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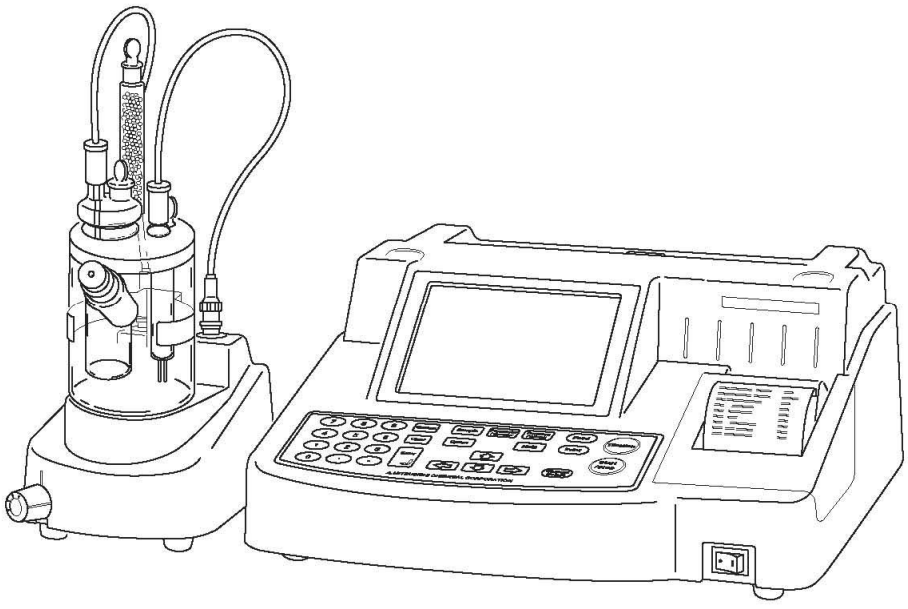
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**Control No. ZCAEMAE-00**

# Instruction Manual
# For
# Moisture Meter
# (Coulometric Titration)
# Model CA-200



**MITSUBISHI CHEMICAL CORPORATION**
**TOKYO, JAPAN**

# DECLARATION OF CONFORMITY

Application of Council Directives :

EC Electromagnetic Compatibility Directive : 89/336/EEC
Electrical Equipment Designed for Use within Certain Voltage Limits : 73/23/EEC

Standard to which Conformity is Declared :
EN61000-6-3: 2001, EN61000-6-1: 2001, EN61010-1/A2 (1995)

| | |
|---|---|
| Manufacturer's Name | : Mitsubishi Chemical Corporation |
| Manufacturer's Address | : 370, Enzo Chigasaki, Kanagawa, Japan |
| EU Office Address | : Prinzenallee 13 40549 Duesseldorf Germany |
| Type of Equipment | : Laboratory Equipment |
| Model Name | : Moisture Meter Model CA-200 |
| Beginning of Serial Number | : E1M00016 |
| Month and year of Manufacture | : July, 2006 |

*I, the undersigned, hereby declare that the equipment specified above conforms to the above Directives and Standards.*

Masanori Hirai
General Manager

# Introduction

Thank you for your purchase of our Moisture Meter Model CA-200.

This unit measures trace (10 μg to 100mg) of moisture in liquid, solid, and gas samples.

To use Model CA-200 correctly and safely, appoint supervisors and operators.

* “Sicapent” in this manual is a Merck’s registered trademark.

# Before the use

- You should read this instruction manual with care before the use of the moisture meter.
- Keep the manual at hand to read it soon if necessary. When the moisture meter is rearranged, also rearrange the manual.
- Follow the contents in this manual. When troubles or damages occur by neglecting the contents in this manual, we do not guarantee the unit even within the term.

# IMPORTANT SAFEGUARDS AND PRECAUTIONS

## WARNING

Place Model CA-200 at the place where temperature is 5 to 40 degrees Celsius and humidity is under 80%. The placement except these conditions causes troubles.

## WARNING

Ground a power cable ground line or a ground terminal surely.
By touching the metal of Model CA-200 without grounding, you can get an electric shock.

## WARNING

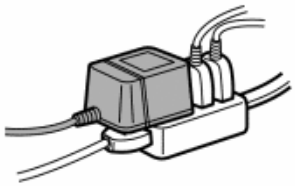
As it thunders, do not connect a power cable. Danger of an electric shock by lightning

## CAUTION

Do not place things in front of Model CA-200. When things are placed, the power switch of the unit can't be turned off emergently and accidents can be caused.

## CAUTION

Do not connect many cords into outlets. Danger of a fire by outlet overheat



## CAUTION

Place Model CA-200 at the place free from water, humidity, dust, and oily smoke.
Danger of a fire, breakage, and an electric shock

## WARNING

Model CA-200 is not explosion prevention, so do not place flammable material near Model CA-200. The placement except these conditions causes a fire and an explosion.

**WARNING**

After stopping the unit or at the parts change, repair, and inspection, pull off the main power plug necessarily to avoid an electrical shock.

**WARNING**

Pull out a power plug while holding it not to disconnect or short-circuit in a plug or a cord.

**WARNING**

Put on protective goggles and gloves necessarily when using reagents. Without putting on them, skin disorder and blindness can be caused.

**CAUTION**

Do not impact exposed glass not to break it. Fragments and scatter cause accidents.

**WARNING**

Never disassemble or remodel the unit. Contact our distributors if necessary.

**WARNING**

When a trouble happens, immediately notify the fact to the person in charge and take an emergency measure. If the cause is unclear or the problem is not solved, never restart the unit.

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# Section 1: Measurement Principle

Model CA-200 measures moisture by applying Karl Fischer reaction to coulometric titration.
In this coulometric titration, supply electrolytic solution mainly composed of iodide ions, sulfur dioxide, and alcohol to a titration cell. Iodine for titration is internally generated by electrolysis.

* Karl Fischer reaction

Water reacts with iodine and sulfur dioxide in base and alcohol.

$$H_2O + I_2 + SO_2 + ROH + 3Base \rightarrow 2Base \cdot HI + Base.....HSO_4R \quad (1)$$

* Coulometric titration
Iodine is generated from iodine ions by electrolysis in the anode solution containing iodine ions.

$$2I^- - 2e \rightarrow I_2 \quad (2)$$

When iodine generated by the reaction of the formula (2) is consumed according to the formula (1), the consumption of iodine is detected by a detector electrode and iodine is generated again from an anode by electrolysis according to the formula (2). The generated iodine is proportional to electric quantity by "Faraday's law".

From the formula (1), the ratio of reaction of $H_2O$ and $I_2$ is 1 : 1.
Therefore, 1 mol (18g) of water corresponds to $2 \times 96500$ coulombs and 1mg of water corresponds to 10.72 coulombs.

Based on the above principle, moisture content is calculated from the electricity for electrolysis.

# Section 2: Installation and Assembly

## 2-1. Installation

### 2-1-1. Unpacking and contents check

Packing box A: 1 set

| No. | Part names | Part numbers | Quantity |
|---|---|---|---|
| 1 | CA-200 unit | | 1 set |
| 2 | CA-200 stirrer | CAESTR | 1 set |
| 3 | Fuse 2.5A φ5.2/20 midget slow-blow | FU25MS | 2 pcs/set |
| 4 | Printer roll paper | PRIPR4 | 1 set |
| 5 | Rubber packing φ10/2 t | CAMGPC | 100 pcs/set |
| 6 | Silicon rubber chip small 10/10/5 t | CAMSIG | 50 pcs/set |
| 7 | Grease 3g | | 1 set |
| 8 | Silica gel 100g | | 1 set |
| 9 | Cotton ball | | 50 pcs/set |
| 10 | Stirrer number sticker | | 1 pc |

Packing box B: 1 set

| No. | Part names | Part numbers | Quantity |
|---|---|---|---|
| 11 | Generator solution cell without a drain port | CAMGC4 | 1 set |
| 12 | Detection electrode (BNC) | CAMDEB | 1 pc |
| 13 | Cathode solution cell (with a sealing plug, BNC) | CA20CE | 1 set |
| 14 | Sealing plug long φ12/12L | | 1 pc |
| 15 | Drying tube large (with a plug) | CAM011 | 1 set |
| 16 | Stirrer bar φ35L | | 1 pc |
| 17 | Sample injection plug | | 1 pc |
| 18 | Polyethylene funnel (L) | KF1050 | 1 pc |
| 19 | Polyethylene funnel (S) | CARTS | 1 pc |
| 20 | Pipette (For discharge) | | 1 pc |
| 21 | Lock-type syringe 1ml (with a needle) | | 1 set |
| 22 | Drain bottle 500ml (washing bottle-type) | CAEVBL | 1 pc |

Packing box C: 1 set

| No. | Part names | Part numbers | Quantity |
|---|---|---|---|
| 23 | CA-200 instruction manual (this manual) | ZCAEMAE | 1 pc |
| 24 | Balance interface specifications | ZCAEBIE | 1 pc |
| 25 | Power cable (100/ 120 or 230/ 240V) | CAM085 | 1 pc |
| 26 | 2P-3P converting plug (120V only) | CAM083 | 1 pc |
| 27 | Check solution P (100ml) | | 1 pc |

For 2 channels specifications, the following attachments are added to the above packing boxes A, B, C.

***1. Coulometric-method- Coulometric method***

Attachment added to Packing box A

| No. | Part names | Part numbers | Quantity |
|---|---|---|---|
| 28 | CA-200 stirrer | CAESTR | 1 set |

One set of packing box B is added to be two sets.

| No. | Part names | Part numbers | Quantity |
|---|---|---|---|
| 29 | Generator solution cell without a drain port | CAMGC4 | 1 set |
| 30 | Detection electrode (BNC) | CAMDEB | 1 pc |
| 31 | Cathode solution cell | CA20CE | 1 set |
| 32 | Sealing plug long φ12/12L | | 1 pc |
| 33 | Drying tube large (with a plug) | CAM011 | 1 set |
| 34 | Stirrer bar φ35L | | 1 pc |
| 35 | Sample injection plug | | 1 pc |
| 36 | Polyethylene funnel (L) | KF1050 | 1 pc |
| 37 | Polyethylene funnel (S) | CARTS | 1 pc |
| 38 | Pipette (discharge) | | 1 pc |
| 39 | Lock-type syringe 1ml (with a needle) | | 1 set |
| 40 | Drain bottle 500ml (washing bottle-type) | CAEVBL | 1 pc |

Attachment added to Packing box C

| No. | Part names | Part numbers | Quantity |
|---|---|---|---|
| 41 | Check solution P | | 1 pc |

***2. Coulometric-method- Volumetric method***

Attachment added to Packing box A

| No. | Part names | Part numbers | Quantity |
|---|---|---|---|
| 42 | KF-200 stirrer | KFESTR | 1 sets |

One set of the following packing box is added.

| No. | Part names | Part numbers | Quantity |
|---|---|---|---|
| 43 | Titration flask body A-2 type (without a drain port) | KFA202 | 1 set |
| 44 | Titration flask cap (with an O-ring) | KF7FCP | 1 set |
| 45 | Titration flask cap screw | KF10N1 | 3pcs/set |
| 46 | Detection electrode (BNC) | KF7DTE | 1 pc |
| 47 | Sealing plug long φ12/12L | | 1 pc |
| 48 | Sealing plug φ12/12L | CAMBLS | 2 pcs/set |
| 49 | Drying tube with a three-way cock | KF1006 | 1 set |
| 50 | Stirrer bar φ30L | | 1 pc |
| 51 | Sample injection plug | | 1 set |
| 52 | Polyethylene funnel (L) | KF1050 | 1 pc |
| 53 | Lock-type syringe 2ml (with a needle) | | 1 set |
| 54 | Drain bottle 500ml (washing bottle-type) | CAEVBL | 1 pc |

Attachment added to Packing box C

| No. | Part names | Part numbers | Quantity |
|---|---|---|---|
| 55 | KF-200 instruction manual | ZKFEMAE | 1 pc |

One set of Packing box D is added.

| No. | Part names | Part numbers | Quantity |
|---|---|---|---|
| 56 | KF-200 buret drive<br>(a protective cover, a holder, a tray) | | 1 set |
| 57 | Syringe buret, 10ml | KFEBS7 | 1 set |
| 58 | Valve line set φ3 | KF7TB9 | 1 set |
| 59 | Buret nozzle φ3M7 | KF5BNZ | 1 pc |
| 60 | Buret nozzle holder | | 1 pc |
| 61 | Reagent bottle cap kit (with a desiccant tube) | GTCPK5 | 1 set |
| 62 | Dropper bottle small (for titer determination) | | 1 set |
| 63 | Drive signal cable (single) | KF8CB1 | 1 set |
| 64 | Buret number sticker | | 1 pc |

### *3. Coulometric-method- Volumetric method (Double)*

The following attachments are added to Coulometric method - Volumetric method (Single).

One set of packing box D is added to be two sets.

* A drive signal cable (double) is attached and a dropper bottle small is not attached.

| No. | Part names | Part numbers | Quantity |
|---|---|---|---|
| 65 | KF-200 buret drive<br>(a protective cover, a holder, a tray) | | 1 set |
| 66 | Syringe buret, 10ml | KFEBS7 | 1 set |
| 67 | Valve line set φ3 | KF7TB9 | 1 set |
| 68 | Buret nozzle φ3M7 | KF5BNZ | 1 pc |
| 69 | Buret nozzle holder | KF6NZ1 | 1 pc |
| 70 | Reagent bottle cap kit (with a desiccant tube) | GTCPK5 | 1 set |
| 71 | Drive signal cable (double) | KF8CB1 | 1 set |
| 72 | Buret number sticker | | 1 pc |

## 2-1-2. Place for installation

(1) No large temperature changes, corrosive gas, dust, vapor, and direct sunlight

(2) The temperature should be 5 to 40 degrees Celsius and humidity should be under 80% without dew drop.

