the burette number with KF reagent in “Titr.Burette No.” on Titration parameter. Then, select "Dose Mode: On" and enter the burette 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. Burette No.” on Titration parameter. (MKA-520 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:

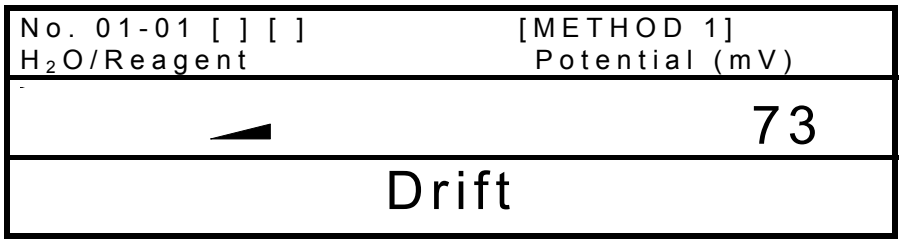
For precise measurement of a sample injected through the inlet by removing the ball stopper, perform measurements without the sample and set up Blank value in advance.

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)

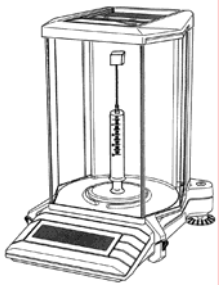
Formula 2, Drift Titration : On, Start : Manu

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

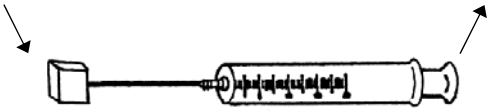


2) Transfer the sample into syringe or sampler and measure its weight.

Transfer the sample into syringe or sampler.



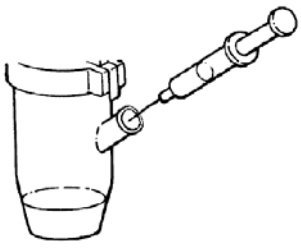
Measure its weight. (Wt1)



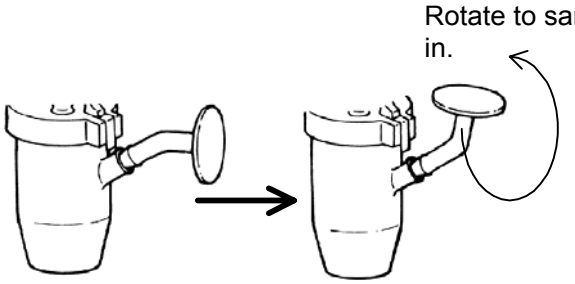
If a sample is volatile, avoid evaporation by a silicone chip on tip of syringe.

3) Press [Start] key.

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



Sampling by a syringe

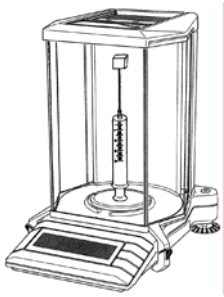


Sampling by a curved sampler

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 [ ] [ ] H_2O/Reagent	[METHOD 1] Titr. Volume (mL)
	12.0050
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	

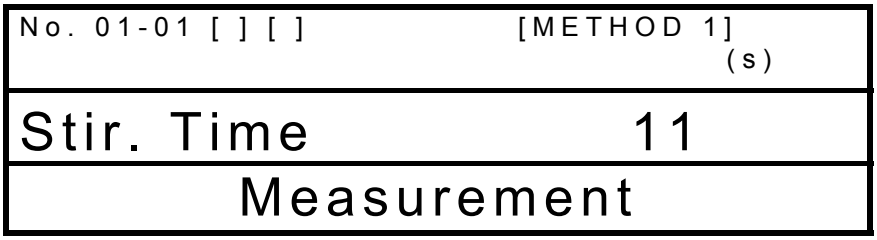
8) The measurement results will be displayed and printed out.

No. 01-01 [ ] [ ] H_2O/Reagent	[METHOD 1] Concentration : %
	23.658
Result	

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

Note:

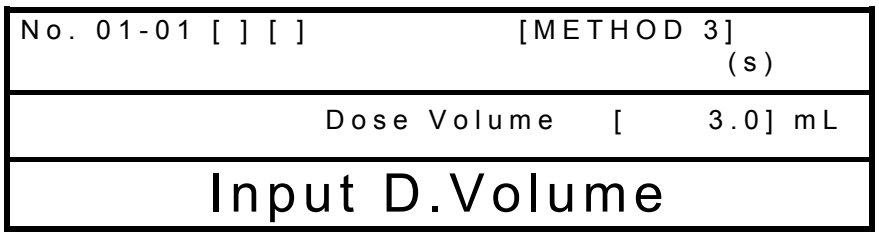
1. **Pointing Wt2 on Sample Parameter even during titration can input the weight of Wt2. If Calc. No.3 - 10 is selected, input other value than Wt1, Wt2.**
2. **Time will start counted down in below display when t(stir) is set up on Titration parameter.**



Note:

Select constant volume injection for back titration at manual (Titr.Mode : Back, Dose Mode : Manu.).

The potential is more than 75mV when injected, the below display is shown and measurement will be stopped.



Input a larger Dose Volume than the present value and press [↵] key to continue measurement.

Dose Volume changed is to be reflected on the method in use.

< Handling after completing measurements >

Keep the titration nozzle – filled with KF reagent – in the solvent in the titration flask.

Store MKA/MKS-520 unit after completely draining out the reagent from the burette and rinsing the inside of burette with Methanol or the like when MKA/MKS-520 in not used for an extended time period. In addition, it is recommended that the titration flask be rinsed, dried out and stored in a desiccator with the flask disassembled.

⚠ **Caution!**

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

7-6. When Balance is connected

When connected with a balance, the sample weight can be read into Wt1 and Wt2. 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) Once the balance becomes stable, press the [↵] key to enter the 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 the titration finishes, the beep will require you to enter the Wt2. Do so by pressing the [↵] key once the balance becomes stable.
8) Measurement results will be shown on display and printed out.

Note:

1. **The Wt2 can be entered even when the titration is going on by positioning the cursor to the Wt2 in the sample parameter. If Calc. No.3 – 10 is selected, input other value than Wt1, Wt2.**
2. **Absolute value will be taken even if Wt1 – Wt2 < 0.**
3. **When the sample weight cannot be recognized from the balance, press the [-/Disp.] key to read the weight.**

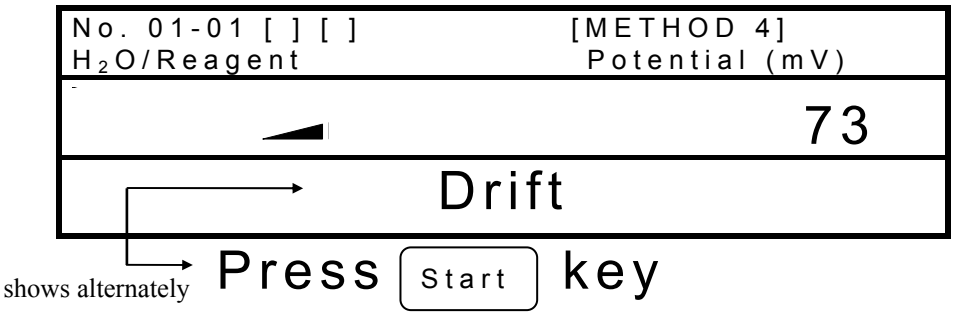
7-7. When Evaporator is connected

The MKA-520/MKS-520 when connected to Evaporator can measure moisture of solid sample or samples hard to dissolve in solvent by heating and evaporating the sample material.

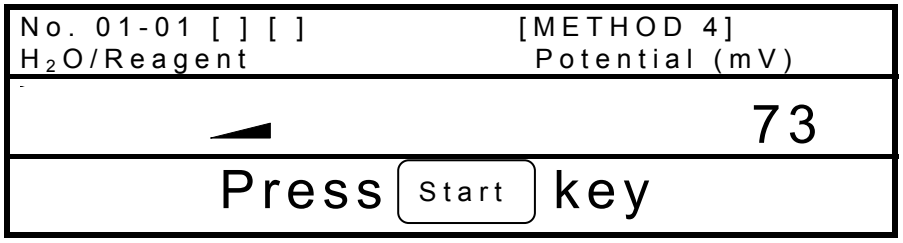
1) Set up the connection of Titrator and Evaporator according to the instruction of Evaporator.
2) Perform ageing of Evaporator on Function 5. (see 9-7)
3) Select “Oven : ADP-“ on Titration parameter, and set up “Oven Temp”, “Pre Titr”, “Back Purge”, “Cell Purge”, “Sampler Purge”, etc. (see 6-1-3)
4)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

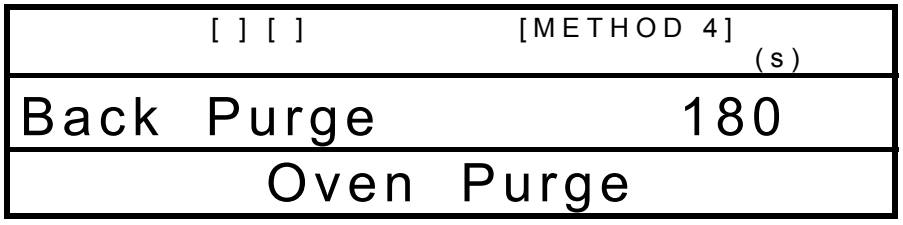


The below display shows the message. Take the sample into the sampler and weigh the sampler.

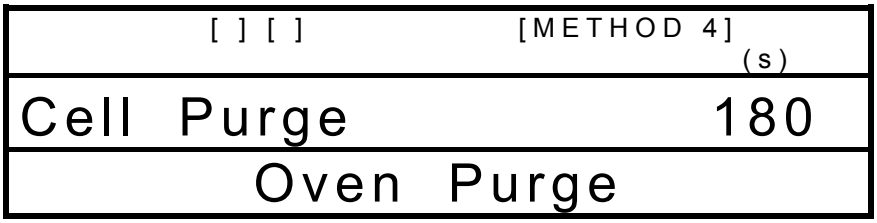


Press [Start] key.

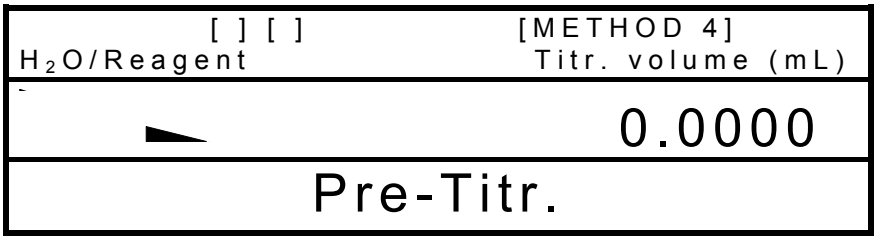
The display changes to the below immediately after it has changed as above, and then shifts to back purge.



When Back purge begins, time starts counted down.

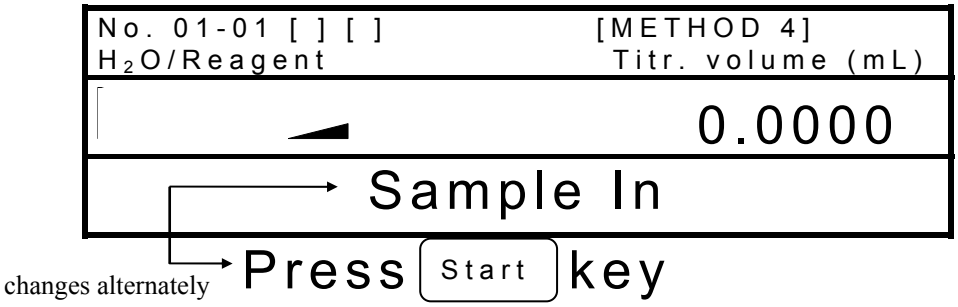


Cell purging time is counted down.

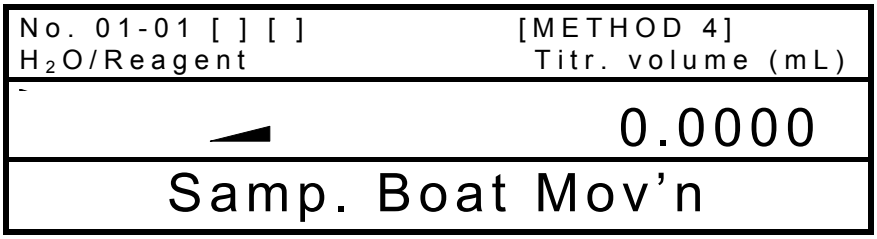


After cell purge, the display waits for pretitration to be finished.

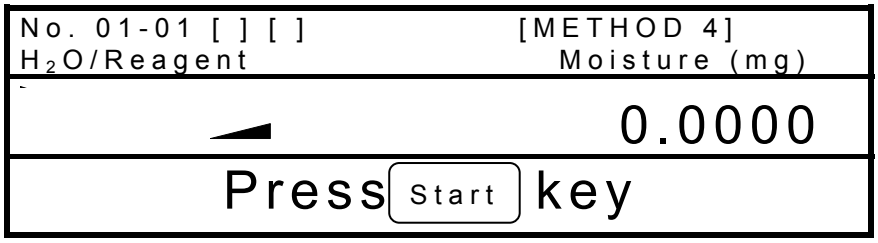
After pretitration, the display changes as above, however, it will soon change to the next display.



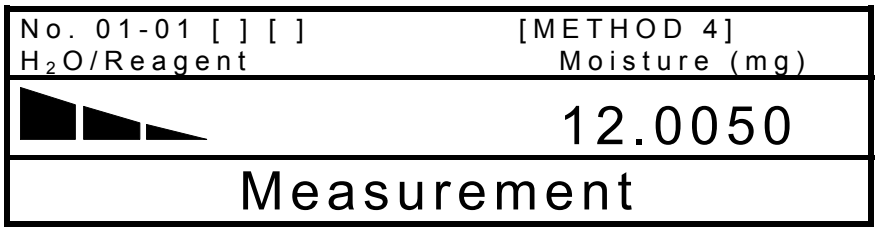
Remove the ball stopper, and inject the sample. Insert the ball stopper again and press [Start] key.



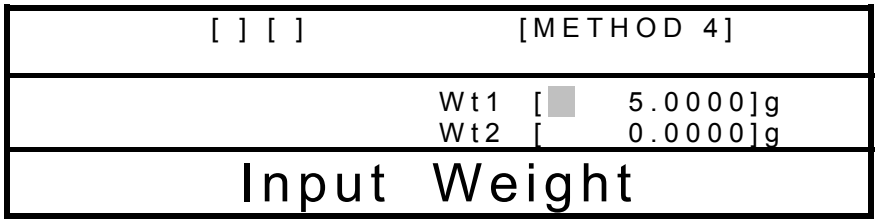
The sample boat moves into Heating unit.