(3) No electric and magnetic fields influence

**POINT**

Temperature change makes detection potential unstable and analysis accuracy low. Direct sunlight causes liberation of iodine and analysis values are low.

## 2-1-3. Power supply

Connect a power cable apart from other units (large motors, dryers etc.) which generate noise.
In addition, connect it at the place where power change is within ±10%.
Use a 3P outlet with a ground or a 2P-3P adapter to ground firmly.

**WARNING**

If you touch the chassis metal part when an earth terminal is not grounded completely, you get a shock.

# 2-2. Assembly

## 2-2-1. Titration cell

Remove each part of a titration cell and spread lightly contacting parts with attached exclusive grease. Put cotton balls and silica gel into a drying tube.

**POINT**

Necessarily use exclusive grease. Particularly when moisture adsorbs to the ceramic septum of a cathode solution cell, much time is required until the widow condition indication is stable. After leaving a cell in the air for a long time, dry it with a dryer and assemble it.

(1) Put a titration cell to a stirrer stand so that a sample injection plug is at the front.

(2) Insert the BNC connector 1 of a detection electrode into the right connection jack (green). Insert the BNC connector 2 of a cathode solution cell into the left connection jack (blue). Turn the cell right to fix it.

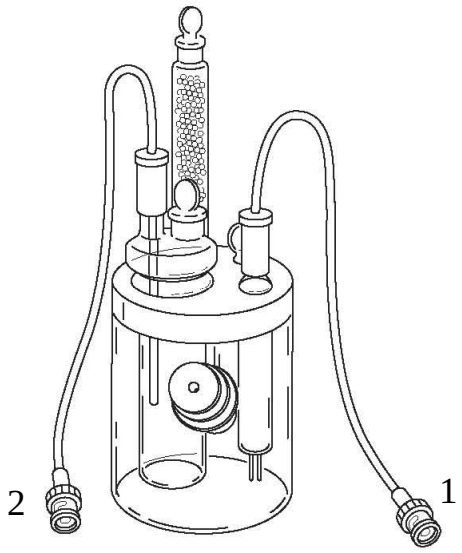



**Illustration 2-1. Titration flask assembly**

## 2-2-2. Stirrer connection

Connect a stirrer cable to “STIRRER 1” of the unit rear.

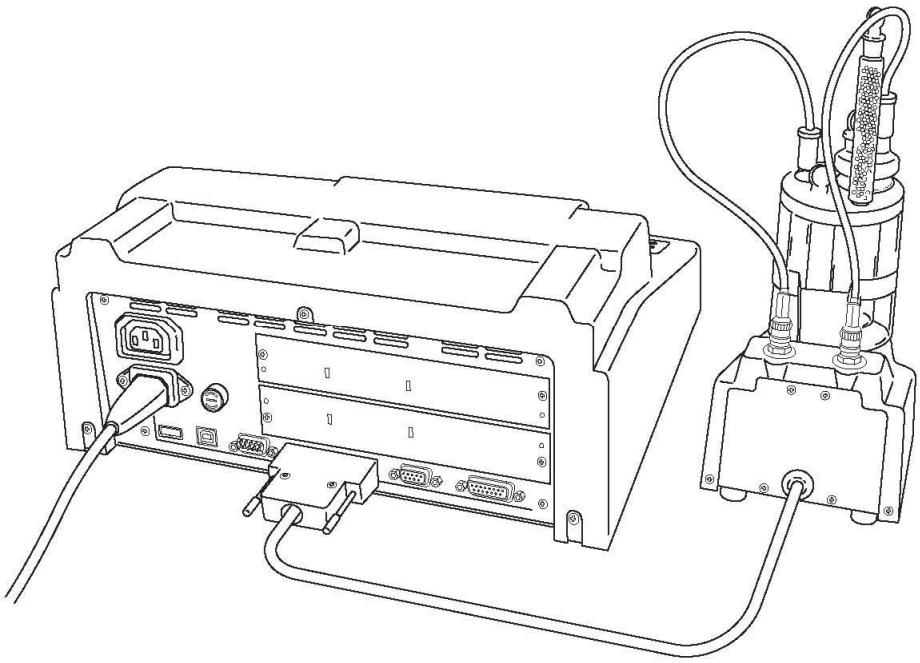


**Illustration 2-2. Connection of a stirrer to the unit**

* For 2 channels specifications, connect the second stirrer cable to CH2 board “STIRRER2”.

## 2-2-3. Printer roll paper setting

(1) Take off a printer cover. Do not take off it forcibly.

(2) Cut the end of printer paper in a perpendicular direction to the feed direction. Put the paper from a roll paper inlet so that the back of paper faces to this side.

(3) Raise a lever, pass paper so that printing side is downside, and lower the lever.

(4) Pass roll paper through the cover and set the cover.

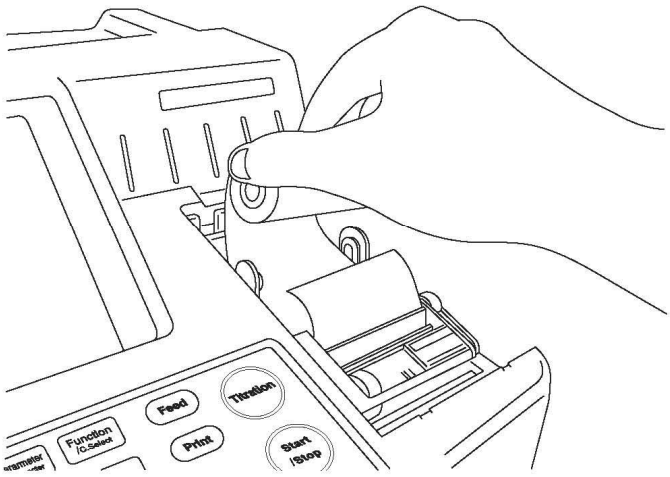



**Illustration 2-3. Printer roll paper setting**

**CAUTION**

After paper setting, set a printer cover necessarily.
The cutter of a printer cover is sharp.
Take care not to get hurt at the setting.

# Section 3: Names and Functions of Model CA-200

## 3-1. Main unit front

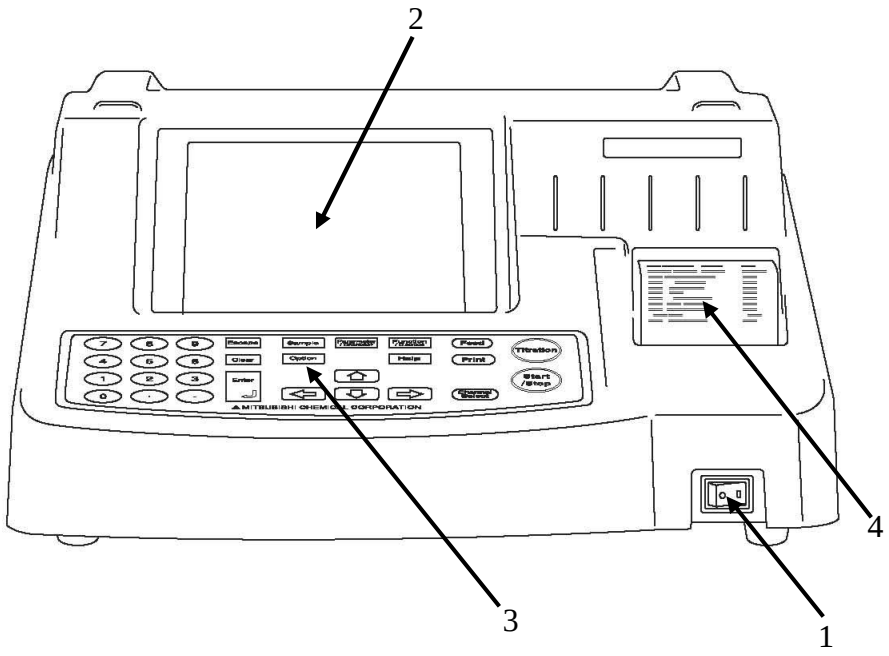



**Illustration 3-1. Main unit front**

| No. | Names | Functions |
|---|---|---|
| 1 | Power switch | By pressing [ \| ] side, power is on. By pressing [○] side, power is off. |
| 2 | Display | It is 5.7 inches color LCD and displays setting and operation information and error messages. |
| 3 | Keypad | For titration start, stop, and sample weight input<br>For keypad operation, display, and each input setting, refer to 5. Moisture Measurement Mode. |
| 4 | Printer | Titration parameters, measurement result, and graphs are printed. |

**Table 3-1. Main unit front**

# 3-2. Main unit rear

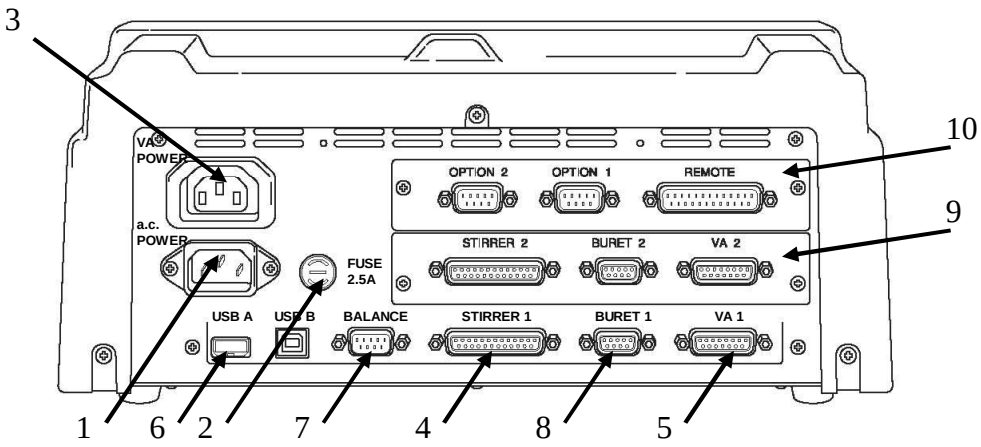



**Illustration 3-2. Main unit rear**

| No. | Names | Functions |
|---|---|---|
| 1 | Power cable connection port | For connecting a power cable |
| 2 | Fuse holder | For setting a 2.5A fuse<br>Pull it with a flathead screwdriver. |
| 3 | VA power cable connection port | For connecting a vaporizer power cable |
| 4 | Stirrer cable connection port | For connecting a stirrer cable |
| 5 | VA signal connection port | For connecting a vaporizer signal cable |
| 6 | USB memory connection port | For connecting an USB memory |
| 7 | Balance signal connection port | For connecting a balance signal cable |
| 8 | Buret signal connection port | For connecting a KF-200 buret signal cable |
| 9 | CH2 board | For 2 channels simultaneous measurement |
| 10 | Personal computer interface board | For an external dot printer and RS-232C communication |

**Table 3-2. Main unit rear**

# 3-3. Titration cell

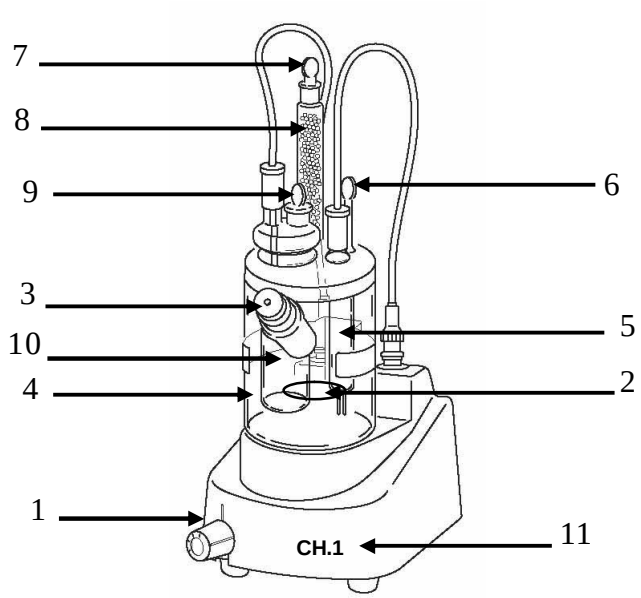



**Illustration 3-3. Titration cell**

| No. | Names | Functions |
|---|---|---|
| 1 | Speed adjustment knob | For adjusting stirrer bar rotation speed<br>Usually set it to "2 to 3". By setting it to "0", a stirrer bar stops. |
| 2 | Stirrer bar 35L | For stirring evenly anode solution (generator solution), samples, and iodine |
| 3 | Sample injection port | For injecting liquid sample from here with a syringe |
| 4 | Generator solution cell | For Karl Fischer reaction |
| 5 | Detection electrode (BNC) | For potential detection |
| 6 | Sealing plug long φ12/12L | Open a sealing plug and inject powdery and solid samples. Moisture can be prevented from pouring into a generator solution cell. |
| 7 | Drying tube plug φ10/12L (with ventilation) | With a gap to discharge gas at much sample injection, |
| 8 | Drying tube (Large) | For preventing moisture from pouring into a generator solution cell |
| 9 | Sealing plug for cathode solution cell | For preventing moisture from pouring into a cathode solution cell |
| 10 | Cathode solution cell (BNC) | For iodine generation from anode platinum mesh |
| 11 | Stirrer number | Attach a stirrer number sticker. |