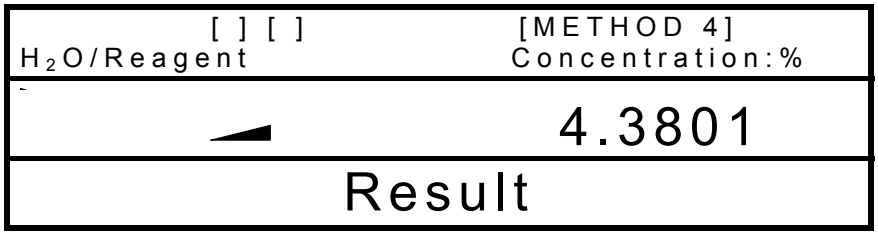
After the boat has moved in, the display changes as above.
Press [Start] key.



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)

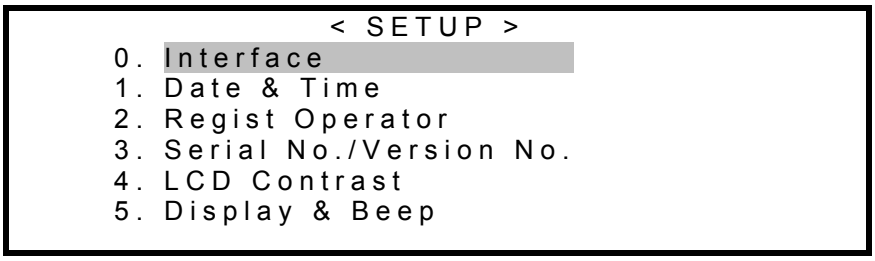
8. Setup Function

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.



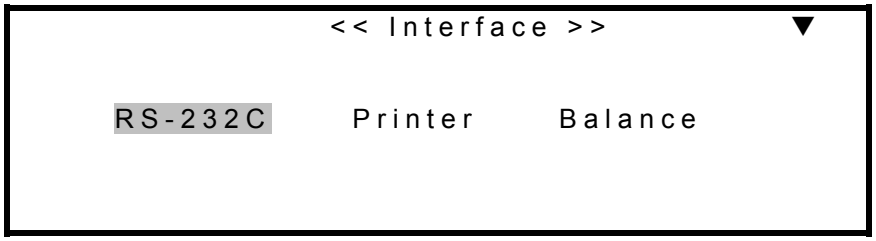
8-2. Interface setup (Setup 0)

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

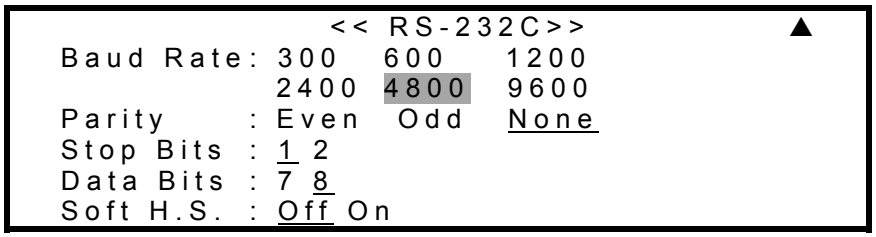
8-2-1. RS-232C

The MKA-520/MKS-520 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.

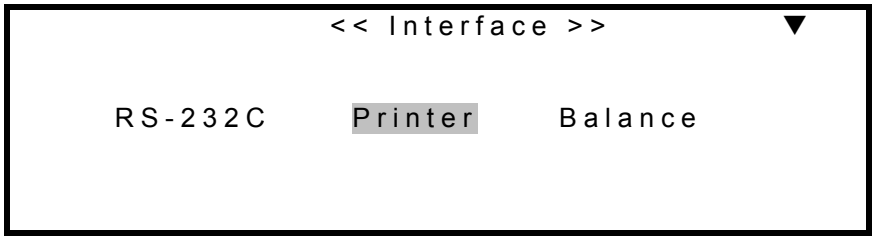


To exit, press [Setup] key.

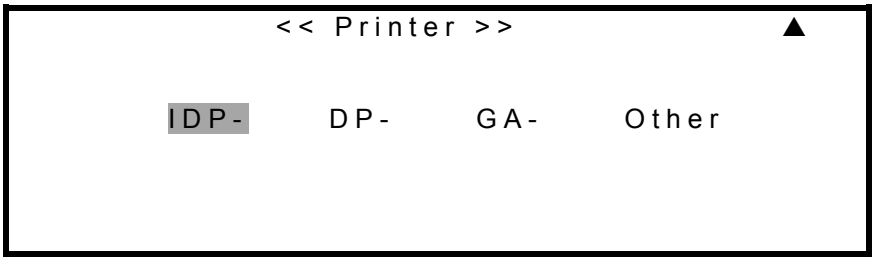
Note:
For details of software by RS-232C, refer to the separate brochure of "MKA-520/MKS-520 RS232C Communication Software".

8-2-2. Printer

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

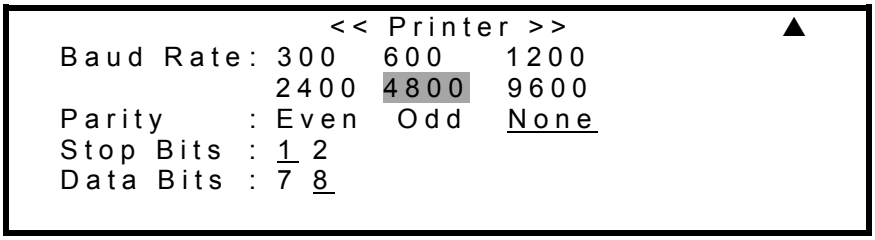


The display will change as follows, and select the type of your printer by cursor using [←], [→] key and confirm by [↵] key.



IDP- : Select this when IDP-100 Impact dot matrix printer is used.
DP- : Select this when DP-500 Thermal printer(KEM) is connected.
GA- : Select this when GA-42 printer (Mettler) 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.



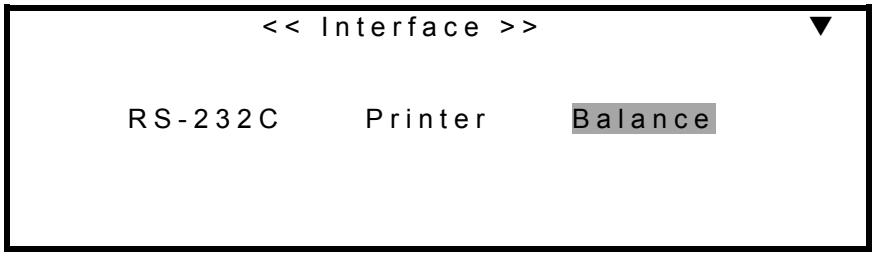
To exit, press [Setup] key.

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

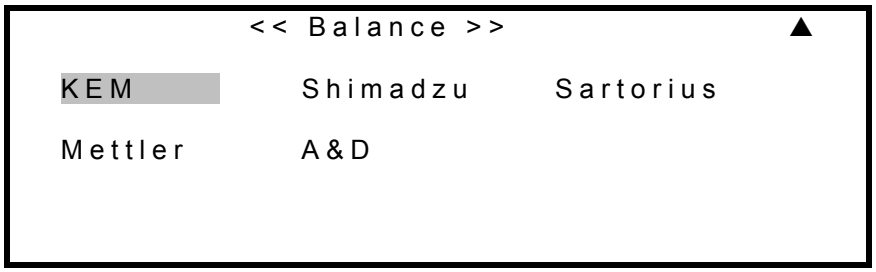
8-2-3. Balance

When Balance is connected, the weight of a sample can be read and stored in MKA-520/ MKS-520 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

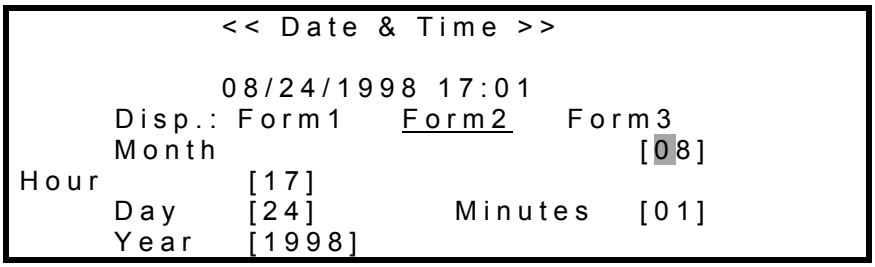
Note:

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-520/MKS-520 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.

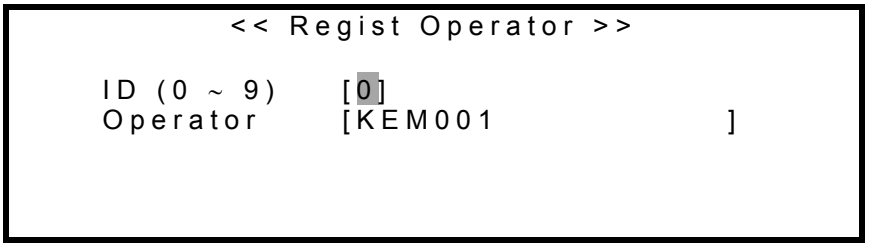


Disp : Select the display form of the date
Form 1 YYYY:MM:DD
Form 2 MM/DD/YYYY
Form 3 DD/MM/YYYY

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

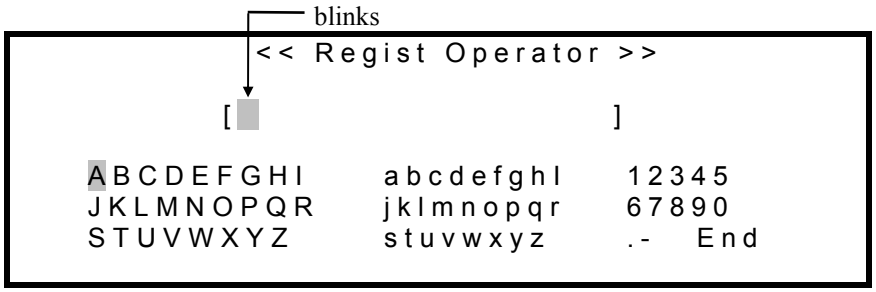
Up to ten operator names can be registered in order to conform to GLP/GMP requirement.
The operator's name is automatically printed with resulting data. (Alphabetic large and small characters, and numerals only)

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.

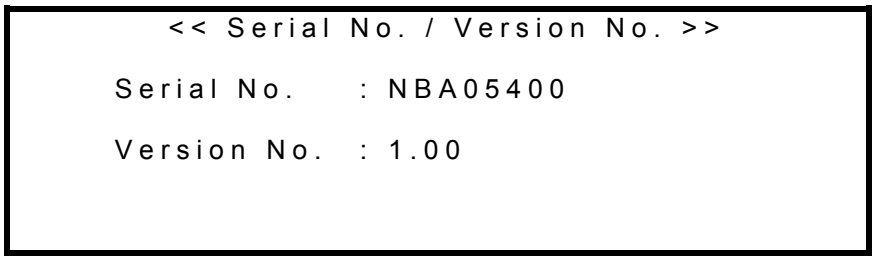
Select the desired character by cursor using [↑], [↓], [←], [→] key and confirm by [↵] key. The blinking cursor shifts by one letter after another. Use [Bs] key to erase the preceding character, and if you wish to erase all the entered letters, use [clr] key. To confirm the entry, point "End" by cursor 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-520/MKS-520, and you can check those numbers by yourself.

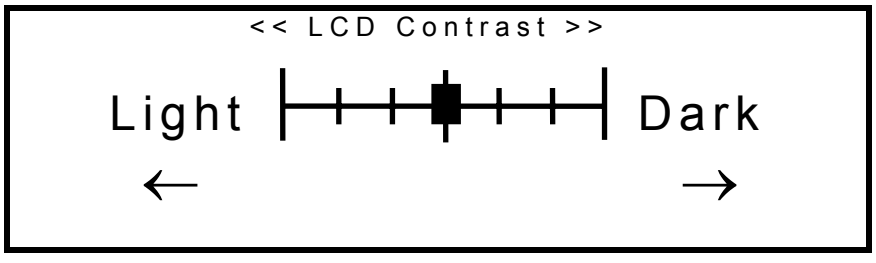
Press [Setup], [3], [↵] key one after another. The display will show the numbers.
To exit, press [Setup] key.



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.
Press either [Page down] or [page up] to change displays below.

[First display] (* This display shows languages, English, Japanese and Mandarin)

```
<< Display & Beep >>        ▼

Result Time      [ 0]s
Sample No.       :Off   On
Language         :English     Japanese
                  Mandarin
```

[Second display]

```
<< Display & Beep >>        ▲

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.
A language selection is subject to a version of softwares JC and K.
JC version.... [English/Japanese/Mandarin]
K version ..... [English/Korean]

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.

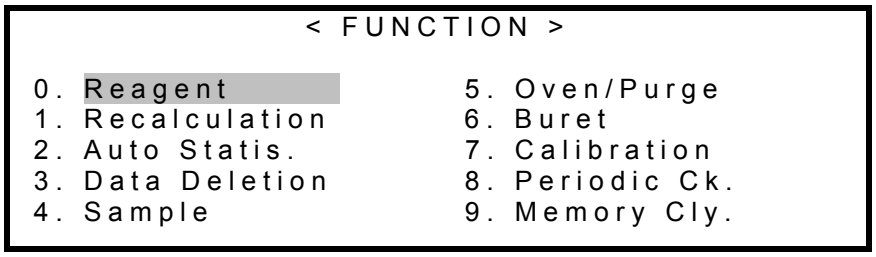
9. Special function

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 >>

Buret        1       2

1. Factor
2. History
```

Buret	: Select the buret. (MKA-520 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

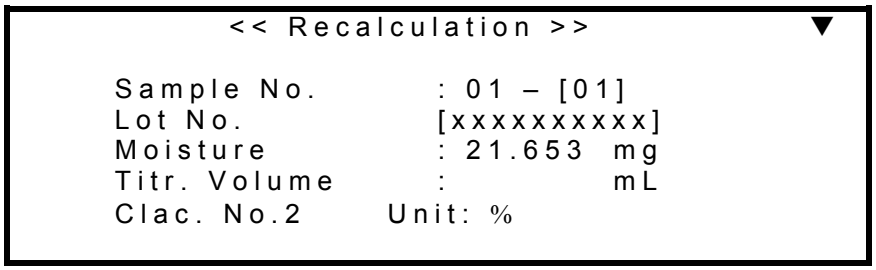
```
<<History (APB-1)>>                ▲▼
 Date          Factor
1999/12/29    4.9805>4.8827 mg/mL
1999/12/15    4.9865>4.9805 mg/mL
1999/11/30    4.9982>4.9865 mg/mL
1999/11/15    5.0042>4.9982 mg/mL
1999/10/29    4.9542>5.0042 mg/mL
```

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.



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
         ------------
```

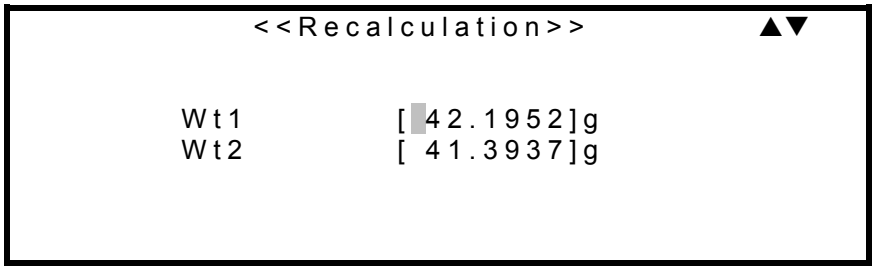
For Calc. No.2, when [page down] key is pressed, the display will change as below.
Set up the Blank value and confirm by [↵] key.

```
            <<Recalculation>>              ▲▼


   Drift              :        0µg/min
   0Blank              [      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

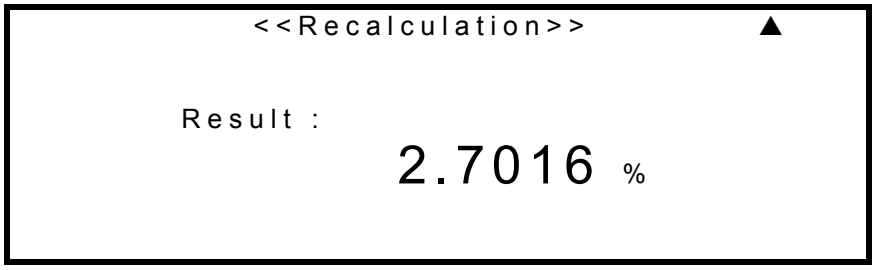
Press [page down] key, the display will change as below.
Set up the weight and confirm by [↵] key.



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-520/MKS-520 can process statistical calculation automatically. The MKA-520/ MKS-520 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.

Results : Number of data
The number of data that have been batch processed for statistics.

Mean : Average value of data

SD : Standard deviation of data

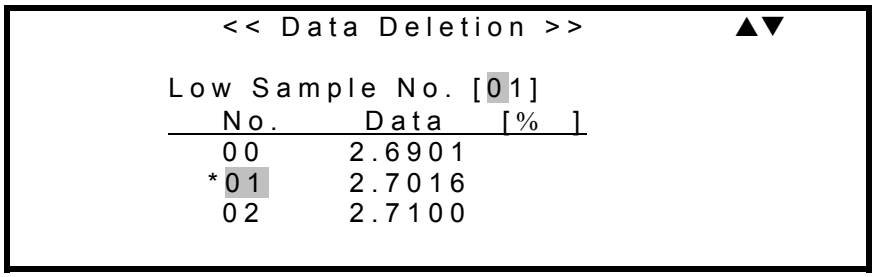
RSD : Relative standard deviation of data

```
<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.         [    xxxx]%
       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)

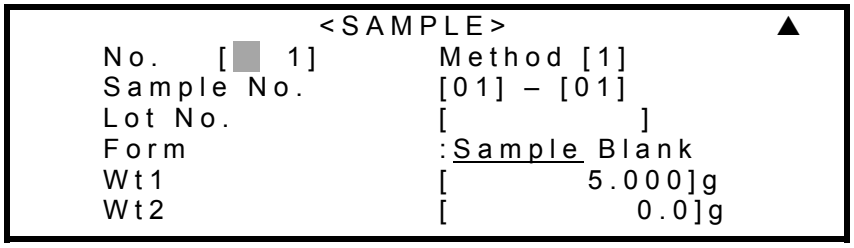
Next Meas. : Next measurement number
The number of the next sample to be measured. (1 to 100)

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-520/MKS-520, 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 burette.

1) Weight ← Enter Conc. [ ]% and press [↵] key.
2) Weight shows :*****g the best sampling amount

Note:

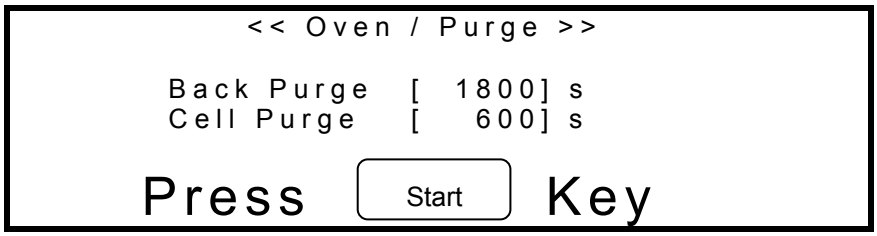
1. **The unit for the anticipated water content is the same as for the formula selected for the Method.**
2. **The sampling size by this function is only for reference, and whether to apply the value or not depends on your evaluation.**

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 can be controlled by MKA-520/ MKS-520. 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.

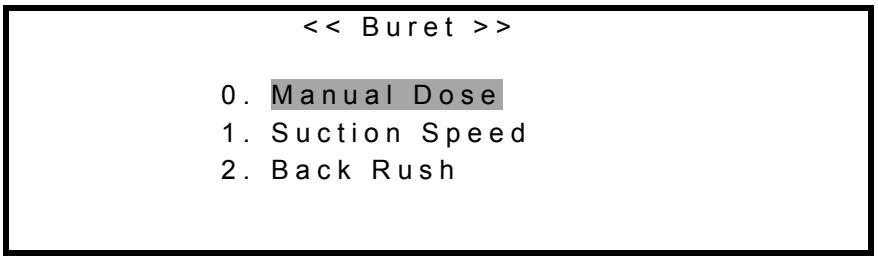


9-8. Auxiliary function for buret (Function 6)

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.

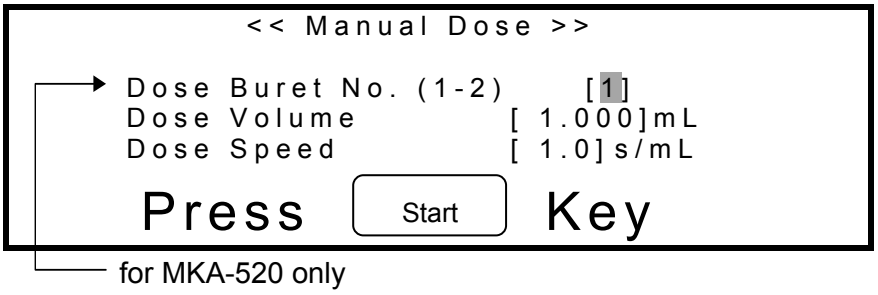


0. Manual Dose	:	Fixed amount by manual dose
1. Suction Speed	:	Control reagent dispensing speed
2. Back Rush	:	Select amount for backlash

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.

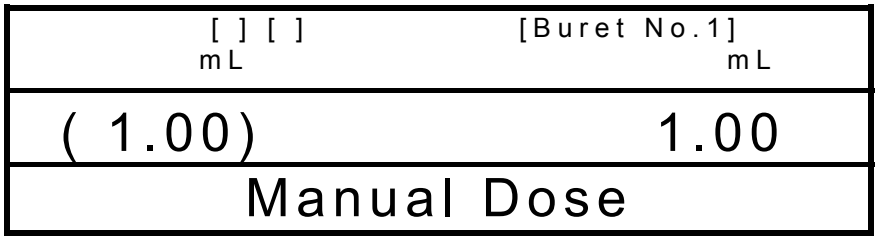


Dose Buret : Buret setup for fixed volume dose (MKA-520 only)

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.

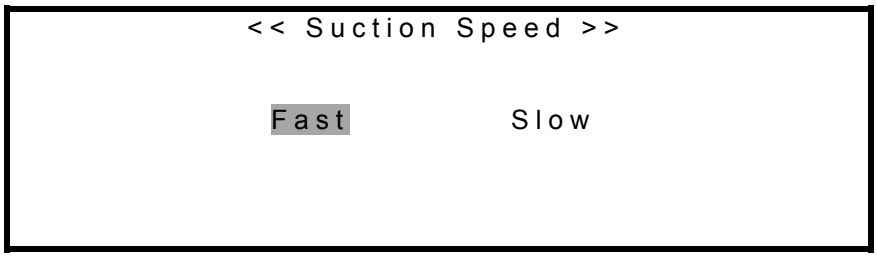


Note:
Manual fixed dose works only on Standby mode ("Waiting for Pretitration").

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.

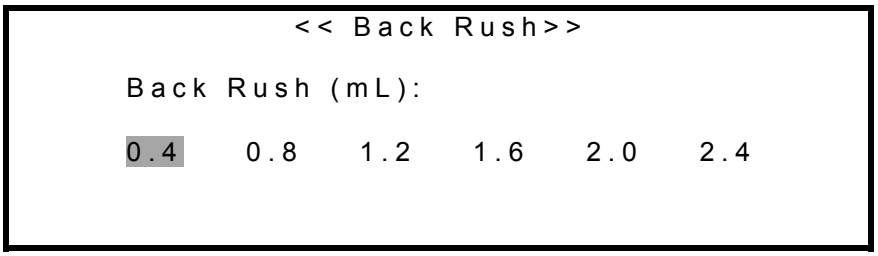


To return to Main display, press [Function] key.

9-8-4. Select amount for backlash

If the piston head of burette is deteriorated over long time use, air bubbles may sneak into the burette 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 burette 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.



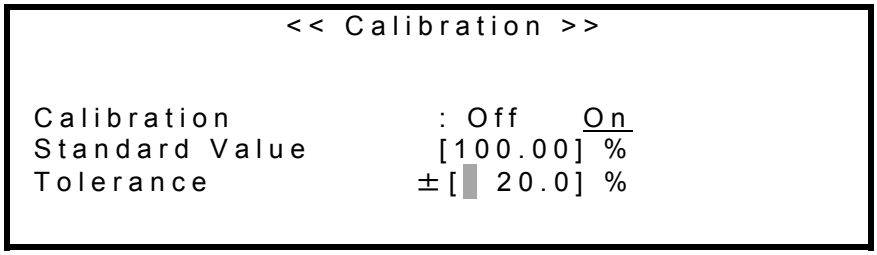
Note:
If amount of backlash is set to more than 0.8mL, the maximum dispensed volume by piston will be reduced by more than 10mL.

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-520/MKS-520 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.



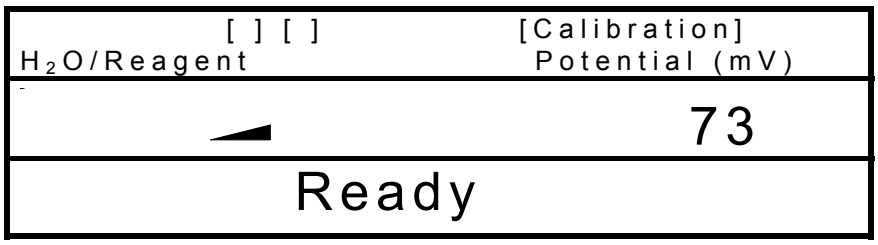
Calibration : Select this mode or not.

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

Tolerance : 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)

1) 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.

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

3) 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-520/MKS-520.

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.

```
<< Periodic Check >>                    ▼
Next Calib Date        : --/--/----