**Table 3-3. Titration cell**

# 3-4. Keypad

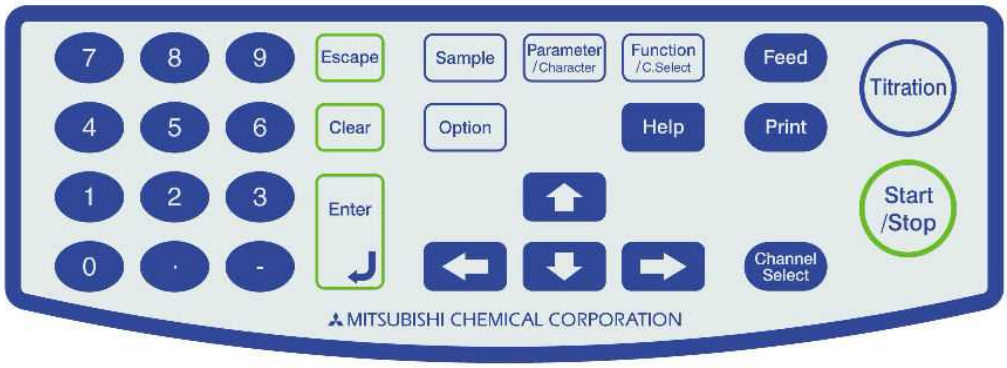



**Illustration 3-4. Keypad**

| Displays | Names | Functions |
|---|---|---|
| Parameter /Character | Parameter/Character key | 1. For parameter setting<br>Parameters can be set regularly and changed during titration.<br>2. The name input window is indicated at name input. |
| Sample | Sample key | For sample parameter setting<br>It can be set regularly.<br>If required mass is not set, input is waited after titration. |
| Function /C.Select | Function/ C. Select key | 1. For each function selection<br>2. Unavailable during measurement. |
| Titration | Titration key | 1. For setting titration to ON or OFF<br>2. For suspending titration and returning to the initial titration window |
| Start /Stop | Start/Stop key | 1. For starting moisture measurement and ending it forcibly<br>2. For canceling operations during dehydration waiting, delay, purge, pre-baking, and cooling to proceed to the next step<br>3. For stopping KF-200 piston up and down (at buret manual operation) |
| Print | Print key | 1. For printing statistical calculation result, file contents, and data<br>2. Unavailable during titration |
| ↑ ↓ | UP and Down arrow keys | 1. For transferring to items and selecting characters<br>2. For KF-200 piston up and down (at buret manual operation) |

**Table 3-4. Keypad**

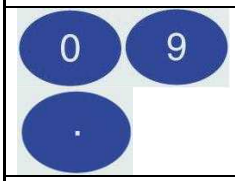
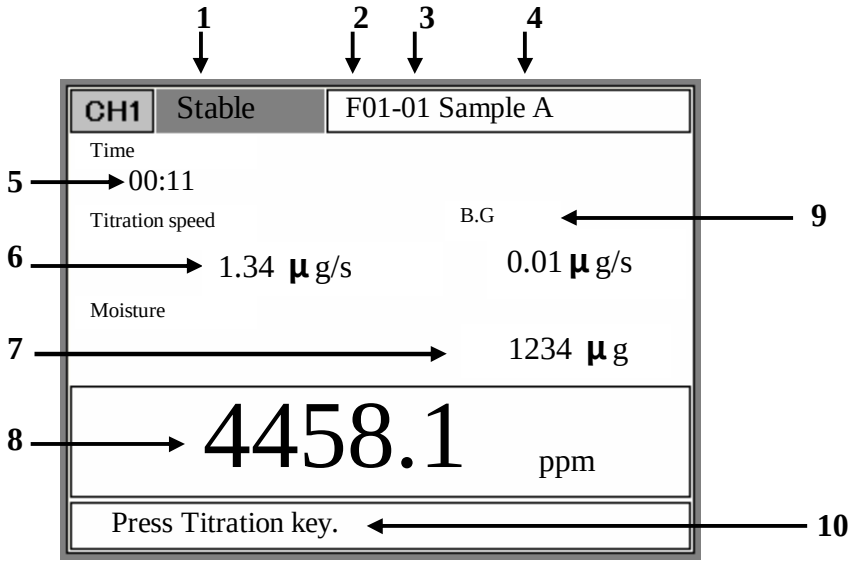
| Displays | Names | Functions |
|---|---|---|
|  | Left and right arrow keys | 1. For changing parameters and selecting characters<br>2. For KF-200 valve selection (at buret manual operation) |
|  | Number keys | 1. For menu selection, titration and sample parameter input<br>2. For sample size decimal points |
|  | Bar key | For name input. |
|  | Escape key | 1. For suspending the setting.<br>2. For returning to the previous window |
|  | Clear key | For deleting the right indication from the cursor position |
|  | Enter key | For determining contents and menus |
|  | Channel Select key | Available when a 2CH board is installed In channel selection, it beeps once for CH1 and it beeps twice for CH2. |
|  | Help key | The help window is displayed to search troubleshooting information. |
|  | Feed key | For paper feed<br>Unavailable during printing |

**Table 3-4. Keypad**

# 3-5. Display

## 3-5-1. 1 CH measurement indication




1. Condition: Current conditions

- Standby : When electrolysis is OFF
- Conditioning 1 : At electrode conditioning
- Conditioning 2 : Waiting for detection electrode stability
- Wait : When titration speed is over 0.5 µg$H_2O$/sec
  (Measurement can't be started.)
- Ready : When titration speed is under 0.3 µg$H_2O$/sec at the speed decrease
  When titration speed is under 0.5 µg$H_2O$/sec at the speed increase
- Stable : When titration speed is under 0.1 µg$H_2O$/sec
- Delay : Waiting for delay: Set it at water vaporizer use.
- Titration

2. File number: Selected numbers

3. Measurement number: 1 is added every measurement.

It is "1" automatically at power supply or file change.

4. Sample name: Up to 13 characters of a set name are indicated.

5. Time: Passed time (except delay time) from titration start

6. Titration speed: Titration speed ( µg$H_2O$/sec) is indicated by values.

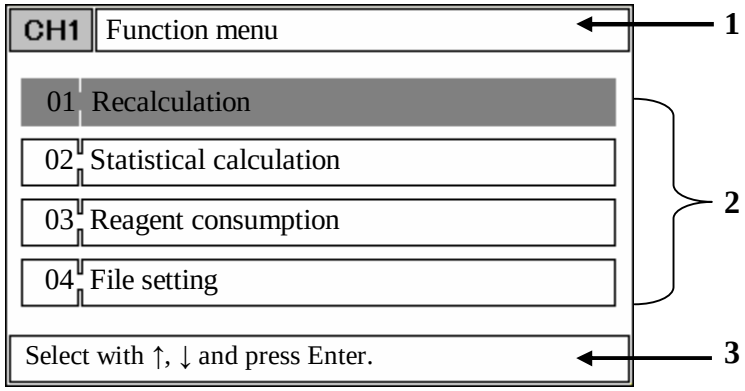
7. Moisture: Moisture integrated value ( µg$H_2O$/sec) from titration start

8. Measurement result: Measurement values and units

9. B.G.: The passing time from measurement start (except delay time) is indicated.

10. Instructions: Operation guidance and contents description
"W" and "w" of weight result from a balance are indicated.

## 3-5-2. 1 CH menu indication

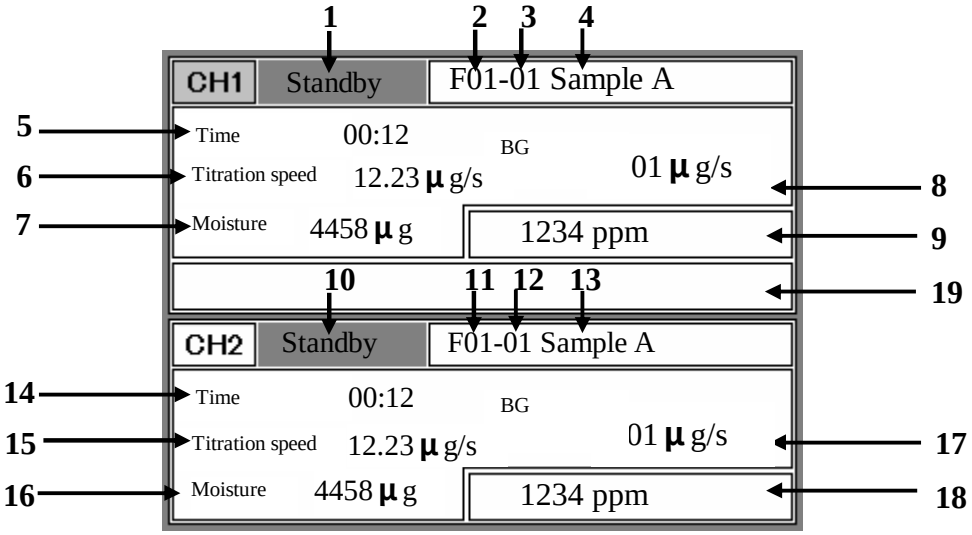



1. Title: Current menu contents

2. Menu items

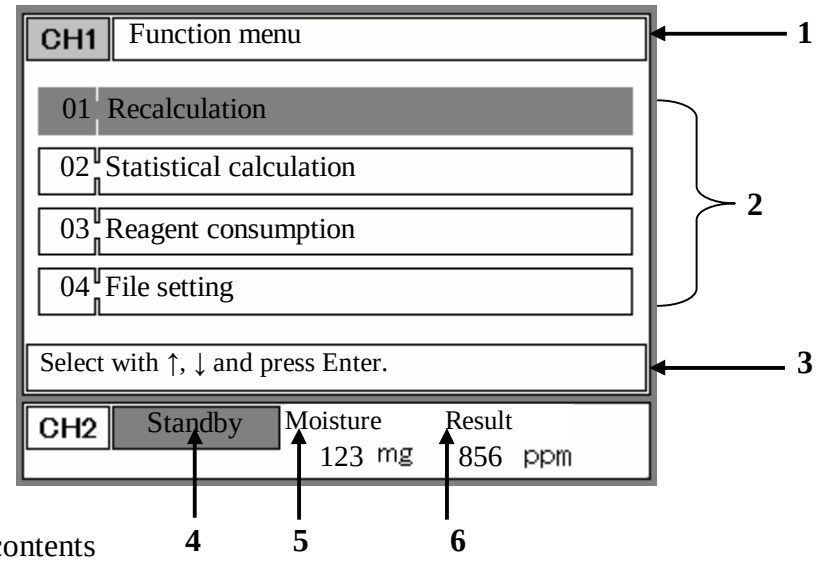
3. Instructions: Operation guidance and contents description

## 3-5-3. 2 CH measurement indication




1. 1CH condition: Current conditions
2. 1CH file number: Selected numbers
3. 1CH measurement number: 1 is added every measurement.
   It is "1" automatically at power supply or file change.
4. 1CH sample name: Up to 13 characters of a set name are indicated.
5. 1CH Time: Passed time (except delay time) from titration start
6. 1CH Titration speed: Titration speed ( µg$H_2O$/sec) is indicated by values.
7. 1CH Moisture: Moisture integrated value ( µg$H_2O$) from titration start
8. 1CH B.G.: Titration speed (background) when pressing [titration] key is indicated.
9. 1CH Measurement result: Measurement values and units
10. 2CH condition: Current conditions
11. 2CH file number: Selected numbers
12. 2CH measurement number: 1 is added every measurement.
    It is "1" automatically at power supply or file change.
13. 2CH sample name: Up to 13 characters of a set name are indicated.
14. 2CH Time: Passed time (except delay time) from titration start
15. 2CH Titration speed: Titration speed ( µg$H_2O$/sec) is indicated by values.
16. 2CH Moisture: Moisture integrated value ( µg$H_2O$) from titration start
17. 2CH B.G.: Titration speed (background) when pressing [titration] key is indicated.
18. 2CH Measurement result: Measurement values and units
19. 2CH instructions: Operation guidance and contents description
    Weight result "W" and "w" from a balance are indicated.

## 3-5-4. 2 CH menu indication




1. Title: Current menu contents

2. Menu items

3. Instructions: Operation guidance and contents description

4. 2CH condition: Current conditions

5. 2CH Moisture: Moisture integrated value ( $\mu gH_2O$) from measurement start

6. 2CH Result: Measurement values and units

# 3-6. Connection of optional units

CA-200 optional units are as follows. Buy them if necessary. Refer to each instruction manual for details. By connecting various optional units, KF-200 application extends and efficiency improves.

## 3-6-1. CA-200 CH2 (channel 2)

CA-200 CH2 is useful when one more volumetric moisture meter is required.
By connecting a display, a keypad, and a printer, simultaneous measurement by 2 units is possible.
By pressing [Channel / Select] key, CH1 and CH2 display contents switch.

CH1 and CH2 available measurement modes and optional units are as follows.

| | CH1 | CH2 |
|---|---|---|
| Measurement modes | CA-200 moisture measurement mode<br>KF-200 moisture measurement mode | CA-200 moisture measurement mode<br>KF-200 moisture measurement mode |
| Vaporizers | VA-200*1<br>VA-210*1<br>VA-230<br>VA-124S<br>VA-121<br>VA-122 | VA-200*1<br>VA-210*1<br>VA-230<br>VA-124S<br>VA-121<br>VA-122 |
| Others | Electronic balance<br>Personal computer<br>Reagent supply and drain unit<br>(Valid only when KF-200 is used.) | Electronic balance*2<br>Personal computer<br>Reagent supply and drain unit<br>(Valid only when KF-200 is used.) |

**Table 3-5. Measurement modes and optional units**

*1. VA-200 or VA-210 can be connected to one CA-200. To connect the second unit, purchase an optional CA/KF200 expanded power unit.

*2. To input sample weight into CH2 side by an electric balance, purchase an optional cable with a switch for CA/KF200 balance connection.

## 3-6-2. KF-200 buret set

By adding a KF-200 buret set, a moisture meter is changed to KF-200 of volumetric titration.

KF-200 is useful for the samples containing much water and insoluble to electrolytic solution.

Up to 4 burets can be connected.

* When using more than 3 burets, purchase an optional CA/KF200 addition power unit.

## 3-6-3. Moisture vaporizers

For samples insoluble to electrolysis solution and containing interfering substances, water vaporizers are required. We offer the following water vaporizers for your needs.

| Names | Purposes |
|---|---|
| VA-200 | For general use |
| VA-210 | For lubricants |
| VA-230 | For general use, vial-type |
| VA-124S | For solid and powder samples (Automatic sample changer) |
| VA-121 | For high temperature |
| VA-122 | For iron ore |

**Table 3-6. Water vaporizer list**

## 3-6-4. Electronic balance

Weight can be automatically inputted by connecting an electronic balance.
For connection and interface tests, refer to balance interface specifications.

## 3-6-5. Personal computer

Data can be processed by connecting a personal computer.
For format setting and interface test, refer to computer interface specifications.

## 3-6-6. Reagent supply and drain unit

Dehydrating solvent is supplied and drained automatically at KF-200 use.

## 3-6-7. Fritless cathode solution cell

A fritless cathode solution cell is used for CA-200 moisture measurement mode.

# Section 4: Measurement Preparation

## 4-1. Cautions

### 4-1-1. Caution in handling reagents

Do not inhale reagent and touch it. Use protective glasses for safety.

If reagent touches your skin, wash it immediately with much water.

Reagents contain toxic components (such as sulfur dioxide and iodide) and ventilate your room sufficiently. Take care of environment pollution in the disposal of waste solution.

Keep reagent airtightly to prevent moisture from coming in.

### 4-1-2. Caution in measurement

(1) The moisture measurement range of Model CA-200 is 10 μg to 100mg$H_2O$.
(different by titrant factor)
To measure accurately and efficiently, take samples by referring to Table 4-1.

| Moisture | Sampling weight | Moisture | Sampling weight |
|---|---|---|---|
| 100% | About 10mg | 0.1% | 1g to 300mg |
| 50% | 20mg to 10mg | 0.01% | 5g to 1g |
| 10 % | 100mg to 20mg | 0.001 % | 5g to 10g |
| 1 % | 300mg to 100mg | 0.0001 % | 10g or more |

**Table 4-1. Moisture content examples**

(2) When changing silica gel and reagents, spread attached exclusive grease lightly on contacting part to prevent a titration cell from sticking to each part. (every week)
If the titration cell is left for a long time, contacting part is stick to the titration cell and can't separate from it.

(3) If you don't use a titration cell for a long time, remove parts, wash, and dry, and keep them in a desiccator.

(4) To measure trace of moisture accurately, use exclusive grease which contains a little moisture and is slightly soluble.

**CAUTION**

When using grease containing much moisture, moisture in grease is sampled successively even without contacting reagent. Much time is required for dehydration.

(5) The rubber packing of a sample injection port is sometimes holed by repetitive measurement. Before the packing is holed, open the sample injection port and change it to prevent the absorption of moisture in the air.

(6) While anode solution and cathode solution are separated by a special ceramic board, both liquid levels are same with time. (A special ceramic board mechanism is same as a filter.) When anode solution level is upper than anode solution one, measurement values are improper. In this case, extract cathode solution so that it is same as an anode solution liquid level or lower.

## 4-2. Titration cell preparation

(1) Anode solution (AQUAMICRON® AX) injection

Remove the sealing plug of a generator solution cell and pour about anode solution up to a cell liquid level (about 100ml) with an attached funnel (large, bore diameter 55mmφ).
Remove the funnel and put back the plug.

(2) Cathode solution (AQUAMICRON® CXU) injection

Remove the sealing plug of a cathode solution cell and pour about 5ml of cathode solution with an attached funnel (small, bore diameter 35mmφ).
Remove the funnel and put back the plug.

Our recommenced reagents (API corporation-made)

| | Anode solutions | Cathode solutions |
|---|---|---|
| For general use | AQUAMICRON® AX01<br>AQUAMICRON® AX | AQUAMICRON® CXU |
| For ketone | AQUAMICRON® AKX | AQUAMICRON® CXU |

(3) Put cotton balls into a drying tube, put silica gel, and put cotton balls again.

(4) Set a titration cell to the unit cell stand so that a sample injection plug is at the front.

(5) Connect a cathode solution cell connector to a stirrer G (blue). Connect a detection electrode connector to a stirrer D (green).

1. Insert a connector into stirrer electrode connection part.
2. While pushing the connector end forward, turn it right to fix it.

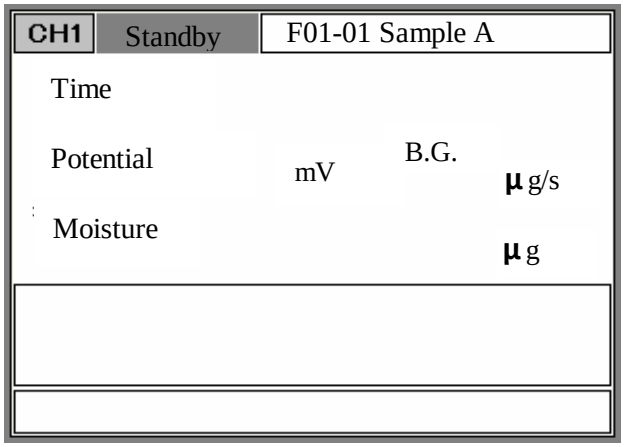
* Fix it so that the connection part projection fits into the connector groove.

# Section 5: Moisture Measurement Mode

## 5-1. Moisture measurement mode flow

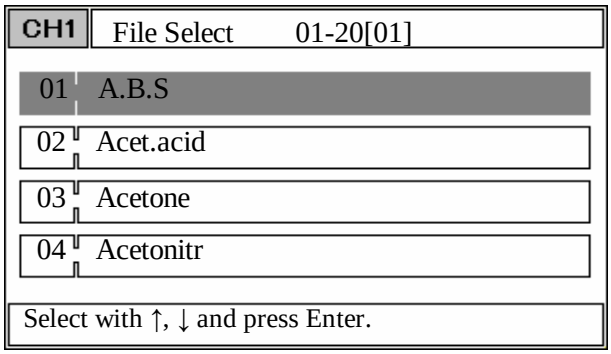
(1) Turn on the power switch.

(2) Condition electrodes and dry a titration flask. Press [Titration] key to condition electrodes. After conditioning, dry the titration flask inside.




(3) Selection a file.

Without changing a file, proceed to (4).
Press [Parameter/Character] key to display the file selection window.
Select a file with [ ↓ ] [ ↑ ] keys+ [Enter] key or number keys + [Enter] key.
Press [Escape] key to return to the titration window.



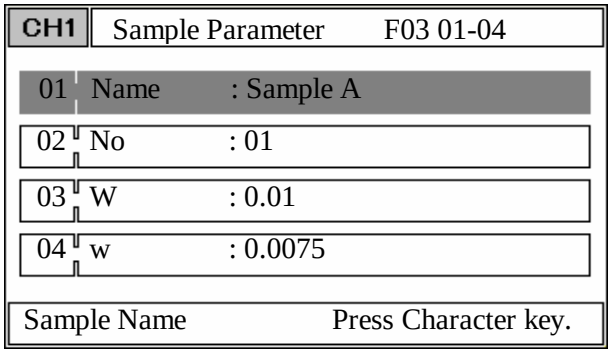

(4) Sampling

Refer to "5-5. Sampling".

(5) Input a sample name and a measurement number. (5-4-3. Sample parameters setting)

(6) Input "W" (sample weight + tare weight).

Press [Sample] key, input with number keys, and press [Enter] key.
Press [Escape] key to return to the titration window.




* Balance transfer input is possible at the titration window.
Mass is indicated in the message window.

(7) Wait until “Stable” is displayed.

When titration speed is 0.3 μg/sec or less, “Wait” changes to “Ready”. When titration speed is 0.1 μg/sec or less, “Ready” changes to “Stable”.




(8) Inject samples.

Press [Start/Stop] key and inject samples.
Measurement starts and background titration speed is displayed in “BG”. “Titration” is displayed.







* When Delay is set, “Titration” is displayed after “Delay”.

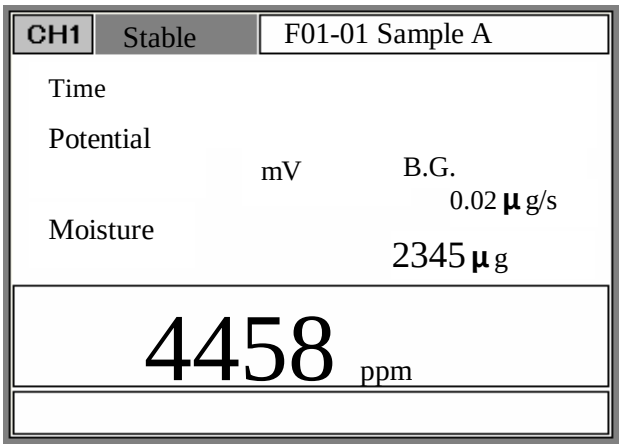
(9) Input tare weight “w”.

Press [Sample] key, input tare weight “w”, and press [Enter] key.
Press [Escape] key to return to the titration window.

(10) When measurement reaches the end point, a buzzer beeps and result is displayed.
End point condition: Titration speed ≦B.G. + End Sense

(11) Repeat (3) to (10) for the subsequent samples.

(12) Press [ ↑ ] key to return the reagent of a buret syringe to the bottle.
Turn off the power switch after measurement.



## 5-2. Titration cell dehydration

(1) Turn a stirrer dial to set the rotation speed to 2 to 3.

(2) Press [Titration] key to dry a titration cell.

Wait until “Wait” changes to “Ready” and “Stable”.

(3) When background (titration speed) is not down, repeat the following operations.

1. Press [Titration] key to stop titration. Set the stirrer dial to “0” to stop stirring.
2. Remove the titration cell from the stirrer. Shake it silently to absorb moisture of the cell inside in generator solution.
3. Put the cell on the stirrer and operate the stirrer by the operations after (1).

**POINT**

When background is not down, causes can be as follows.
1. Moisture influx from the titration cell outside
2. Moisture absorption of a cathode solution cell ceramic board
3. Reagent deterioration

Refer to 8-2. Titration cell handling.

# 5-3. File selection

## 5-3-1. File Composition

Select a file for sample measurement. When “Dehydrating” or “Ready” or “Stable”is displayed, a file can be selected. When “Delay” or “Titration” is displayed, a file cannot be selected. (Titration and sample parameters during measurement can be displayed and set.)
When a CH2 P.C.B is installed, CH1 and CH2 have respective files.