Alarm                  : Off      On
Interval (1 ~ 12)      [ 1]month
Display                : List     Detail
Memory Clear           : No       Yes
```

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.

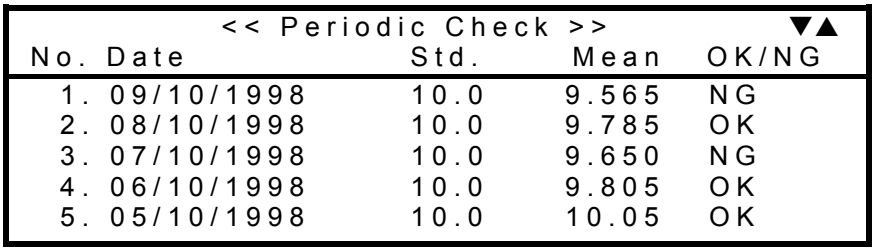
List : Display of a list of the last 10 checks

Detail : Display of detailed record of the last 10 checks

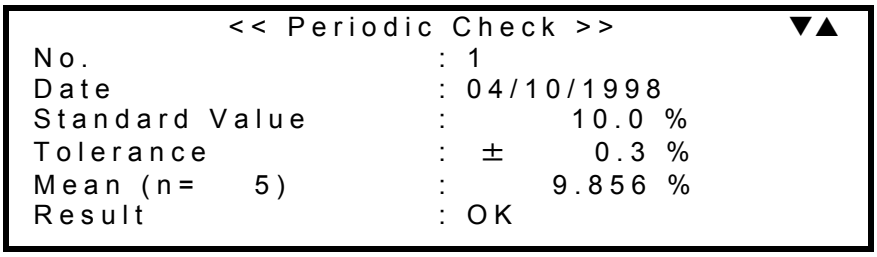
Memory Clear : Select or not to delete the record of last 10 checks.
If "Yes" is chosen, all past records are erased.

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

When “List” is selected:



When “Detail” is selected:



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

Tolerance : 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-520

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.	Off
	Method	Off
	Calc. No.	Off
	Size	On
	Factor	Off
	Drift	Off
	Blank	On
	Result	On
	Titration Time	On
	End Time	Off
	I. Potential	Off
	I. Resistance	Off
	Operator	Off
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-520

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 measurement	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-520

Parameter		Default
Method		1
Protect		Off
Titration	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
	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. (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.	Off
	Method	Off
	Calc. No.	Off
	Size	On
	Factor	Off
	Drift	Off
	Blank	On
	Result	On
	Titration Time	On
	End Time	Off
	I. Potential	Off
	I. Resistance	Off
	Operator	Off
Titr. Curve	Sapling 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
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-520

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.

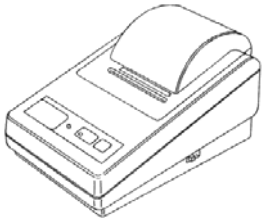
11. Connecting Printer

When Printer is connected, MKA-520/MKS-520 can print out measurement results, measured date, user name, etc.

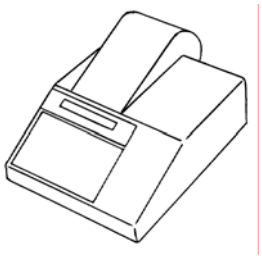
11-1. Printers

The built-in interface for printer installed in MKA-520/ MKS-520 is for Kyoto Electronics IDP-100 Dot printer and Mettler-Toledo GA-42 printer. Other printers can also be connected when digital configuration is set up to MKA-520/ MKS-520. The recommended printer is IDP-100.

IDP-100
(Impact dot matrix)

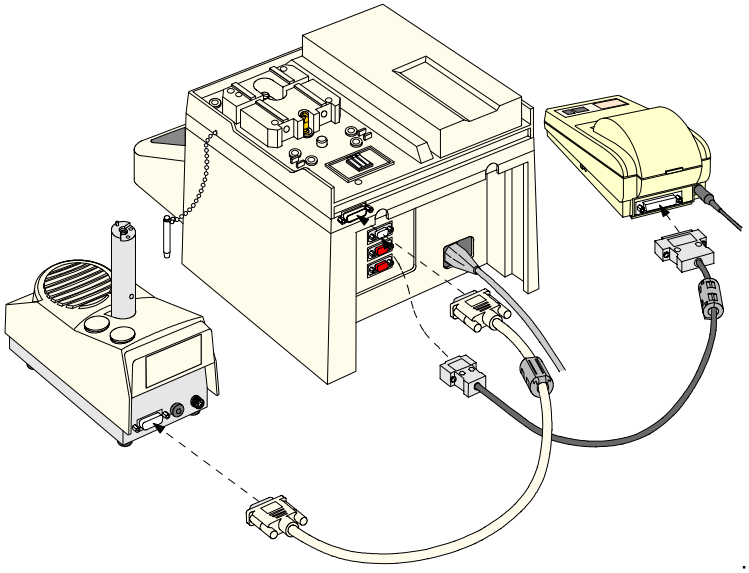


GA-42
(Impact dot matrix)



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:

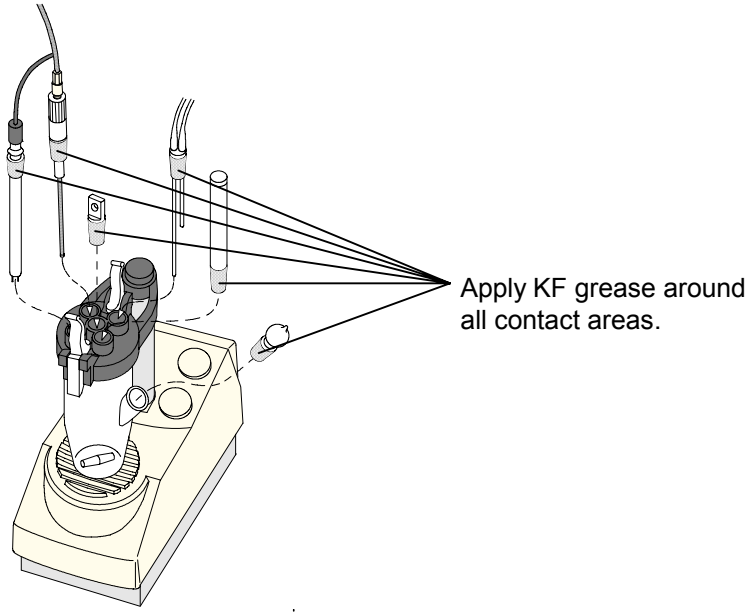
For detailed information about your printer, refer to the users manual of your printer.

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.



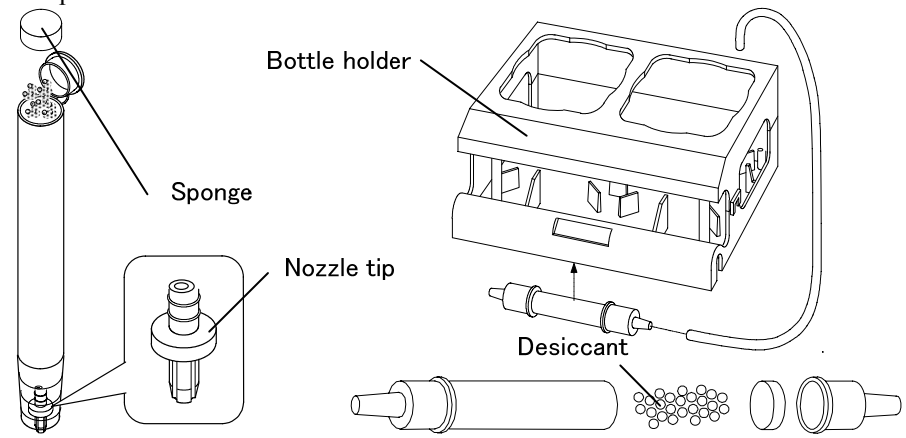
Check the contact area once a week to see the area if it is in smooth contact with grease.
If found not smooth, apply KF grease thinly, however, do not paste too much to avoid moisture in the grease, which will affect the drift later on.

⚠ Caution!

If the contact area is not checked from time to time, the greased area may be solidified. If solidified, follow the step "14-4." to remove the solids.

12-2. Replacement of silica gel

The desiccant tube is removed from a titration flask like the clause of an application of KF grease. And the desiccant tube is removed from a bottle holder. Replace the desiccant with new one when its moisture absorption turns down to reddish color.



< Desiccant tube A > < Desiccant tube >

Be sure to apply KF grease around sliding area between the titration cell and desiccant tube A.

Note:

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

12-3. Replacement of KF reagent

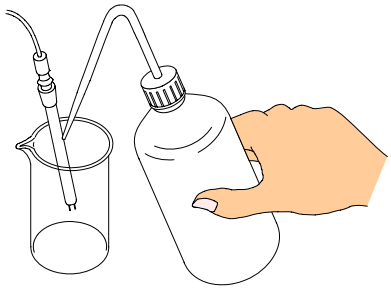
Once reagent factor is determined before measurement, it will not be necessary to replace it until all of it is dispensed, however, it is recommended to replace the reagent if its factor is reduced significantly.
(see 5-6-1)

12-4. Replacement of water-methanol (MKA-520 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.