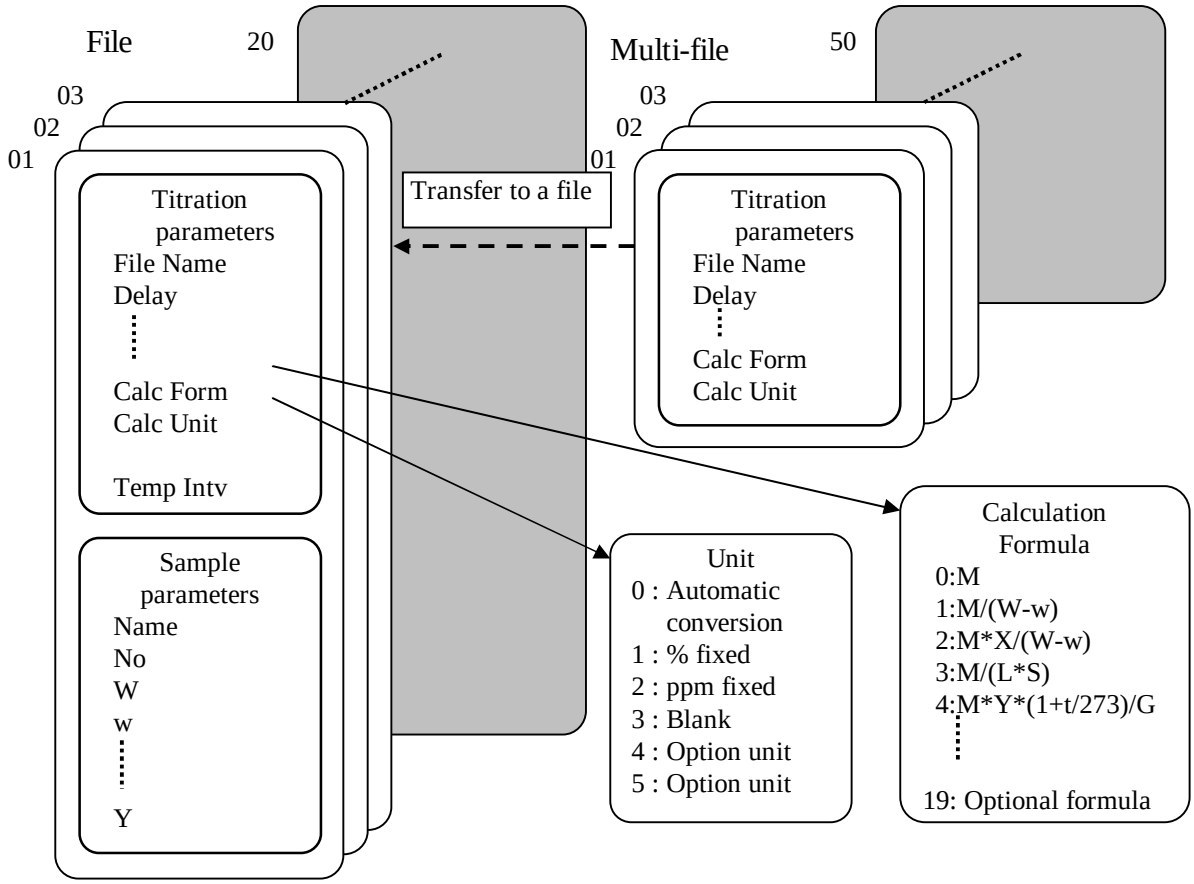



**Illustration 5-1. File composition**

**Files** **:** They include titration parameters and sample parameters. Up to 20 files can be saved.

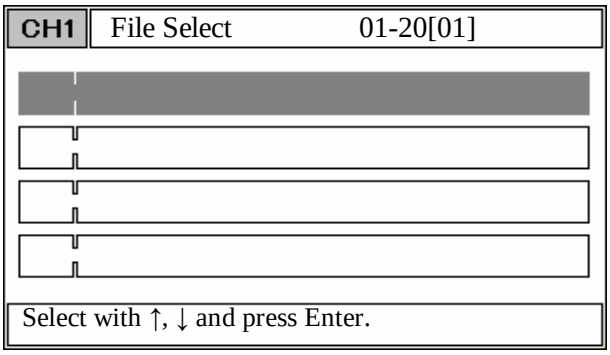
**Multi-files** **:** 50 files of our recommended titration parameters are set. Transfer them to a file to use.

**Concentration calculation formulas :** They include 10 fixed formulas and 2 option formulas. Specify them in titration parameters.

**Results units** **:** They include 4 fixed units and 2 option units. Specify them in titration parameters.

## 5-3-2. File selection

By turning on the power switch, the titration window is displayed. To use the previous file, proceed to 5-4-3. Sample parameters setting.
To use different files, press [Parameter /Character] key, select a file with [ ↓ ] [ ↑ ] keys, and press [Enter] key.
Proceed to 5-4-1. Titration parameter setting.




## 5-3-3. Multi-file selection

To use our recommended titration parameters, transfer parameters to the files 1 to 20 and use them.
Refer to “6-4-2. Multi file setting” for transfer method.

# 5-4. Parameters setting

Set titration and sample parameters. Parameters are set generally before titration. Even during titration, unfinished contents can be changed. The final set parameters are printed out.

## 5-4-1. Titration parameter setting

By setting blank or "0" at each item, the item is ineffective. Titration parameters can be protected by protection. Select a file number and set the titration parameters.

Input values with number keys and press [Enter] key.

* When ⇄ is displayed at the message left, parameters can be set with [←] [→] keys.

**POINT**

It is important in setting to select either "Calc Form (Concentration calculation formula)" or "VA Select (Selection of vaporizers)". After selection, only necessary items are displayed.

## 5-4-2. Titration parameters

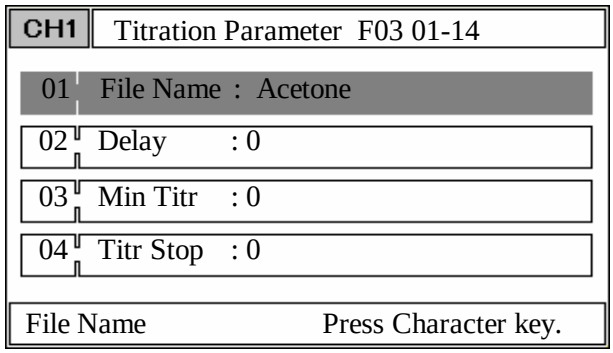
| Marks | Function names | Max. | Min. | Defaults | Units |
|---|---|---|---|---|---|
| File Name | File name | 9 | 0 | | |
| Delay | Titration start delay time | 99 | 0 | | min |
| Min Titr | Titration continuing time | | | | |
| Titr Stop | Titration forced end time | | | | |
| End Sense | End sense detection level | 1 | 0 | 0.1 | μg/s |
| Print Form | Print format number | 5 | 0 | 3 | |
| Print Intv | Printing interval | 99 | 0.1 | 1 | min |
| Calc Form | Calculation formula | 11 | 0 | 1 | |
| Conc Unit | Unit | 5 | 0 | 0 | |
| Blank Test | Times of blank measurement | 10 | 0 | 1 | |
| VA Select* | VA selection | 7 | 0 | | |

**Table 5-1. Titration parameters**

After pressing [Parameter / Character] key and selecting a file with [ ↓ ] [ ↑ ] keys, press [Enter] key to display the titration parameter window.

(1) File: File name

Input a file name to clear titration contents.
(up to 9 characters)




1. Alphameric characters and symbols

Press [Parameter/Character] key to display the input window.




Select characters with arrow keys and press [Enter] key.

Press [Parameter/Character] key again to end input. (The character input window is cancelled.)

2. Numbers

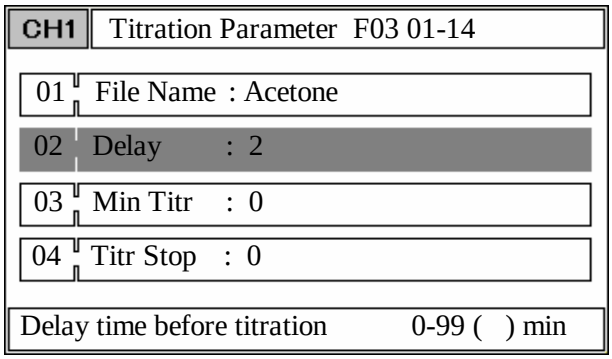
Press number keys.

* Press [Clear] key to delete the right characters from the cursor position.

(2) Delay: Titration start delay time

After pressing [Start/Stop] key, titration start is delayed forcibly until the set time. Set “Delay” when samples can not solve shortly or using a vaporizer.

Example: 2 minutes Delay: [2] key + [Enter] key



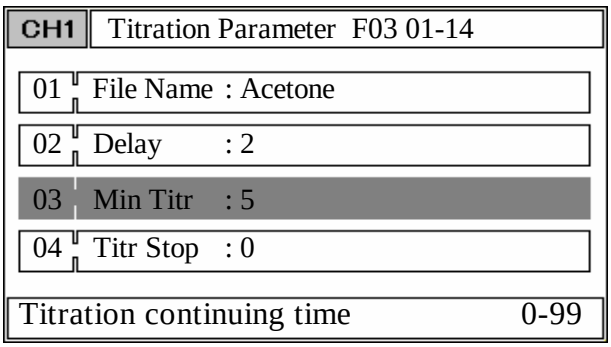
(3) Min. Titr: Titr continuing time

For continuing titration forcedly by the set time

When "Delay" is set, titration continuing time starts after "Delay".

Example: 5 minutes

Min Titr: [5] key + [Enter] key




(4) Titr Stop: Titration forced end time

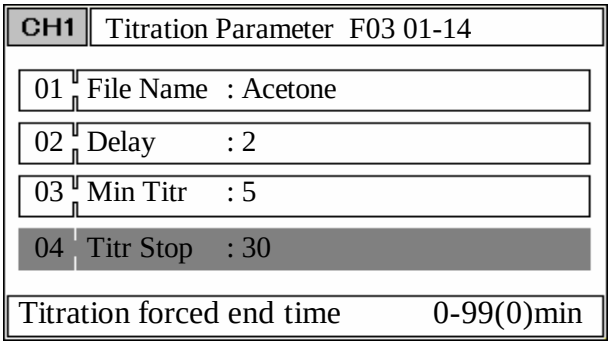
Titration is forcedly stopped at the set time.

When setting "Delay", titration forced end time is from after Delay end.

When setting shorter time than Min Titr, it is invalid.

Example: 30 minutes

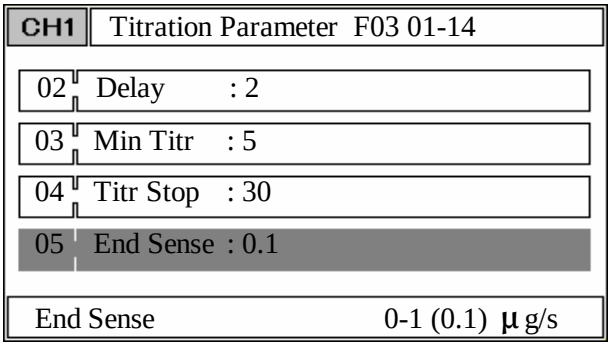
Min Titr: [3] key + [0] key + [Enter] key




(5) End Sense: End point sense

For determining the end point

When electrolysis speed during titration is End Sense + background at titration start, titration reaches the end point.



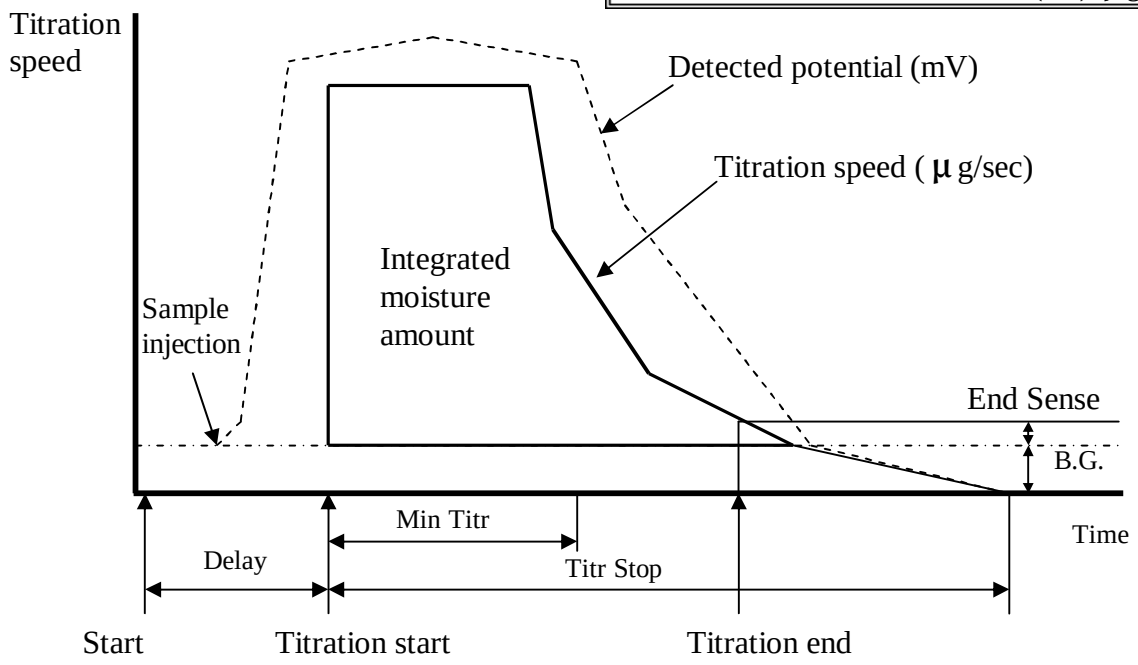



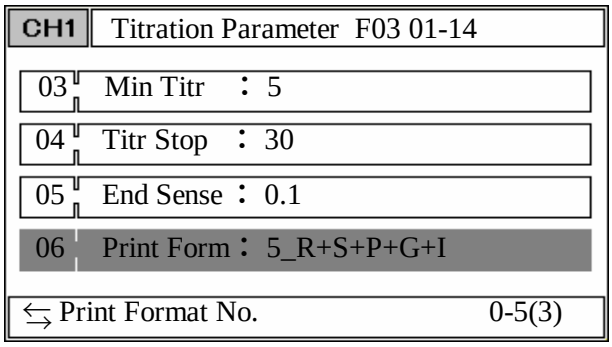

**Illustration 5-2. Titration parameters**

(6) Print Form: Print format number

Select a print format from the following table.

Example: Print format 5

Print Form: [5] key + [Enter] key




| Display | Print contents |
|---|---|
| 0: No Print | No print |
| 1: R | Results |
| 2: R+S | Results + Sample |
| 3: R+S+P | Results + Sample + Parameters |
| 4: R+S+P+G | Results + Sample + Parameters+ Graphs |
| 5: R+S+P+G+I | Results + Sample + Parameters + Graphs + and interval integration values and total integration values |

**Table 5-2. Print format number format list**

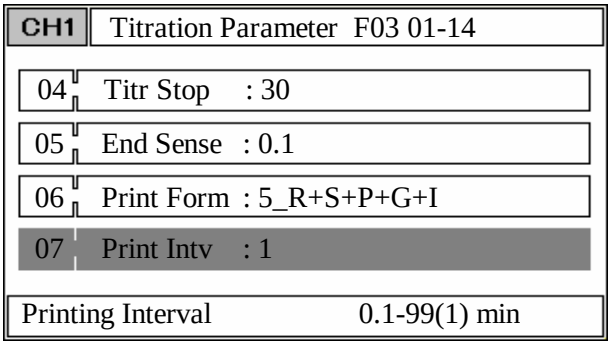
The first figure (0-5) shows the print format number.
A print format example is shown in the next page.

(7) Print Intv: Printing interval
(Displayed only when Print Form 5 is selected.)

The interval cycle time for printing interval integration values and total integration values of moisture content and concentration.

Example: 1 minute

Print Intv: [1] key + [Enter] key



Printing format 2 An example

```
File:01    ID No:99
SMPL: ABCDEFGHI -01
        <RESULT>
Conc:13.792  %
  M  : 6096.4  mg

  BG  : 0.08  µg/s
  Time: 16:25
  2006/06/27 15:50
        <SAMPLE>
M/(W-w)
  W  :8.5863     g
  w  :8.5421     g
 W-w :0.0442     g
```

Printing format 5 CA200/VA-200 example

```
File    :01    ID No:99
SMPL  :ABCDEFGHI -01
        <RESULT>
Conc   :13.792  %
  M    : 6096.4  µg

  BG  : 0.08  µg/s
  Time: 16:25
  2006/06/27 15:50
        <SAMPLE>
M/(W-w)
  W  : 8.5863    g
  w  : 8.5421    g
 W-w : 0.0442    g
      <PARAMETER>
 File Name: Moisture control
A
 Delay    : 1    min
 Min Titr : 5    min
 Titr Stop : 30    min
 End Sense: 30   sec
```

Format 1

Format 2

Format 3

Format 4

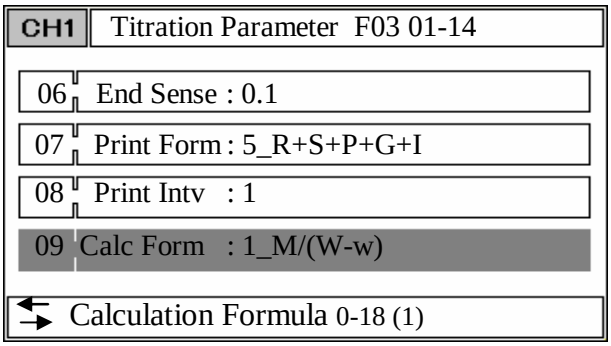
Format 5

```
        <GRAPH>
        Moisture
        0 20 40 60 80 100
     5
T
i
m  10
e
   15
        <INTERVAL>
        D. µg  T. µg
        D.ppm  T.ppm
 Time
 0:00   0     0
        0     0
 5:00   1298  1298
       29377  54824
10:00   1308  5036
       22875 136808
15:00    43   6090
        980  137788
```

(8) Calc Form: Calculation formula

Select a concentration calculation formula from the following list.

Example: 1
Calc Form: [1] key + [Enter] key




| No. | Formula | Unit | Remark |
|---|---|---|---|
| 0 | M | $H_2O$ µg | Only moisture content |
| 1 | M/(W-w) | Unit selection | Use it for measuring weighed liquid and solid samples. |
| 2 | M*X/(W-w) | | Use it when solving liquid or solid samples in solvents and measuring some samples.<br>X: Dilution multiple |
| 3 | M/(L*S) | | Use it for weighing liquid samples by volume and measuring them<br>L: Volume (ml) S: Density |
| 4 | M*Y*(1+t/273)/G | | Use it for weighing gaseous samples by volume and measuring them.<br>t : Temperature (°C)<br>G : Volume (l)<br>Y : Input coefficient 1.244. |
| 5 | M-B | $H_2O$ µg | Formula to subtract blank values from formula 0 |
| 6 | (M-B)/(W-w) | Unit selection | Formula to subtract blank values from formula 1 |
| 7 | (M-B)*X/(W-w) | | Formula to subtract blank values from formula 2 |
| 8 | (M-B)/(L*S) | | Formula to subtract blank values from formula 3 |
| 9 | (M-B)*Y*(1+t/273)/G | | Formula to subtract blank values from formula 4 |
| 10 | Option Formula 1 | | For preparing formulas except 0 to 9 fixed ones |
| 11 | Option Formula 2 | | |

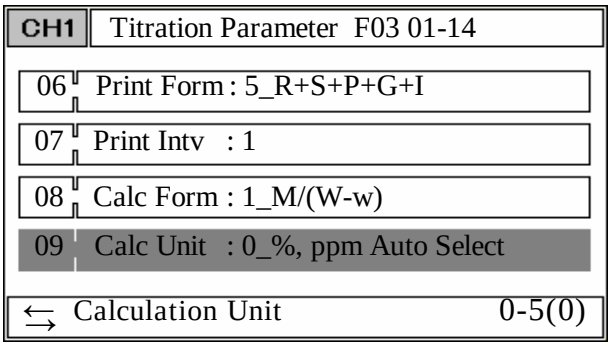
**Table 5-3. Concentration calculation formulas**

(9) Calc Unit: Result unit

Select a result unit from the following list.

Example: 0_%, ppm Auto Select

Calc Unit: [0] key + [Enter] key



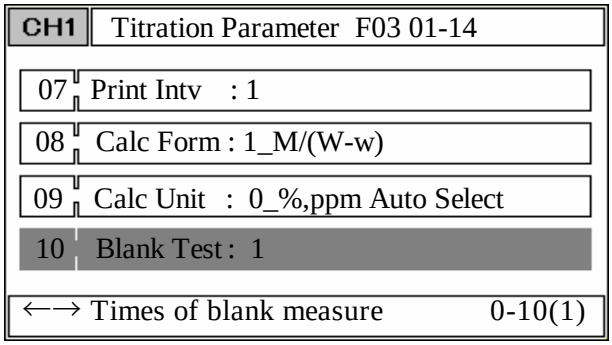

| Indications | Contents |
|---|---|
| 0: %, ppm Auto Select | Less than 0.1%: ppm is printed.<br>0.1% or more: % is printed. |
| 1: % only | Only % is printed. |
| 2: ppm only | Only ppm is printed. |
| 3: Not Print | No unit print |
| 4: Option Unit 1 | Except the above units, an optional unit is prepared. |
| 5: Option Unit 2 | |

**Table 5-4. Result units list**

The first figure (0-5) shows the unit number.

(10) Blank Test: The number of times of blank measurement

(Displayed when the formula with B is selected.)
Specify the number of times of blank measurement.
When the specified number of times of measurement is completed, the average of blank measurement is automatically printed out and inputted in "B".
Subsequently, sample measurement can be run.
When a blank value is known, input "0" as the number of times and input the blank value in "B" of sample parameters.

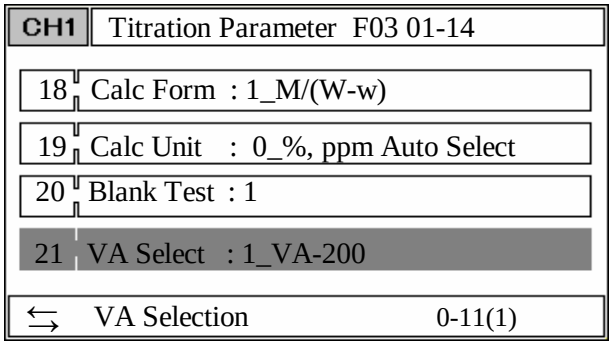



Example: Once

Blank Test: [1] key + [Enter] key

(11) VA Select: VA selection

Set the use and the type of water vaporizers. Refer to vaporizer instruction manuals for details.



## 5-4-3. Sample parameters setting

Set sample parameters. Press [Sample] key to display only required items selected from the calculation formula of titration parameters. Even if titration parameters are protected, they can be changed. All sample parameters can be set or changed before and during measurement.
Parameters except "W" and "w" can be used successively every sample.
Input "W" and "w" every sample. If they are not inputted by measurement end, input is waited.

**POINT**

Set parameters "L", "S", "G", "t", "B", "X" and "Y" necessarily before the measurement end. Once parameters are set, they are used successively every samples.

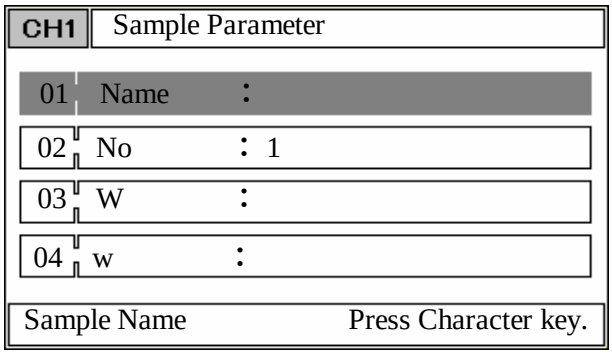
Sample parameters

| Indications | Function names | Max. | Min. | Units |
|---|---|---|---|---|
| Name: | Sample name | Characters 13 | Characters 0 | |
| No: | Measurement No. (Automatic) | 99 | 1 | |
| W: | Sample weight + tare weight | 999 | 0 | g |
| w: | Tare weight | 999 | 0 | g |
| L: | Sample volume | 99 | 0 | ml |
| S: | Sample specific gravity | 9 | 0 | |
| G: | Gaseous sample volume | 99 | 0 | L |
| t: | Gas temperature | 199 | 0 | °C |
| B: | Blank value | 999 | 0 | µg |
| X: | Optional coefficient X | 10000 | 0 | |
| Y: | Optional coefficient Y | 10000 | 0 | |

**Table 5-5. Sample parameters**

(1) Sample Name

Up to 13 characters can be inputted.




1. Alphameric characters and symbols

Press [Parameter/Character] key to display the input window.




Select characters with arrow keys and press [Enter] key.

Press [Parameter/Character] key again to end input.

2. Numbers

Press number keys.

* Press [Clear] key to delete the right characters from the cursor position.

(2) No: Measurement number

A measurement number is added every measurement.
When the power switch is turned on or when a file number is changed, a measurement number is “1” automatically.
It can be changed manually.

(3) W: Sum (g) of sample weight and tare weight

Input the sum of sample weight and tare (sampler) weight.
It can be easily inputted by the electronic balance communication.
If it is not inputted by the measurement end, input is waited after measurement.
Up to 9 characters can be inputted.

Example: 12.34g

W: [1] key + [2] key + [.] key + [3] key + [4] key + [Enter] key

(4) w: Tare weight (g)

Input tare (sampler) weight. If the item is "0" or blank, "W" is net sample weight.

If it is not inputted by the end of measurement, input is waited.

Up to 9 characters can be inputted.

Example: 9.8765g

w: [9] key + [.] key + [8] key +[7] key + [6] key + [5] key+ [Enter] key

(5) L: Liquid sample volume (ml)

Use it at sampling of constant volume (ml) of liquid sample.

Multiply the constant volume by the specific gravity.

Example: 5ml

L: [5] key+ [Enter] key

(6) S: Specific gravity of liquid sample

Input the specific gravity of liquid samples.

Example: 0.985

S: [0] key + [.] key + [9] key +[8] key + [5] key+ [Enter] key

(7) G: Gaseous sample volume (L)

Input the volume of the gaseous samples (L). Measurement results are indicated by the concentration of volume/volume (V/V).

Example: 2.3 L

G: [2] key + [.] key + [3] key + [Enter] key

(8) t: Gaseous sample temperature (℃)

Correct gaseous sample temperature.

Example: 23°C

t: [2] key + [3] key + [Enter] key

(9) B: Blank value

When the number of times of measurements specified in "Blank Test" is completed, the average (μg) of the blank measurement is inputted automatically.

If abnormal values are found, input values again.

(10) X: Optional coefficient X

Optional coefficient X can be used in concentration calculation formulas (2 or 7) or optional calculation formulas (10 or 11).

Example: 10

X: [1] key + [0] key + [Enter] key

(11) Y: Optional coefficient Y

Optional coefficient Y can be used in concentration calculation formulas (4 or 9) or optional calculation formulas (10 or 11). When expressing the measurement result of gaseous samples by volume/volume (V/V), fix the coefficient Y to 1.244.

Example: 1.244

Y: [1] key + [.] key + [2] key + [4] key + [4] key + [Enter] key

# 5-5. Sampling

## 5-5-1. Liquid sample sampling

Use the following samplers for liquid samples. Dry them well before use.

| | |
|---|---|
| Liquid sample | : Lock-type syringe |
| Viscous liquid sample | : Dropper bottle, Syringe-type sampler (1.5ml, 3ml, 5ml, 6ml)<br>Sealing plug with a spoon |
| Liquefied gas | : Liquefied gas sampler |

(1) For a lock-type syringe

1. Wash with a sample.

   Take a little sample into a syringe with a needle. Push the syringe plunger to wet the inner wall of a syringe with the sample and discharge the sample. Repeat this operation once or twice if necessary.

2. Take the sample and weigh “W”.

   After collecting a required volume of the sample, set a silicone rubber chip to the needle end to avoid sample leakage and moisture absorption and weigh sample + tare “W”.

3. Inject the sample.

   Inject the sample by sticking the needle to the rubber packing of a sample injection plug. Insert the needle end possibly near the liquid level to avoid sample attachment to a titration flask wall and electrodes.