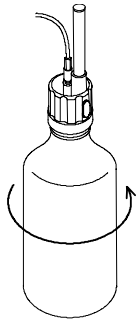


12-6. Cleaning Titration vessel

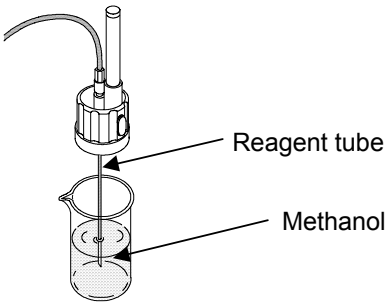
1) Drain out solvent in the flask.
2) Turn the top 90 degrees to the right and open the holding lever, and remove the flask.
3) Remove the ball stopper and rinse by neutral detergent.
4) Dry it in a dryer and cool it down in a desiccator.

12-7. Cleaning the buret

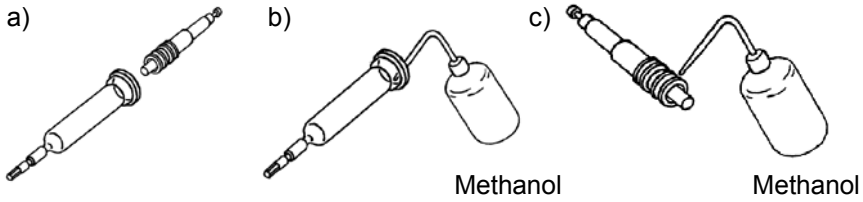
1) Remove the bottle after discarding the remaining reagent.



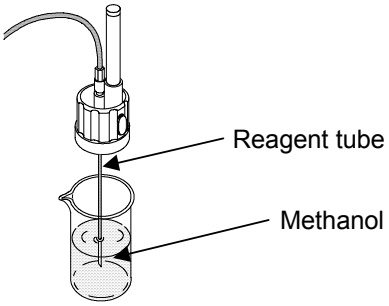
2) Fill methanol in the buret and drain it out, and repeat.



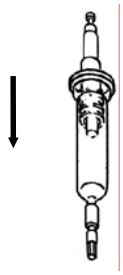
3) Remove the buret from the unit and pull out the piston, and clean by methanol.



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



5) Drain out the methanol in buret completely.



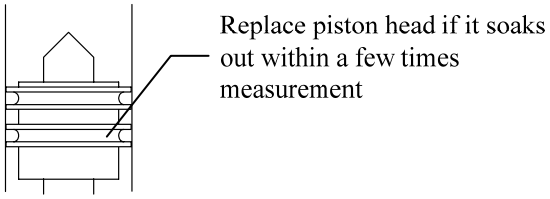
⚠ Caution!

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 burette and clean, and then, store it to avoid crystallization. If crystallized, follow the step 14-2 and 14-3.

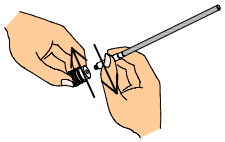
12-8. Replacement of piston head

The piston head may be deteriorated over long time use, thus causing leaking between the piston head and burette wall.

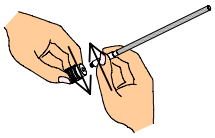
Replace piston head if it soaks out within a few times measurements after the buret unit is cleaned and reagent is renewed.



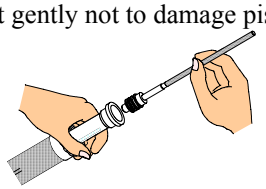
1) Undo the piston screw from the head.



2) Screw in the new head securely.



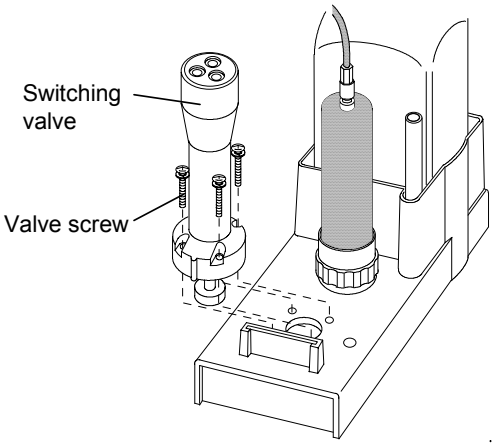
3) Return the piston back into the buret gently not to damage piston head.

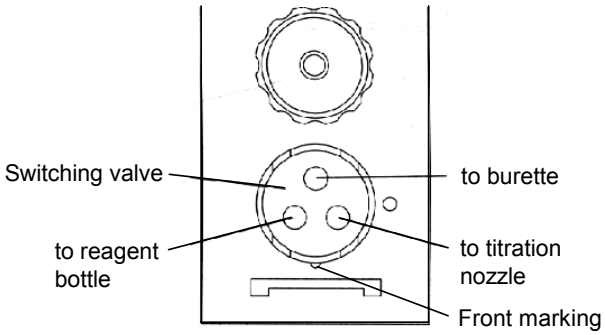


12-9. Replacement of Switching valve

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)





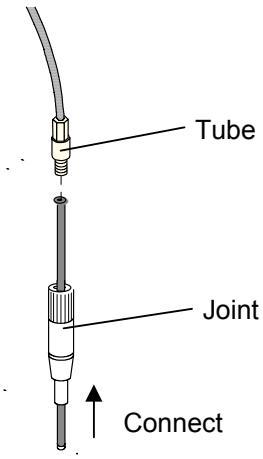
⚠Caution!

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.

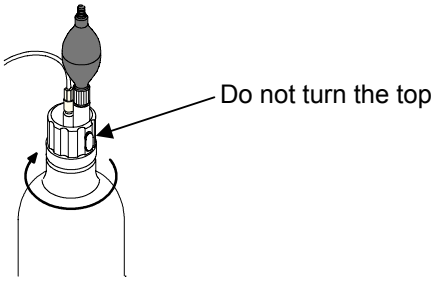
12-12. Drain disposal

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

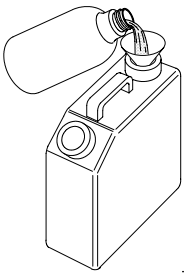
> **⚠Caution!**
> **Dispose drain in the drain bottle at earlier time so that the level of drain in the bottle should be lower than the upper-limit marking of the bottle. In case where the level becomes higher than the marking, overflowing drain can go into the magnetic stirrer, damaging it.**

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:

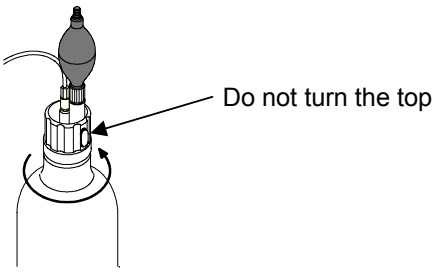
1) Remove the cap of waste bottle by turning the bottle.
   Do not twist the tubing.



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



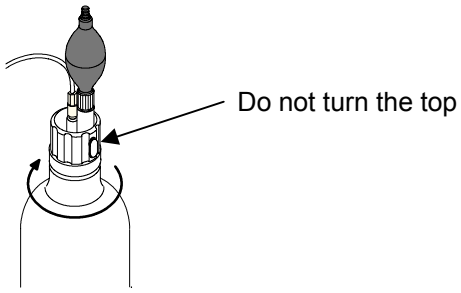
3) Clean the waste bottle neck using tissue paper if it is dirty by the waste.
4) Attach the top of waste bottle by turning the bottle securely to prevent it from leaking. Do not twist the tubing.



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

< Mitsubishi Chemical >

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

< Merck AG >

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

Note:

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

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

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-520 only). · Check if Eq.7 or 8 and Oven: On are chosen by error at the same time.

Error message	Cause	Remedies
Burette Error! ↕ Check Burette	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 titration nozzle becomes clogged

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

14-3. When switching valve is clogged or jammed

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

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

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

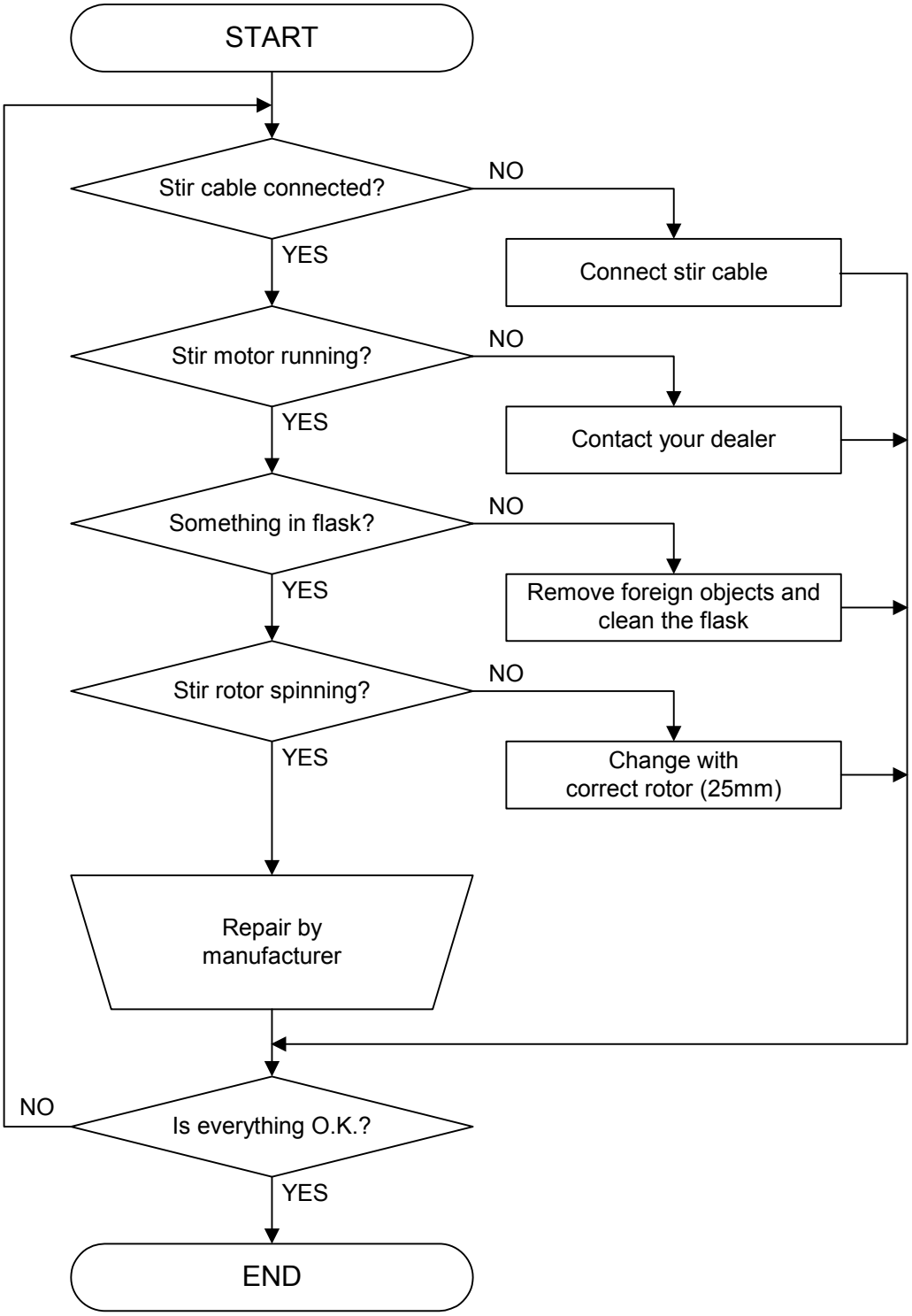
14-4. When the glass contact sliding area is jammed