4. Weigh “w”.

   Weigh tare “w” with the silicone rubber chip.

(2) For a dropper bottle and a syringe-type sampler

1. Wash a sampler with a sample.

   Take a little sample and discharge it. Repeat this operation once or twice if necessary.

2. Take the sample and weigh “W”.

   After taking a required volume of the sample, wipe off the sample on the intake end.
   Weigh sample inserted in a receiver or a cap + tare “W”.
   Take care of the sample adhesion to the receiver or the cap.

3. Inject the sample.

   Remove the sealing plug or the sample injection plug on the top of a titration flask, and inject the sample so that the sample does not touch other parts.
   Insert a sealing plug or a sample injection plug immediately.

4. Weigh “w”.

   Set the receiver and weigh “w”.

(3) For a liquefied gas sampler

**CAUTION**

Replace a drying tube cock of the titration cell top with one with a three-way cock.
Adjust the cock so that it is "T" and the outlet leads directly to the air.
Set a vinyl tube to the outlet and connect it to a gas flow meter.

1. Wash a sampler with a sample.

   Connect a liquefied gas sampler to a line. Set the both ends of an inverted liquefied gas sampler to "Open" to open a gas supply line and wash the inside of the sampler with the sample.

2. Take the sample and weigh "W".

   Set the outlet side of the liquefied sampler to "Close" and take a liquefied sample.
   Set the long injection needle to the liquefied sampler and set a silicone rubber chip to the needle end. Weigh the sample weight + tare "W".

3. Inject the sample.

   Stick the needle to the rubber packing of the sample injection plug, open the valve, and inject the sample. Insert the needle end to the bottom of a titration flask to absorb sufficient water. Set the injection rate at 50 to 200ml/min.
   If the injection rate is too fast, the area near the sampler outlet and the needle are cooled. Moisture in samples attaches to the cooled area and values are lowered.
   During measurement, heat the area near the sampler outlet and the needle with a dryer or a ribbon heater.

4. Weigh "w".

   After all or a part of the sample is injected, close the valve.
   Weigh "w" (the liquefied gas sampler + the needle + the silicone rubber chip tare "w").

## 5-5-2. Solid and powder sample sampling

Solid and powder samples easily soluble in anode solution can be titrated directly.
Insoluble samples can be measured by connecting a water vaporizer Model VA-200 (option) or an automatic water vaporizer Model VA-124S (option) to KF-200.
Refer to each instruction manual. Use the following samplers to measure samples. Dry them well before use.

| |
|---|
| Straight powder sampler, Powder sampler, Sampler for high concentration<br>Airtight sampler, Solid sampler (When a water vaporizer is used.) |

(1) Take a sample and weigh "W".

Dehydrate a titration cell, take a sample with a sampler, weigh "W"

(the weight of a sampler and a sample) with an electronic balance, and input "W".

(2) Inject the sample.

Take off the sealing plug or the sample injection plug on the top of the titration cell, and inject the sample not to touch the sample into the cell. Put on the sealing plug or the sample injection plug immediately.

(3) Weigh "w".

Weigh "w" (the tare weight of sampler) with an electronic balance and input "w".

**POINT**

Even if a sample is hard to solve, it can be measured when moisture can be extracted in anode solution. Input the time (min.) to extract the moisture into "Delay".
If measurement is hard to reach the end point, moisture can remain and be extracted slowly.

## 5-5-3. Gaseous sample sampling

Use the following adapters for gaseous samples. Dry them well before use.
An example of gaseous sample measurement by using a gas adapter is described here.

(1) Preparation of a titration cell

Insert a gas adapter into the sample injection plug of a titration cell.
Replace the drying tube on the titration cell top with one with a 3-way cock.
Turn the cock of the drying tube with a cock to be "T" to open the outlet directly to the atmosphere.
Connect a gas flow meter to the outlet with a vinyl pipe.

(2) Electrolysis preparation

For moisture trapping, pour 150ml generator solution and 10ml cathode solution.

(3) Measurement

Turn the 3-way cock of the gas adapter to the atmosphere side and flow sample gas flow at a controlled flow rate. When the background is stable, turn the 3-way cock to the titration cell side and measure moisture. Gas flow should be 250 to 500ml/min.

**POINT**

Make gases passed through a gas flow meter and exhausted from the atmosphere side of a 3-way cock harmless and discharge them to the outside.

## 5-6. Measurement

### 5-6-1. Blank measurement

Blank operation is rarely done when a sample is taken with a syringe.
If samples can absorb external moisture in the injection like solid samples and the absorbed moisture has an influence on the analytical data, the data should be corrected by the blank operation.
Select a calculation formula with "B" in titration parameters "Calc Form" and make the operation same as sample measurement without sampling in "Blank Test".
The set number of times of the blank measurement is completed and the average of the results is automatically inputted in "B". If abnormal values are found, input normal values manually. (Refer to 5-4-3. Sample parameters setting.)
If the blank value is known, set the number of times of the blank measurement in "Blank Test" to "0" and input the blank value manually to "B".

(1) Wait until background is stable. By pressing [Titration] key, background is down.

(2) Wait until "Stable" is displayed.

(3) After pressing [Start/Stop] key, make blank measurement same as sample measurement. At this time, background is saved.

(4) Titration starts.

(5) The result is printed.

When measurement reaches the end point at background +End Sense, a buzzer beeps and the result is printed out.

(6) Subsequently, repeat (2) to (5) by the set times.

(7) The statistical calculation values are printed out and the average is automatically registered in "B".

### 5-6-2. Recovery measurement

To check that the measurement whole including the unit and reagents is normal, measure a standard sample by the same method as sample measurement. Use water or commercial water standard solution as a standard sample.

### 5-6-3. Sample measurement

This titration is usually applied.

(1) Wait until background is stable. By pressing [Titration] key, dehydration is run and background is down.

(2) Wait until "Stable" is displayed.

(3) After pressing [Start/Stop] key, inject a sample. Background is saved.

(4) Titration starts.

(5) Set sample parameters such as sample names and sample weight. (You can set sample names before sample injection.)

(6) When measurement reaches the end point at background +End Sense, a buzzer beeps and the result is printed out.

(7) Subsequently, repeat (2) to (6).

**POINT**

Press [Start/Stop] key to end measurement forcibly.
"*" is added to results. When a background value is lower at sample injection, result is stable.

## 5-7. Measurement end

1. Do the following items if necessary.

- **Statistical calculation (6-2. Statistical calculation)**
- **Recalculation (6-1. Recalculation)**
- **Arrangement around the unit**

2. Turn off the power switch.

# Section 6: Function

Functions are as follows.

Press [Function/C. Select] key to select a function.

**1. Recalculation** : For printing recalculation by parameter change

**2. Statistical calculation**
- 1. Internal : Internal statistical calculation and printing
- 2. External : External statistical calculation and printing

**3. Reagent consumption** : Reagent consumption display, setting, and printing

**4. File setting**
- 1. File protect setting : For file protection setting
- 2. Multi file setting : For transferring a multi-file
- 3. Option formula setting : For preparing an optional concentration calculation formula
- 4. Option unit setting : For preparing an optional unit

**5. Setting**
- 1. Mode change : For mode switch
- 2. Calendar setting : For date setting
- 3. Display setting : For display setting
- 4. User management function : For operator registration and password setting
- 5. Other details : For other details setting
- 6. Memory initialize : For setting the unit condition to default

**6. Communication setting**
- 1. BALANCE setting : For balance communication setting
- 2. OPTION 1 setting : For option 1 communication setting
- 3. OPTION 2 setting : For option 2 communication setting

**7. Validation**
- 1. Hardware validation : For hardware validation
- 2. Measurement validation : For measurement validation

# 6-1. Recalculation

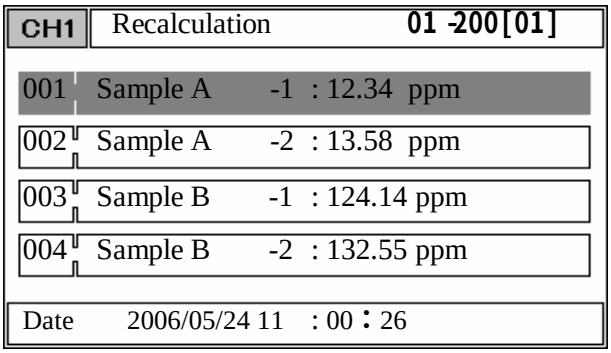
Saved data can be recalculated, displayed, printed. 200 data are saved.

## 6-1-1. Result list indication

Saved data are listed in measurement order.

(Regardless of file numbers)

Up to 200 data can be saved and No 201 data are overwritten in No. 001 data.




001 Sample A -1 : 12.34 ppm

ID No. Sample name No. Analytical value Unit

ID No.: Numbers applied automatically by the unit They are as follows.
001→002•••199→200→001→002•••
The previous ID is registered even after turning on the power switch again.
Therefore serial numbers can be applied regardless of file numbers.
They are used to check printed data against data saved in the unit.

Sample name: Sample names are indicated.

Measurement No.: One number is added every measurement.

The number is “1” automatically at power supply and file change.

Analytical value: When analytical values are 0.1% or more, the unit is %.
When analytical values are under 0.1%, the unit is ppm.

Unit: Analytical value concentration unit

### 6-1-2. Recalculation

The following changes are as follows at recalculation.

1. Print format, print cycle change (possible only for the last data)

   By changing a print cycle when format is 5, printing by the changed print cycle is possible.

2. Concentration calculation formula and unit change

   Based on measured moisture content (μg), results calculated by changed formulas and units are printed.

3. Sample parameter change

   Results calculated by changed values are printed.

(1) Move to items to recalculate with [ ↑ ] and [ ↓ ] keys and press [Enter] key.

* Also selectable by inputting ID No. directly with numerical keys and pressing [Enter] key.

(2) Move to items to change with [ ↑ ] and [ ↓ ] keys.

(3) Change “Print Form” or “Calc Form” with [←] and [→] keys.

Input “W” and “w” such as sample parameters with numerical keys.

(4) Press [Enter] key to determine the contents.

(5) Press [Print] key to print them. The changed contents are saved.

* By pressing [Escape] key without pressing [Print] key, the changed contents are not saved.

The window returns to the result list.

## 6-2. Statistical calculation

Statistical calculations are internal statistical calculation and external calculation.

Internal statistical calculation: Statistical calculation of specified data in the last 200 data

External statistical calculation: Statistical calculation of manually-inputted data independent of saved data

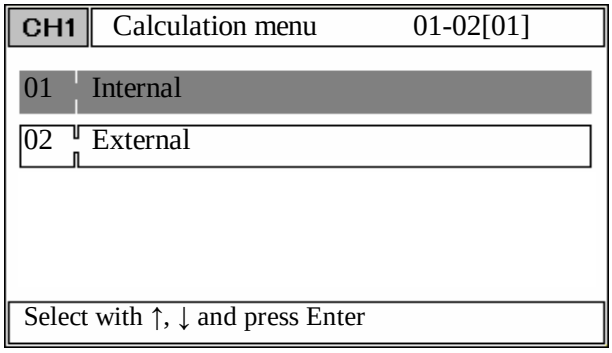
## 6-2-1. Internal statistical calculation

Press [Print] key to calculate current data.

The data of serial measurement numbers are statistically calculated.

To simplify statistical calculation with serial measurement numbers, set the first measurement number to “01” and press [Print] key.

By setting a measurement number to “1” before measurement, “*” is added automatically to internal statistical calculation data.




For optional data statistical calculation,
press [Enter] key to select data and press [Print] key.
“*” is added into selected data.
To cancel selected data, press [Enter] key at the data cancel position.

## 6-2-2. External statistical calculation

By inputting data and press [print] key, statistical calculation result is printed.

Example: External statistical calculation of 582, 576, 580, 601 and 590

EX01: [5] key +[8] key + [2] key + [Enter] key

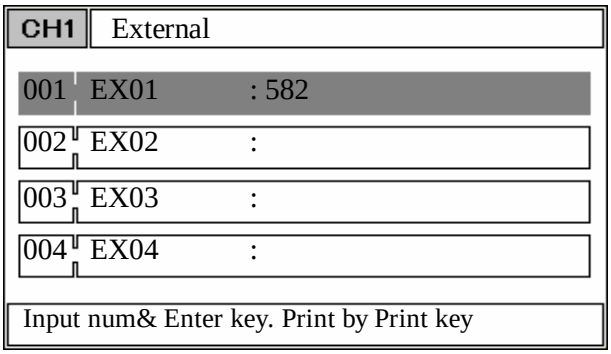
EX02: [5] key+ [7] key + [6] key + [Enter] key

EX03: [5] key + [8] key + [0] key + [Enter] key

EX04: 6 key + [0] key + [1] key + [Enter] key

EX05: [5] key + [9] key + [0] key + [Enter] key

EX06: [Print] key (Results are printed.)