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

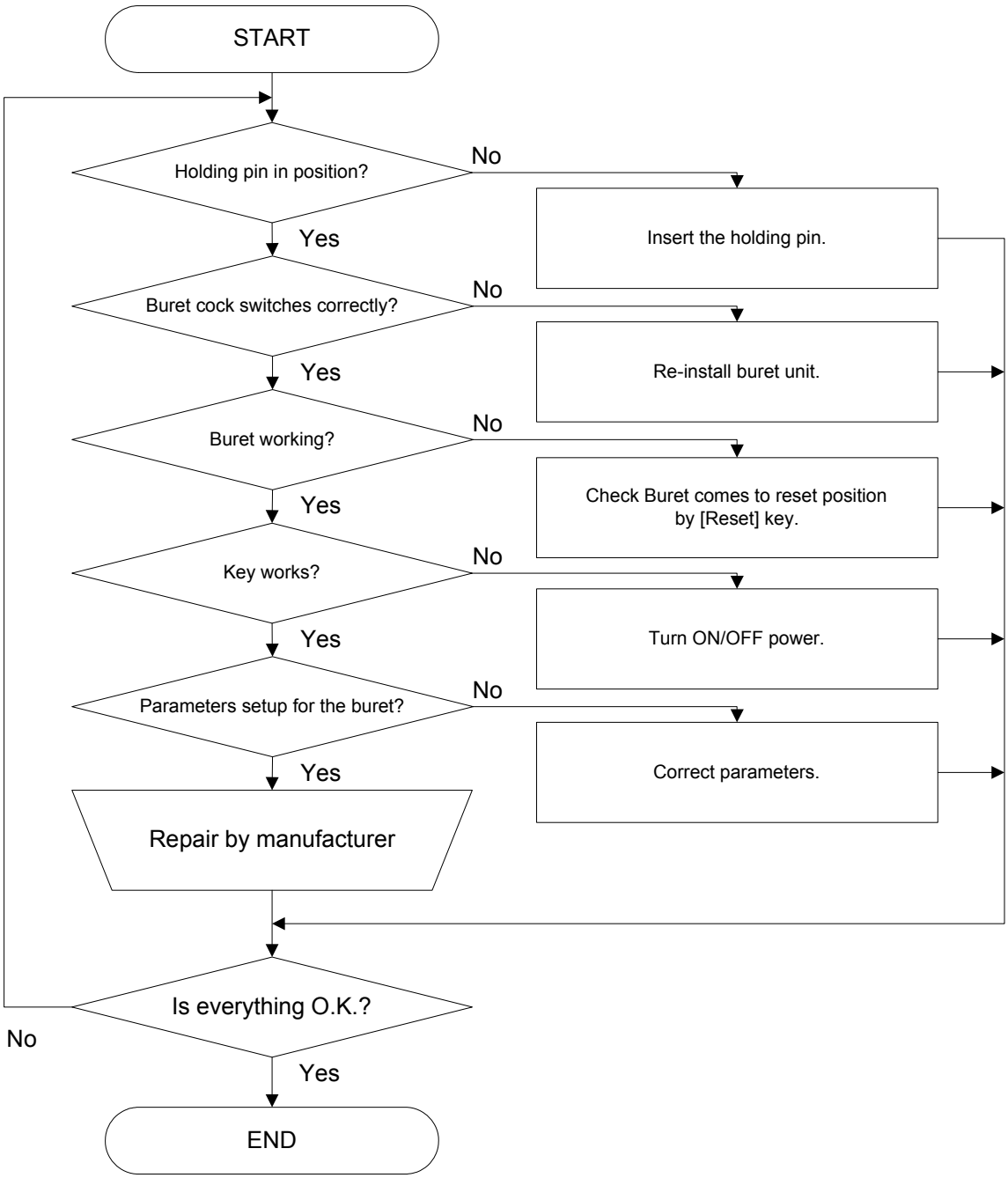
1) Drain the solution in titration flask.
2) Heat the contact areas with a hair dryer to melt the grease.

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

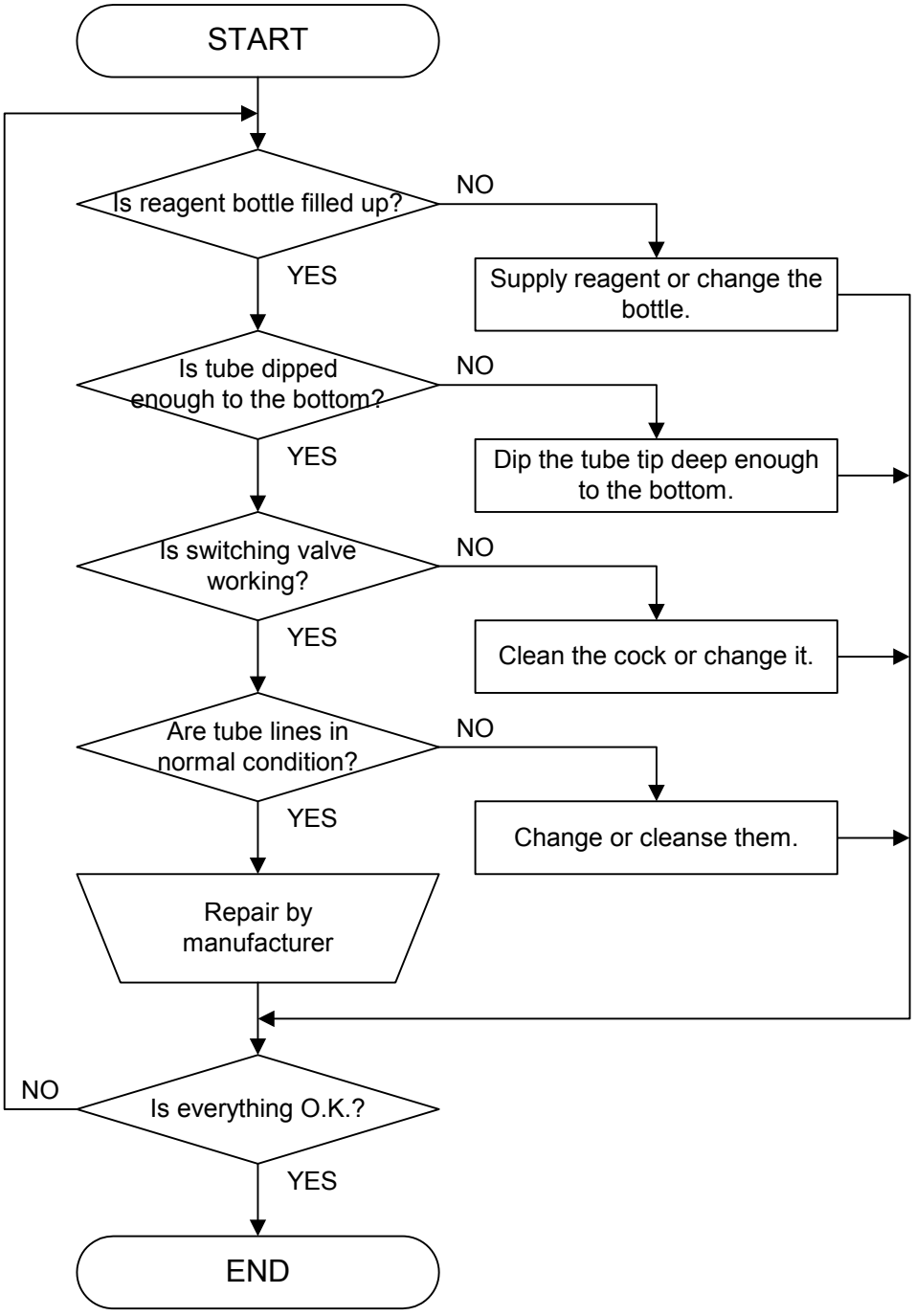
14-5. Stirrer does not work properly



14-6. When Buret malfunctions



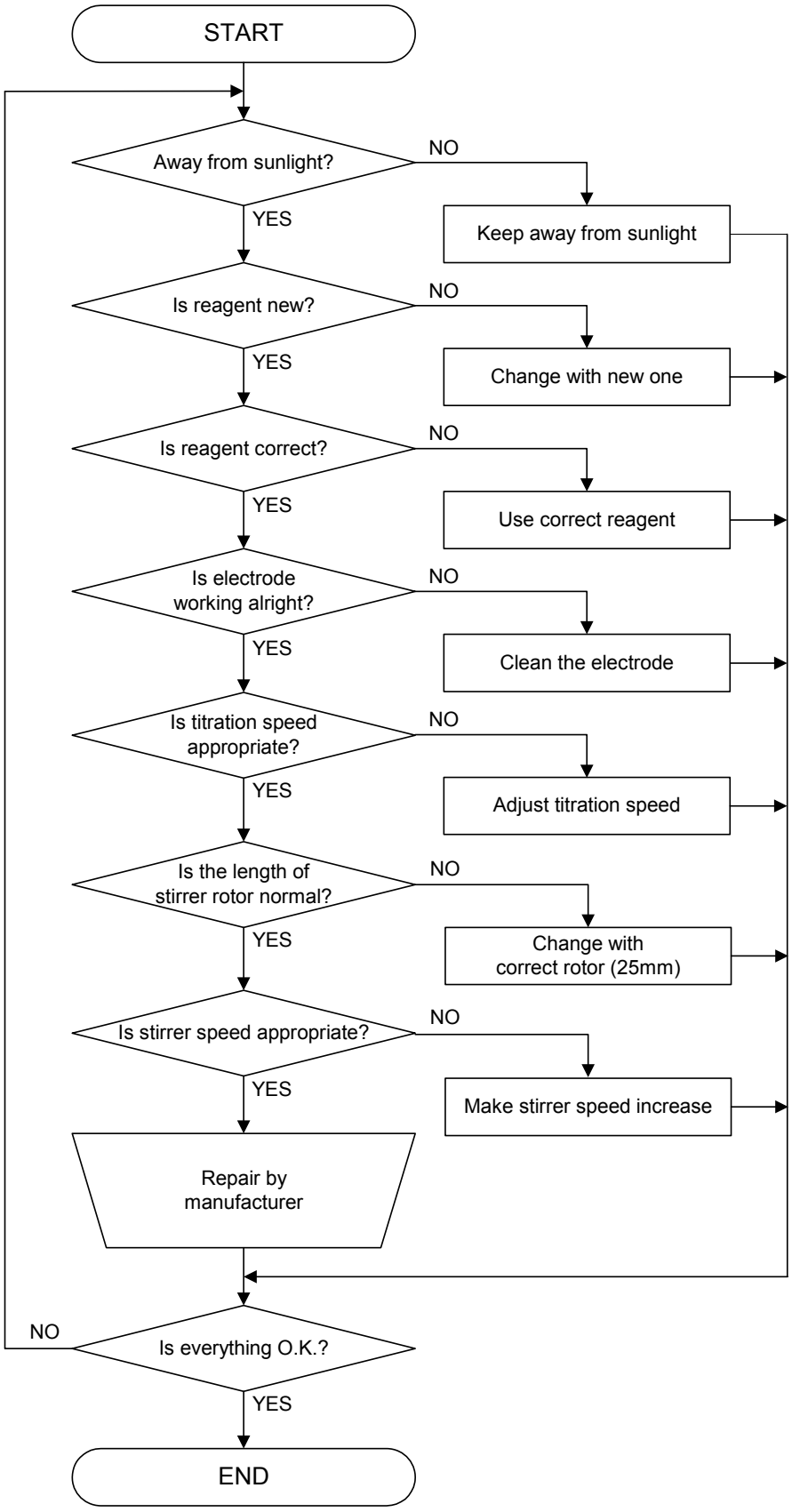
14-7. When air bubbles are found in burette



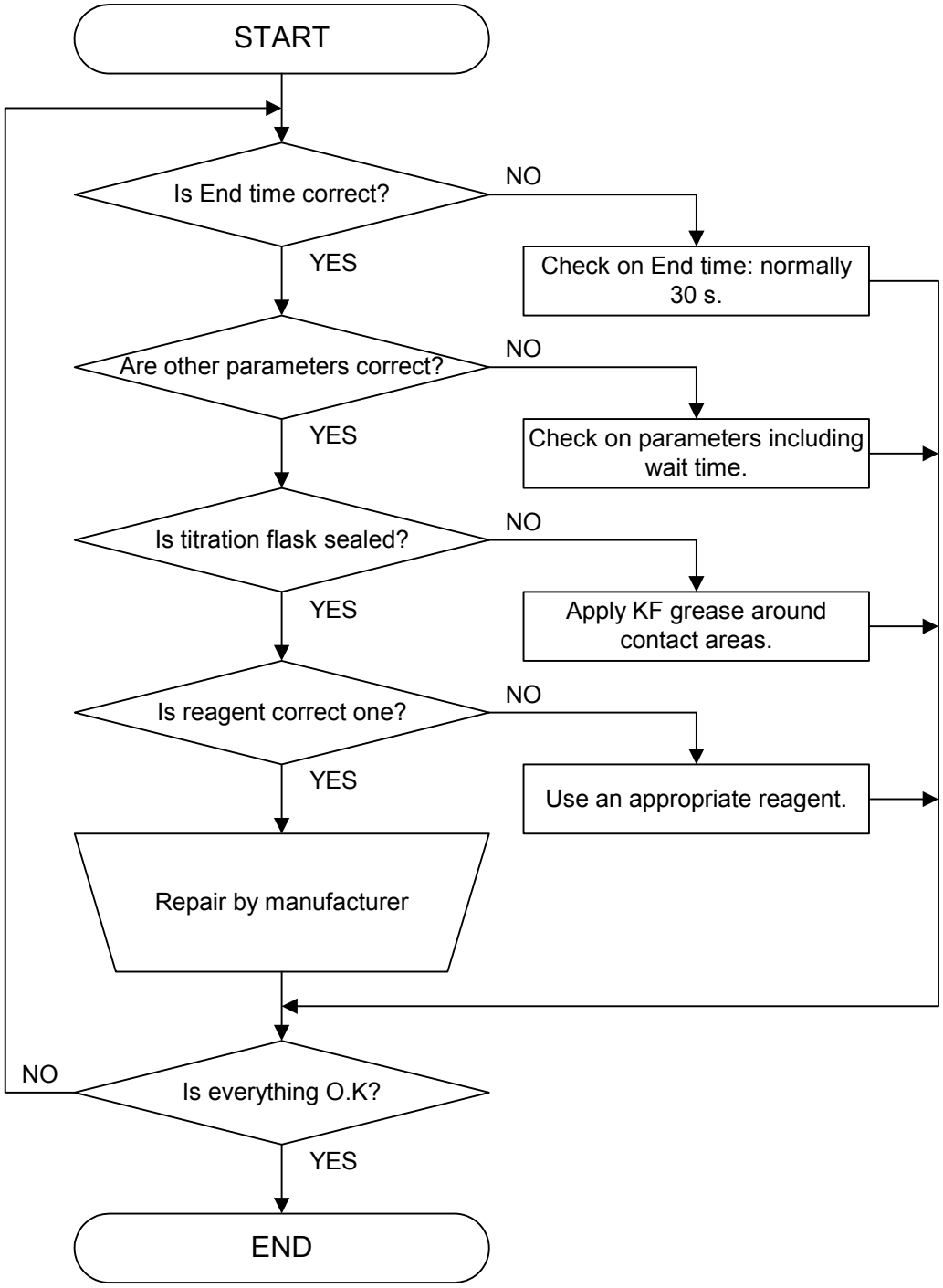
Note:

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

14-8. It runs into over-titration



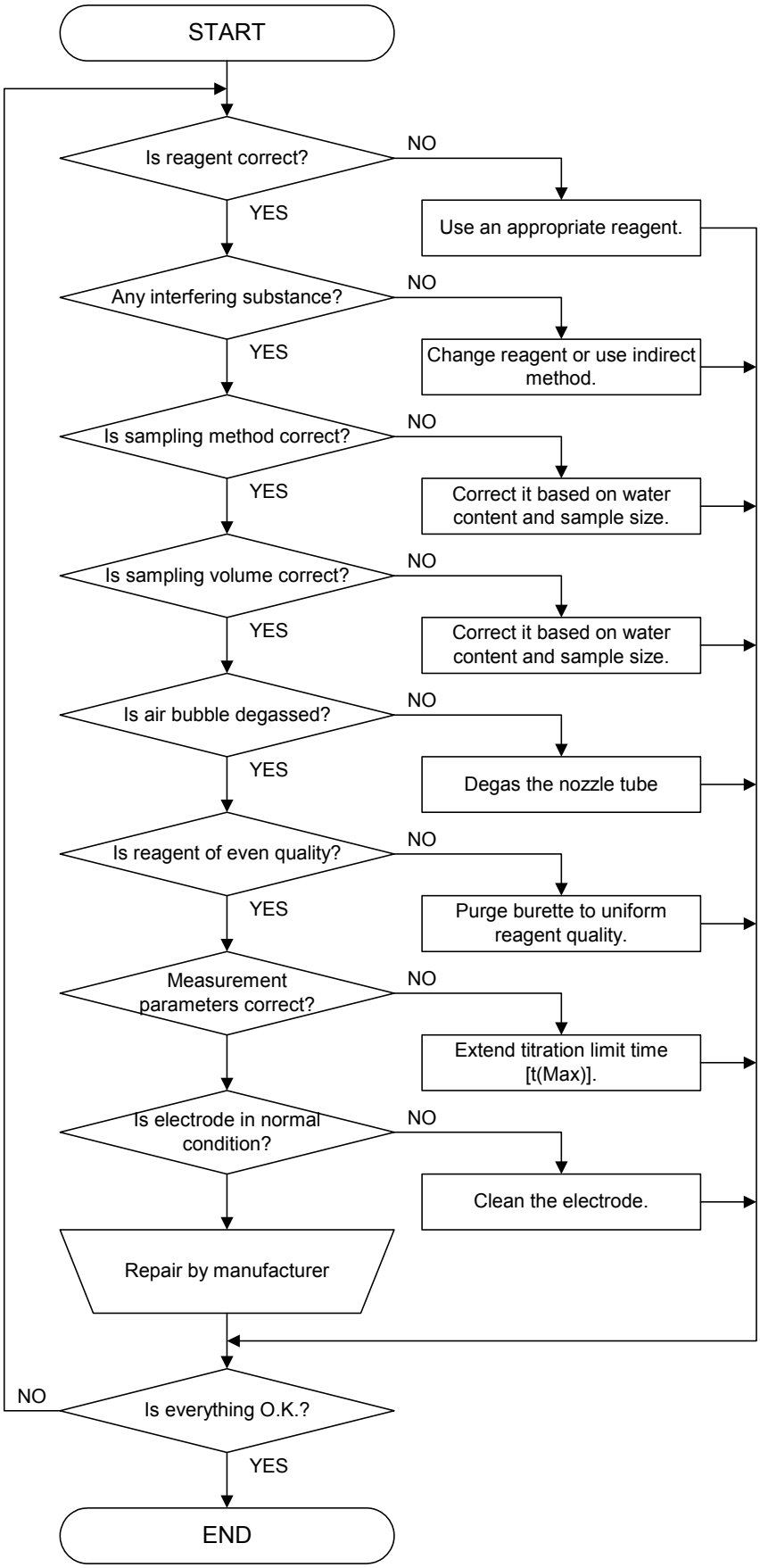
14-9. No endpoint is found or it takes a long time to find EP:



Note:

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

14-10. Poor repeatability or no EP found



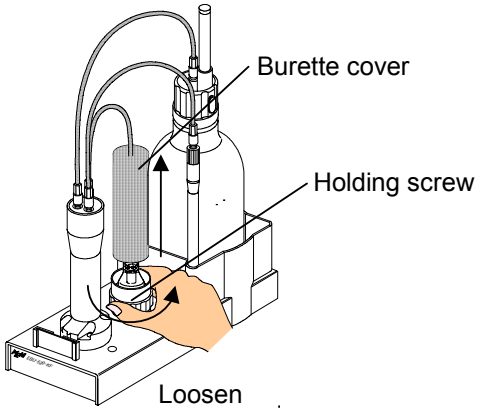
<Relation of water content and sample size>

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

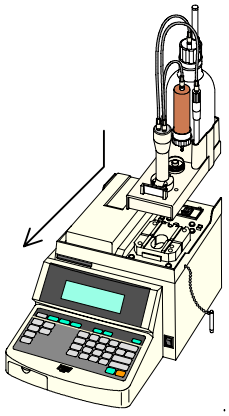
Water concentration	Reagent factor 5mg/mL	Reagent factor 3mg/mL	Reagent factor 1mg/mL
50 ~ 100 %	0.03 ~ 0.015 g	0. 012 ~ 0.006 g	0.006 ~ 0.003 g
10 ~ 50 %	0.15 ~ 0.03 g	0.06 ~ 0.012 g	0.03 ~ 0.006 g
1 ~ 10 %	1.5 ~ 0.15 g	0.6 ~ 0.06 g	0.3 ~ 0.03 g
0.1 ~ 1 %	15 ~ 1.5 g	6 ~ 0.6 g	3 ~ 0.3 g
100ppm ~ 0.1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

14-11. When the burette unit is hard to be mounted.

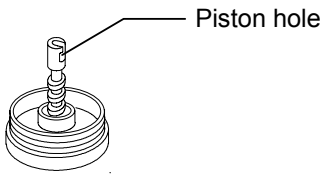
1) Remove burette cover.
2) Remove the burette out of the unit by loosening the holding screw.



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

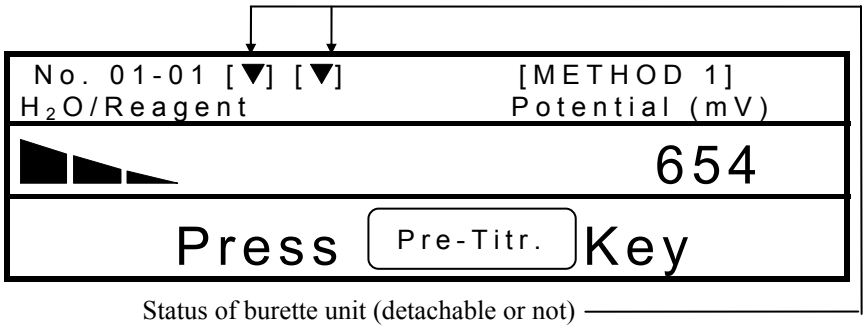


4) Turn on the power and enter burette number by [APB] key, and press [▲] key until the piston hole on the rod appears. Then, stop the piston rod by pressing [▲] key again.

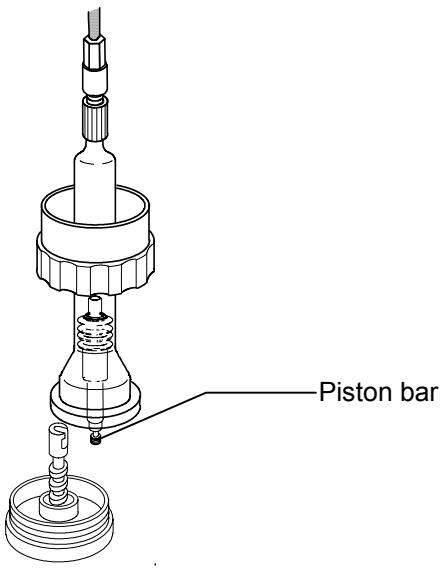


Note:

1. **The burette unit will not activate even after the holding pin is inserted unless both burette units (MKA-520) are mounted. The MKS-520 has only one burette unit to be mounted.**
2. **Before the burette unit is mounted, turn on the burette power and make sure " [▼], [▼] " are shown on display. If its shows " [ ][ ] ", press [▼] key to display " [▼] [▼] ", and then, mount the burette unit. (MKS-520 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 burette so that the rod and piston are on the same axle line.
After the piston stops, fasten the burette screw to hold the burette.



Caution!

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

15. Display messages and glossary

15-1. 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

Display	Meaning
Factor	Factor of reagent
Form 1	Graphic chart of total titration ratio by 100% at EP
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-520/MKS-520 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

Display	Meaning
Pre Treat	Pretreatment of sample using Evaporator
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
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

Display	Meaning
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 Burette,abbreviation of Automatic Power Burette
Burette No.	Selection of burette 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

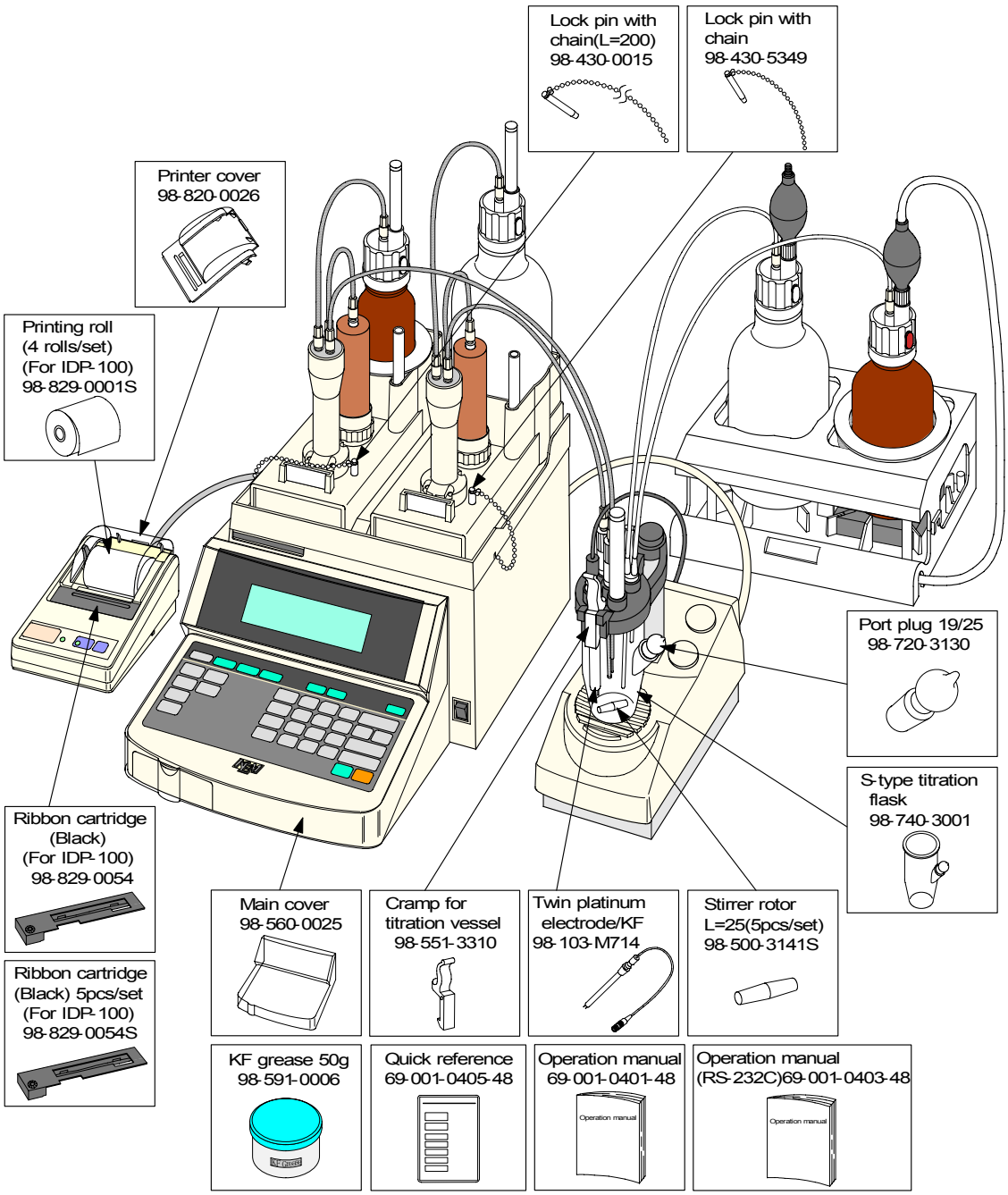
Display	Meaning
I.Potential	Initial potential at start of measurement
I.Resistance	Initial resistance at start of measurement Liquid resistance at start of titration.
LCD Contrast	Adjust brightness of LCD by contrast
Med.	Abbreviation of medium speed
Manual Dose	Setting amount of manually dosed volume. 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 burette.
Titr. Mode	Titration mode. Normal setting 1. For back titration, select 2. Set 3 if excess iodine by 1.
Titr. Burette No.	Select a burette 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 burette 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.

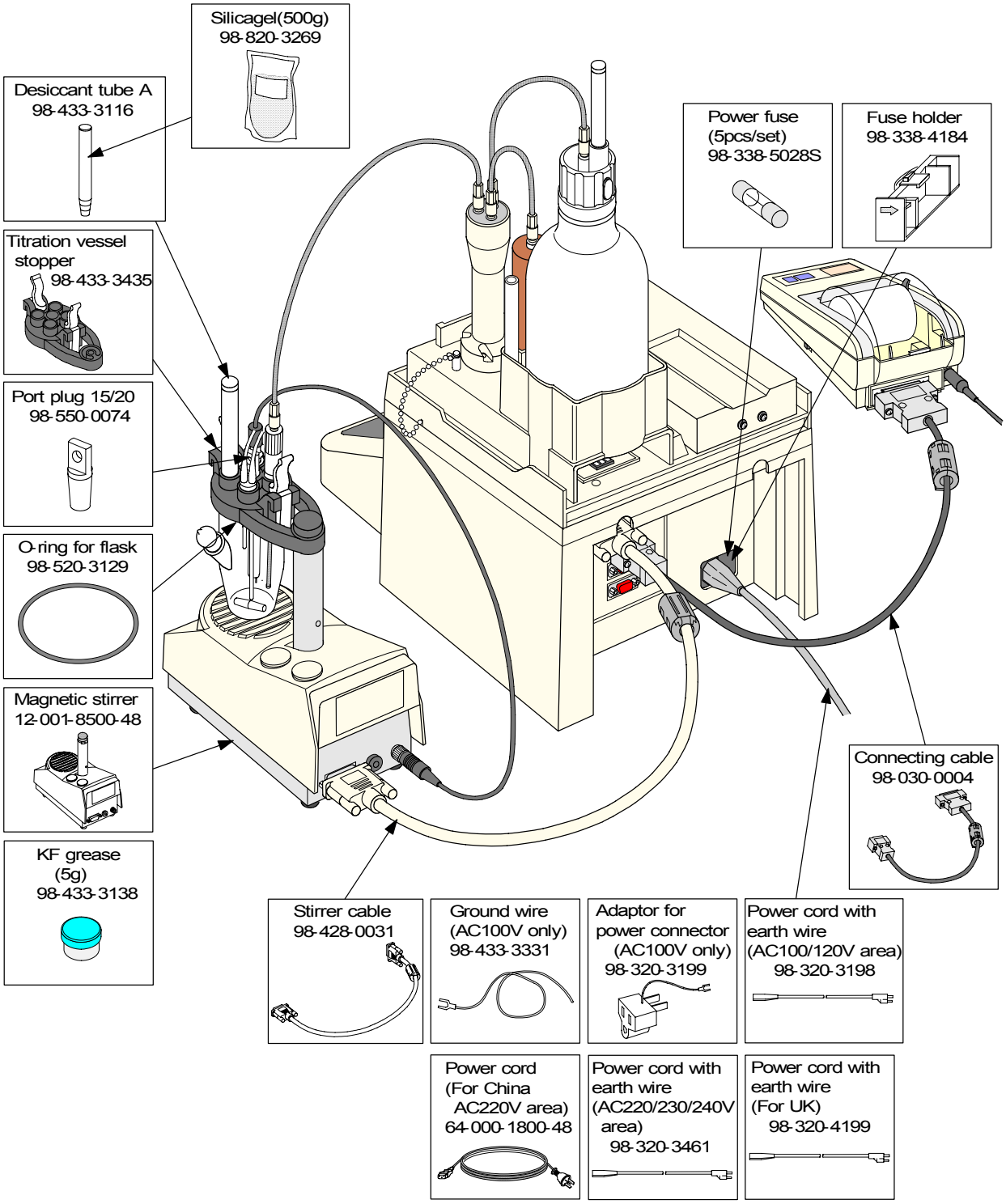
15-2. Glossary

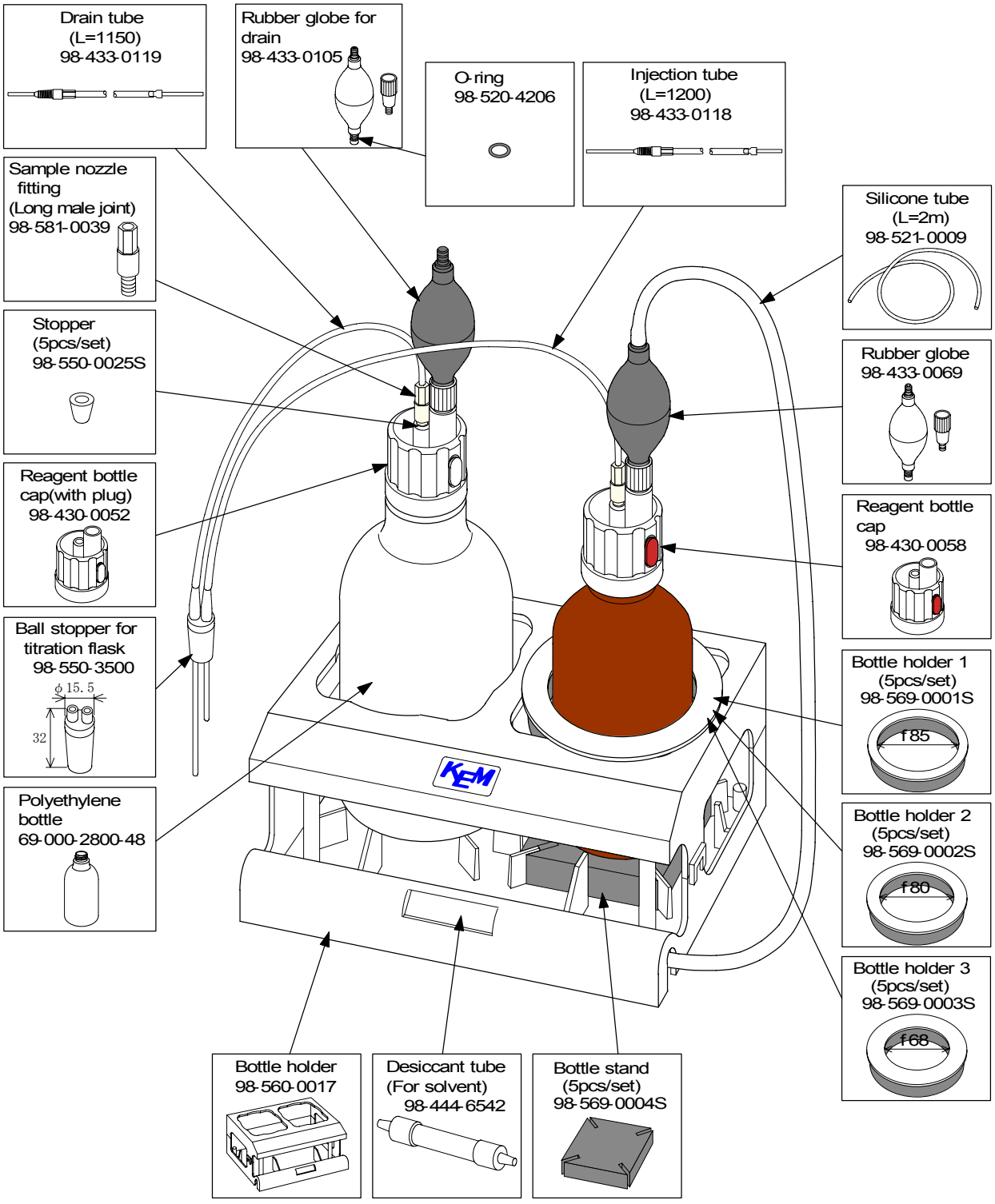
Word	Meaning
Ageing	See “Ageing” on display
Sampler purge	See “Sampler Purge” on display
Evaporator	When moisture sticks around the sample or exists as crystallized, or when a sample cannot be injected into titration cell, such sample is heated to vaporize the moisture in Oven for measurement.
Cell purge	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

16. Parts list

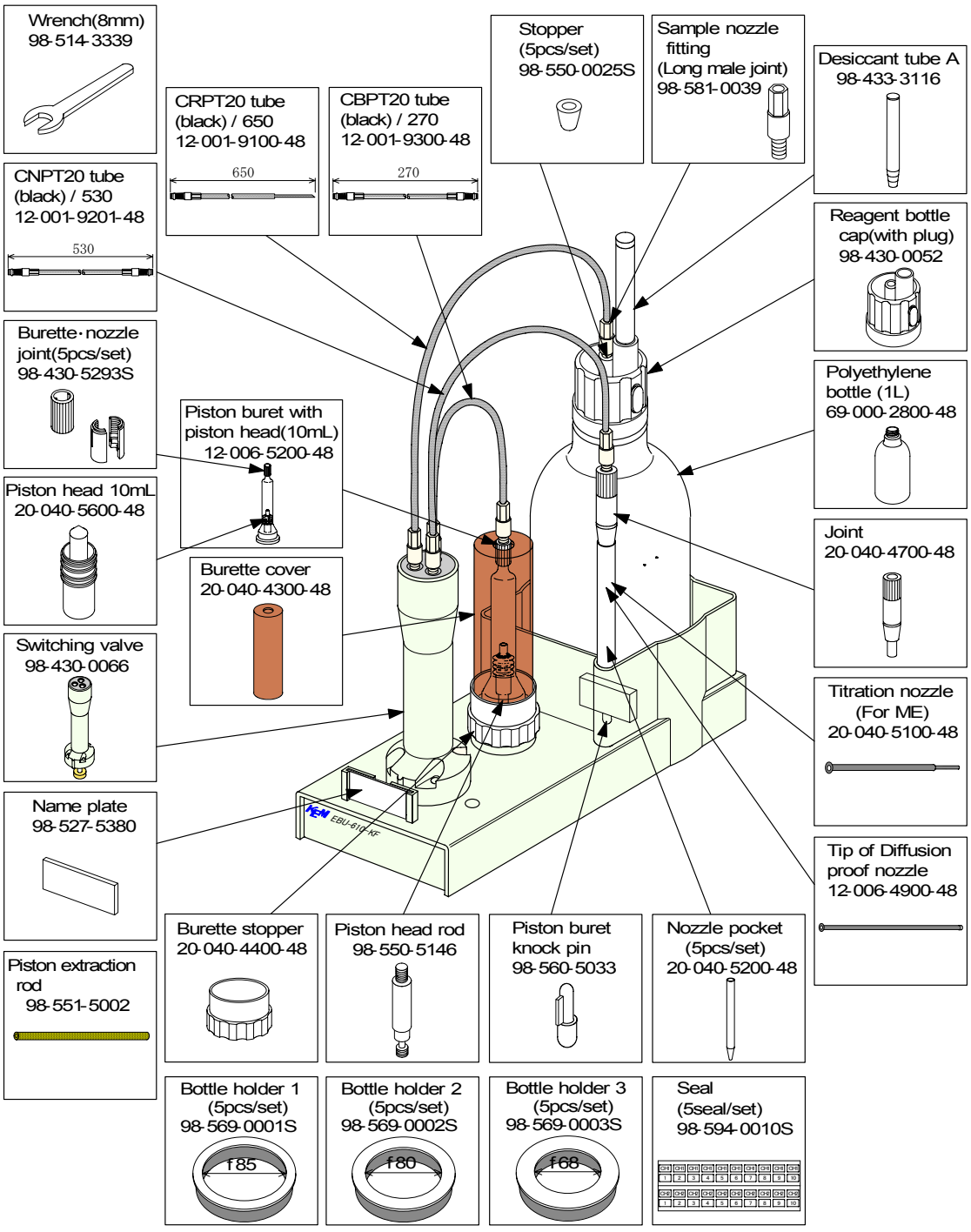
Consumable parts · Maintenance parts



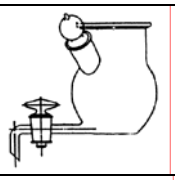
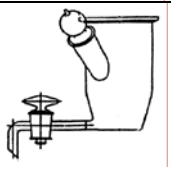
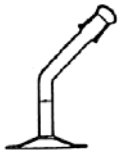
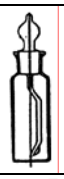
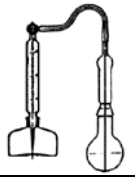
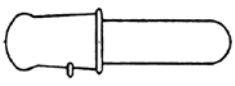

Silicagel(500g)
98-820-3269
Desiccant tube A
98-433-3116
Titration vessel stopper
98-433-3435
Port plug 15/20
98-550-0074
O-ring for flask
98-520-3129
Magnetic stirrer
12-001-8500-48
KF grease
(5g)
98-433-3138
Power fuse
(5pcs/set)
98-338-5028S
Fuse holder
98-338-4184
Connecting cable
98-030-0004
Stirrer cable
98-428-0031
Ground wire
(AC100V only)
98-433-3331
Adaptor for power connector
(AC100V only)
98-320-3199
Power cord with earth wire
(AC100/120V area)
98-320-3198
Power cord
(For China AC220V area)
64-000-1800-48
Power cord with earth wire
(AC220/230/240V area)
98-320-3461
Power cord with earth wire
(For UK)
98-320-4199

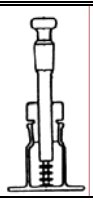
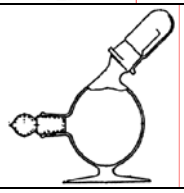
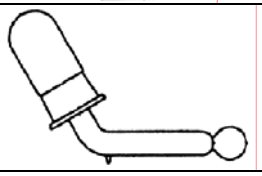
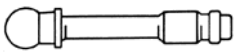
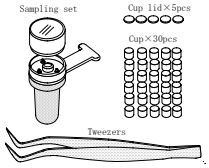
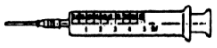
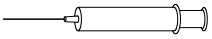
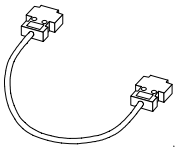
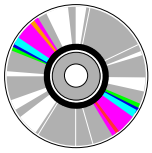
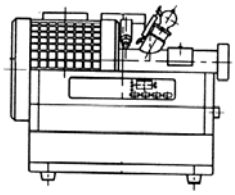

Drain tube
(L=1150)
98-433-0119
Rubber globe for drain
98-433-0105
O-ring
98-520-4206
Injection tube
(L=1200)
98-433-0118
Sample nozzle fitting
(Long male joint)
98-581-0039
Stopper
(5pcs/set)
98-550-0025S
Reagent bottle cap(with plug)
98-430-0052
Ball stopper for titration flask
98-550-3500
ϕ15.5
32
Polyethylene bottle
69-000-2800-48
Silicone tube
(L=2m)
98-521-0009
Rubber globe
98-433-0069
Reagent bottle cap
98-430-0058
Bottle holder 1
(5pcs/set)
98-569-0001S
f85
Bottle holder 2
(5pcs/set)
98-569-0002S
f80
Bottle holder 3
(5pcs/set)
98-569-0003S
f68
Bottle holder
98-560-0017
Desiccant tube
(For solvent)
98-444-6542
Bottle stand
(5pcs/set)
98-569-0004S

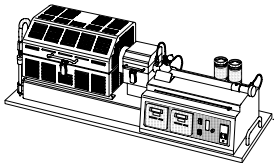
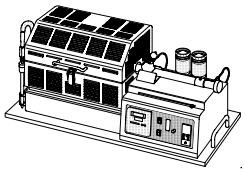
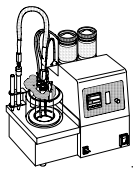
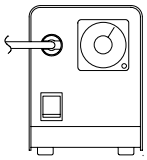
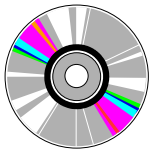
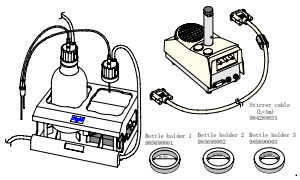
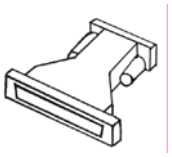
< EBU-610-KF >


Wrench(8mm)
98-514-3339
CRPT20 tube
(black) / 650
12-001-9100-48
650
CBPT20 tube
(black) / 270
12-001-9300-48
270
Stopper
(5pcs/set)
98-550-0025S
Sample nozzle
fitting
(Long male joint)
98-581-0039
Desiccant tube A
98-433-3116
CNPT20 tube
(black) / 530
12-001-9201-48
530
Reagent bottle
cap(with plug)
98-430-0052
Burette･nozzle
joint(5pcs/set)
98-430-5293S
Polyethylene
bottle (1L)
69-000-2800-48
Piston buret with
piston head(10mL)
12-006-5200-48
Piston head 10mL
20-040-5600-48
Joint
20-040-4700-48
Burette cover
20-040-4300-48
Switching valve
98-430-0066
Titration nozzle
(For ME)
20-040-5100-48
Name plate
98-527-5380
Tip of Diffusion
proof nozzle
12-006-4900-48
Piston extraction
rod
98-551-5002
Burette stopper
20-040-4400-48
Piston head rod
98-550-5146
Piston buret
knock pin
98-560-5033
Nozzle pocket
(5pcs/set)
20-040-5200-48
Bottle holder 1
(5pcs/set)
98-569-0001S
f85
Bottle holder 2
(5pcs/set)
98-569-0002S
f80
Bottle holder 3
(5pcs/set)
98-569-0003S
f68
Seal
(5seal/set)
98-594-0010S

Optional accessories and peripherals

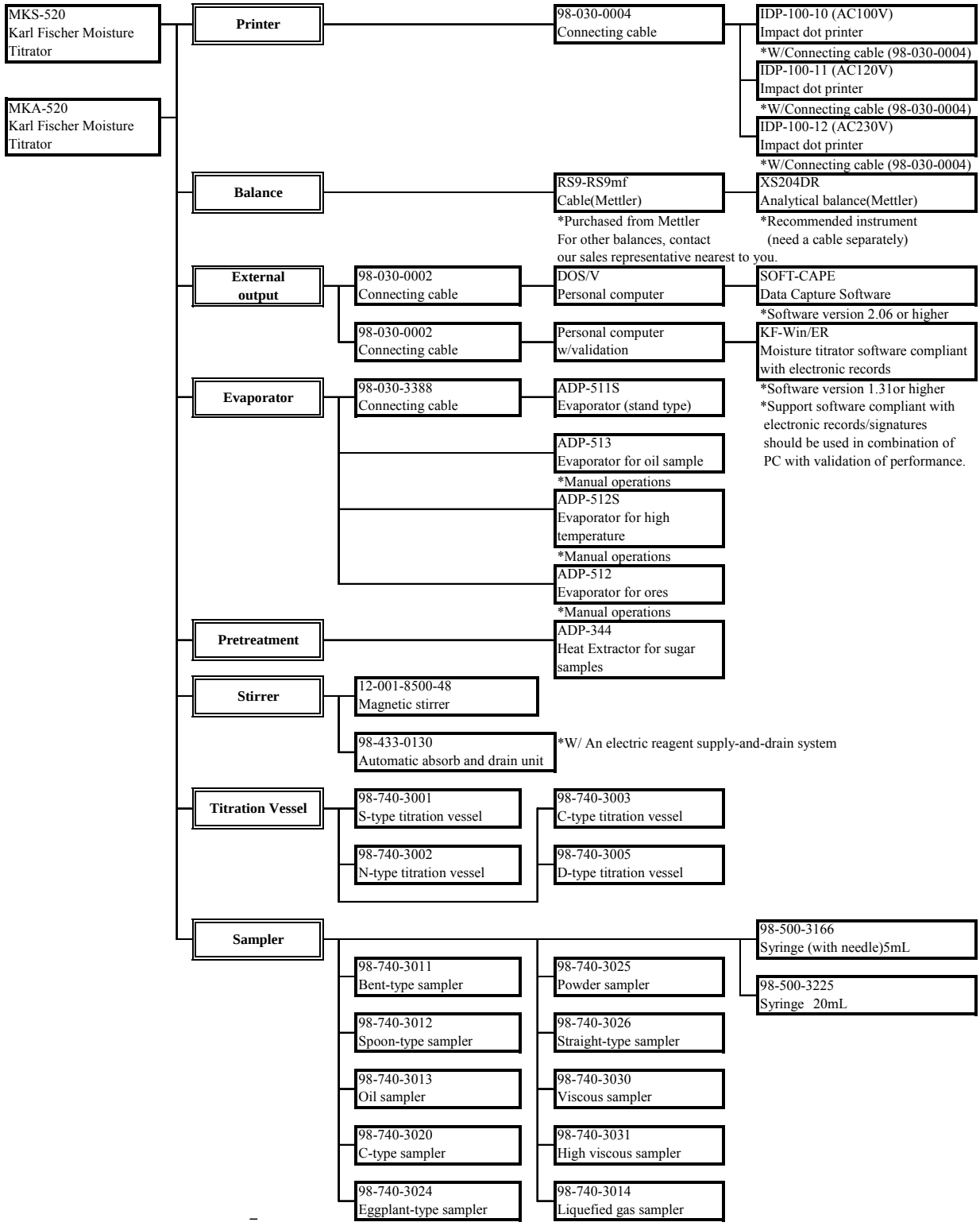
Part code	Part name	Qty	Remark	Sketch
98-740-3002	N-type titration vessel	1	Capacity 50 to 130mL	
98-740-3003	C-type titration vessel	1	Capacity 50 to 130mL	
98-740-3005	D-type titration vessel	1	Capacity 30 to 80mL	
98-740-3011	Bent-type sampler	1		
98-740-3020	C-type sampler	1		
98-740-3012	Spoon-type sampler	1		
98-740-3013	Oil sampler	1		
98-433-3014	Liquefied gas sampler	1		
98-740-3026	Straight-type sampler	1		

Part code	Part name	Qty	Remark	Sketch
98-740-3030	Viscous sampler	1		
98-740-3024	Eggplant-type sampler	1	For powder For ADP-511S	
98-740-3025	Powder sampler	1		
98-740-3031	High viscous sampler	1		
98-433-0093	Sampling set	1		
98-500-3166	Syringe (with needle)	1	5mL	
98-500-3225	Syringe 20mL	1		
98-523-3227S	Silicone pellet	1	5 pce/set	
98-030-0002	Connecting cable	1	9pin-9pin	
SOFT-CAPE	Data capture software	1		
ADP-511S	Evaporator	1	Temperature: Room to 300°C.	

Part code	Part name	Qty	Remark	Sketch
ADP-512	Evaporator for ores	1	Temperature : Room to 200°C Room to 1000°C	
ADP-512S	Evaporator for high temperature	1	Temperature : Room to 1000°C	
ADP-513	Evaporator for oil sample	1	Temperature : Room to 200°C	
ADP-344	Heat Extractor for sugar samples	1	Temperature : Room to 60°C	
KF-Win/ER	Moisture titrator software compliant with electronic records	1		
98-433-0130	Automatic absorb and drain unit	1		
98-350-0001	Conversion module	1	9P-25P	
IDP-100-10 IDP-100-11 IDP-100-12	Impact dot printer	1 1 1	100V area 120V area 230V area With cable	

Part code	Part name	Qty	Remark
98-812-4008	Composite 5	1	
98-812-4007	Composite 2	1	
98-812-4036	Composite 1	1	
98-812-4018	Composite 5K	1	for ketone
98-812-0016	Composolver	1	1L
98-812-4035	Dehydrating solvent ML	1	
98-812-4029	Dehydrating solvent MI	1	
98-812-4039	Dehydrating solvent MS	1	
98-812-4030	Dehydrating solvent CM	1	for oil
98-812-4031	Dehydrating solvent FM	1	for sucrose
98-812-4032	Dehydrating solvent CE	1	for ketone
98-812-4034	Dehydrating solvent ME	1	for gas
98-812-4048	Water-methanol 2	1	250mL
98-812-4044	Water-methanol 5	1	500mL
98-812-0001	Water standard	1	Factor 10 10 pcs/set
98-820-3269	Silica gel	1	500g

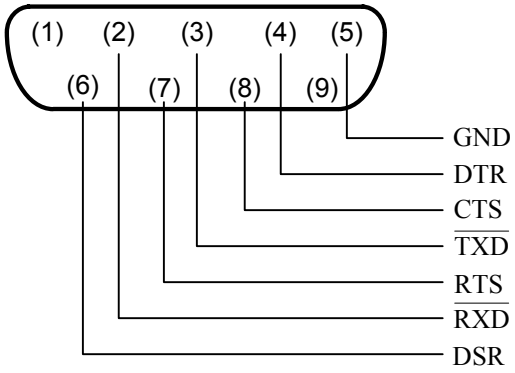
17. System Configuration



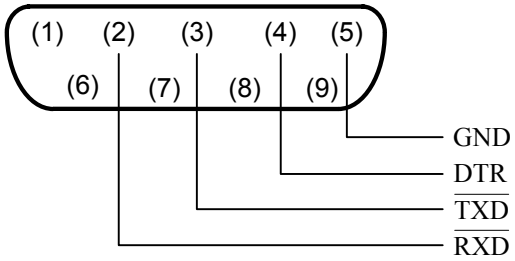
18. External I/O interface pin configuration

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

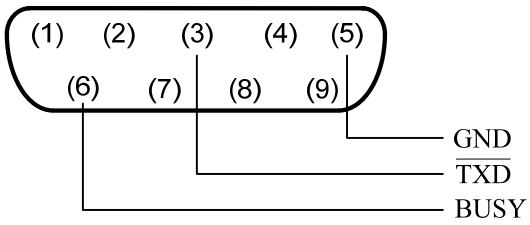
1) RS-232C



2) Balance



3) Printer



19. Basic specification

Type and Model	MKA-520/MKS-520 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 (depends on KF reagent factor) 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-520 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-520 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.
Automatic piston burette 2 sets (MKA-520) 1 set (MKS-520)	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	1) RS232C interface for Printer 2) RS232C interface for Balance and 3) RS232C interface for Computer
Ambient condition	1) Temperature 5 to 35°C 2) Humidity less than 85%RH
Power source	AC100 to 120V/AC200 to 240V ± 10%, 50/60Hz
Power consumption	Aprox.35W
Dimension	1) Main unit: 288(W)×468(D)×629(H)mm 2) Stirrer: 118(W)×225(D)×320(H)mm 3) Solvent change unit: 240(W)×170(D)×405(H)mm
Weight	MKA-520 : Aprox.13.5kg MKS-520 : Aprox.12.5kg
CE marking	EMC : EN61326 LVD : EN61010-1 conformed

20. Warranty and After-Sale Service

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

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

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

   Production number of unit
   Description of the trouble
   Person to contact

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

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

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

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

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