Example of statistical calculation of internal data

| * Internal statistical * | |
|---|---|
| ID 07 | 0.5002 % |
| ID 08 | 0.4989 % |
| ID 09 | 0.4970 % |
| ID 10 | 0.4952 % |
| N = | 4 |
| X = | 0.4978 |
| S = | 0.0022 |
| RSD= | 0.43 % |

Example of statistical calculation of external data

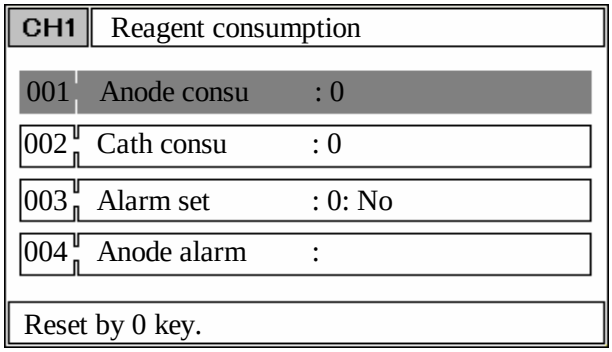
| * External Statistical* | |
|---|---|
| EX 1 | 582 |
| EX 2 | 576 |
| EX 3 | 580 |
| EX 4 | 601 |
| EX 5 | 590 |
| N = | 5 |
| X = | 585.8 |
| S = | 9.9096 |
| RSD= | 1.69 % |

**POINT**

The data number of statistical calculation is from 2 to 200.

## 6-3. Reagent consumption setting

Reagent change is indicated in the window or by the alarm. (At dehydration start and at measurement end)
The setting is as follows.




(1) Anode solution consumption

Anode solution consumption is added automatically including dehydration and titration of measured moisture content. (mg) At reagent change, set anode solution consumption to “0” to reset it

(2) Cathode solution consumption

Cathode solution consumption is added automatically including dehydration and titration of measured moisture content. (mg) At reagent change, set cathode solution consumption to “0” to reset it

(3) Alarm Set

When reagent “measured moisture content” is more than the set value, the check window is displayed and the alarm beeps. Set the alarm to “No” so that this function is invalid. (Default)
Set the alarm to “Yes” so that this function is valid. Set (4) and (5).

(4) Anode solution preset volume

Set “measured moisture content” of anode solution. (Input range: 0 to 9999mg)

AQUAMICRON AX : 800

AQUAMICRON AKX : 300

(5) Cathode solution preset volume

Set “measured moisture content” of cathode solution. (Input range: 0 to 999mg)

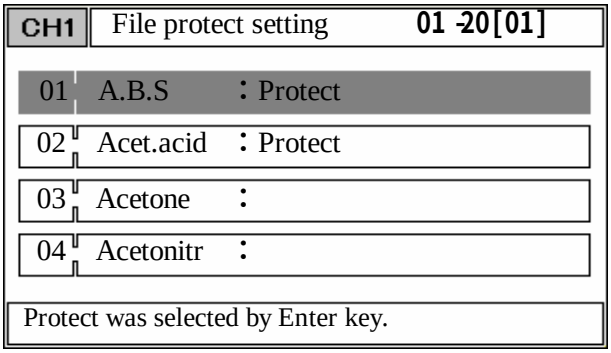
AQUAMICRON CXU : 150

# 6-4. File Setting

Settings are saved even after power-off.

## 6-4-1. File protect setting

When a file is protected, titration file contents can’t be changed.
In addition, a multi-file can’t be transferred.




(1) Protection setting

By pressing [Enter] key at the unprotected file position, “Protect” is indicated and a file is protected.

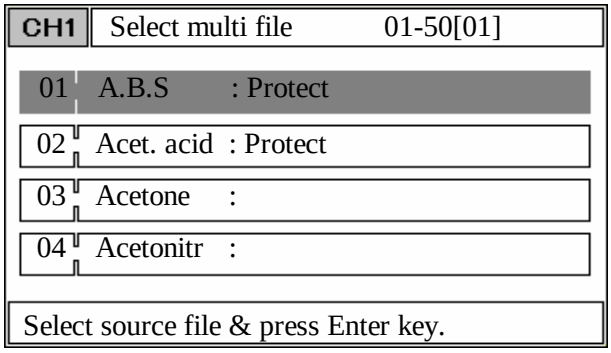
(2) Protection release

By pressing [Enter] key at the protected file position, “Protect” is canceled and file protection is released.

## 6-4-2. Multi file setting

Select a multi-file where each sample titration parameters are registered from No. 01 ～ 50.

Multi-files are indicated by sample names in alphabetical order.
After the selection, the file is transferred into file 01～20. After the transfer, measurement can be run by titration parameters registered in a multi-file. Titration parameters can be changed. “Protect” files can’t be transferred.




A multi-file list and a parameter list are as follows.

**Multi-file list**

| No. | Indications | Sample names | Remarks |
|---|---|---|---|
| 01 | A.B.S. | ABS resin | VA-200 |
| 02 | Acet. acid | Acetic acid | Electrolysis solution for ketone |
| 03 | Acetone | Acetone | Electrolysis solution for ketone |
| 04 | Acetonitr | Acetonitrile | |
| 05 | Acrylate | Acrylate resin | VA-200 |
| 06 | Calcium c | Calcium carbonate | VA-121 |
| 07 | Carbon bl | Carbon black | VA-200 |
| 08 | Chlorofor | Chloroform | |
| 09 | Engi oil | Engine oil | VA-210 |
| 10 | Epoxy res | Epoxy resin | VA-200 |
| 11 | Ethyl ace | Ethyl acetate | |
| 12 | Fureone | Fureone | |
| 13 | Heavy oil | Heavy oil | VA-210 |
| 14 | Hexane | Hexane | |
| 15 | Insul oil | Insulating oil | |
| 16 | Iron ores | Iron ores | VA-121 |
| 17 | Liq cryst | Liquid crystal | |
| 18 | L.P.G. | L.P.G. | |
| 19 | Lub oil | Lubricating oil | VA-210 |
| 20 | M.E.K. | M.E.K. | Electrolysis solution for ketone |

(Continued)

**Multi-file list**

| No. | Indications | Sample names | Remarks |
|---|---|---|---|
| 21 | Methanol | Methanol | |
| 22 | Nitrogen | Nitrogen | |
| 23 | Nylon-66 | Nylon-66 | VA-200 |
| 24 | Paint | Paint | VA-200 |
| 25 | Paper | Paper | VA-200 |
| 26 | P.B.T. | P.B.T. | VA-200 |
| 27 | P.E.T. | P.E.T. | VA-200 |
| 28 | Polybuten | Polybutene | VA-200 |
| 29 | Printboar | Printboard | VA-200 |
| 30 | Polycarbo | Polycarbonate | VA-200 |
| 31 | Polyethyl | Polyethylen | VA-200 |
| 32 | Polypropy | Polypropylene | VA-200 |
| 33 | Polystyle | Polystylene | VA-200 |
| 34 | Rubber | Rubber | VA-200 |
| 35 | S.B.R. | S.B.R. | VA-200 |
| 36 | Silicon r | Silicon rubber | VA-200 |
| 37 | Sodium te | Sodium tertrate | VA-200 |
| 38 | Starch | Starch | VA-200 |
| 39 | T.H.F. | T.H.F. | |
| 40 | Toluene | Toluene | |
| 41 | Toner | Toner | VA-200 |
| 42 | Vinyl chl | Vinyl chloride | VA-200 |
| 43 | Wheat | Wheat | VA-200 |
| 44 | Xyrene | Xyrene | |
| 45 | CA-200 | CA-200 | |
| 46 | VA-200/CA | VA-200/CA-200 | VA-200 |
| 47 | VA-210/CA | VA-210/CA-200 | VA-210 |
| 48 | VA124S/CA | VA-124S/CA-200 | VA-124S |
| 49 | VA-121/CA | VA-121/CA-200 | VA-121 |
| 50 | VA-122/CA | VA-122/CA-200 | VA-122 |

## Multi-file parameter list

| File No. | 01 ABS resin | 02 Acetic acid | 03 Acetone | 04 Acetonitrile | 05 Acrylate resin |
|---|---|---|---|---|---|
| File Name | A.B.S. | Acet.acid | Acetone | Acetonitr | Acrylate |
| Delay | 1 | 0 | 0 | 0 | 1 |
| Min Titr | 3 | 0 | 0 | 0 | 3 |
| Titr Stop | 0 | 0 | 0 | 0 | 0 |
| End Sense | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Print Form | 3 | 3 | 3 | 3 | 3 |
| Print Intv | | | | | |
| Calc Form | 1 | 1 | 1 | 1 | 1 |
| Calc Unit | 0 | 0 | 0 | 0 | 0 |
| Blank Test | | | | | |
| VA Select | 1 | 0 | 0 | 0 | 1 |
| VA Temp | 200 | | | | 230 |
| Purge | 1 | | | | 1 |
| Preheat | 2 | | | | 2 |
| Cooling | 2 | | | | 2 |
| BG Wait | | | | | |
| BG Level | | | | | |

| File No. | 06 Calcium carbonate | 07 Carbon black | 08 Chloroform | 09 Engine oil | 10 Epoxy resin |
|---|---|---|---|---|---|
| File Name | Calcium c | Carbon bl | Chlorofor | Engi oil | Epoxy res |
| Delay | 1 | 1 | 0 | 1 | 1 |
| Min Titr | 3 | 3 | 0 | 3 | 3 |
| Titr Stop | 0 | 0 | 0 | 0 | 0 |
| End Sense | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Print Form | 3 | 3 | 3 | 3 | 3 |
| Print Intv | | | | | |
| Calc Form | 1 | 1 | 1 | 1 | 1 |
| Calc Unit | 0 | 0 | 0 | 0 | 0 |
| Blank Test | | | | | |
| VA Select | 0 | 1 | 0 | 2 | 1 |
| VA Temp | (600) | 200 | | 130 | 230 |
| Purge | | 1 | | | 1 |
| Preheat | | 2 | | | 2 |
| Cooling | | 2 | | | 2 |
| BG Wait | | | | | |
| BG Level | | | | | |

* Set bracketed values by water vaporizers.

| File No. | 11<br>Ethyl acetate | 12<br>Fureone | 13<br>Heavy oil | 14<br>Hexane | 15<br>Insulating oil |
|---|---|---|---|---|---|
| File Name | Ethyl ace | Fureone | Heavy oil | Hexane | Insul oil |
| Delay | 0 | 1 | 1 | 0 | 1 |
| Min Titr | 0 | 3 | 3 | 0 | 0 |
| Titr Stop | 0 | 0 | 0 | 0 | 0 |
| End Sense | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Print Form | 3 | 3 | 3 | 3 | 3 |
| Print Intv | | | | | |
| Calc Form | 1 | 1 | 1 | 1 | 1 |
| Calc Unit | 0 | 0 | 0 | 0 | 0 |
| Blank Test | | | | | |
| VA Select | 0 | 0 | 2 | 0 | 0 |
| VA Temp | | | 130 | | |
| Purge | | | | | |
| Preheat | | | | | |
| Cooling | | | | | |
| BG Wait | | | | | |
| BG Level | | | | | |

| File No. | 16<br>Iron ores | 17<br>Liquid crystal | 18<br>L.P.G. | 19<br>Lubricating oil | 20<br>M.E.K. |
|---|---|---|---|---|---|
| File Name | Iron ores | Liq cryst | L.P.G. | Lub oil | M.E.K. |
| Delay | 1 | 0 | 1 | 1 | 0 |
| Min Titr | 3 | 0 | 3 | 3 | 0 |
| Titr Stop | 0 | 0 | 0 | 0 | 0 |
| End Sense | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Print Form | 3 | 3 | 3 | 3 | 3 |
| Print Intv | | | | | |
| Calc Form | 1 | 1 | 1 | 1 | 1 |
| Calc Unit | 0 | 0 | 0 | 0 | 0 |
| Blank Test | | | | | |
| VA Select | 0 | 0 | 0 | 2 | 0 |
| VA Temp | (750) | | | 130 | |
| Purge | | | | | |
| Preheat | | | | | |
| Cooling | | | | | |
| BG Wait | | | | | |
| BG Level | | | | | |

* Set bracketed values by water vaporizers.

| File No. | 21<br>Methanol | 22<br>Nitrogen | 23<br>Nylon-66 | 24<br>Paint | 25<br>Paper |
|---|---|---|---|---|---|
| File Name | Methanol | Nitrogen | Nylon-66 | Paint | Paper |
| Delay | 0 | 0 | 1 | 1 | 1 |
| Min Titr | 0 | 0 | 0 | 0 | 3 |
| Titr Stop | 0 | 0 | 0 | 0 | 0 |
| End Sense | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Print Form | 3 | 3 | 3 | 3 | 3 |
| Print Intv | | | | | |
| Calc Form | 1 | 1 | 1 | 1 | 1 |
| Calc Unit | 0 | 0 | 0 | 0 | 0 |
| Blank Test | | | | | |
| VA Select | 0 | 0 | 1 | 1 | 1 |
| VA Temp | | | 230 | 200 | 150 |
| Purge | | | 1 | 1 | 1 |
| Preheat | | | 2 | 2 | 2 |
| Cooling | | | 2 | 2 | 2 |
| BG Wait | | | | | |
| BG Level | | | | | |

| File No. | 26<br>P.B.T. | 27<br>P.E.T. | 28<br>Polybutene | 29<br>Printboard | 30<br>Polycarbonate |
|---|---|---|---|---|---|
| File Name | P.B.T. | P.E.T. | Polybuten | Printboar | Polycarbo |
| Delay | 1 | 1 | 1 | 1 | 1 |
| Min Titr | 3 | 3 | 3 | 3 | 3 |
| Titr Stop | 0 | 0 | 0 | 0 | 0 |
| End Sense | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Print Form | 3 | 3 | 3 | 3 | 3 |
| Print Intv | | | | | |
| Calc Form | 1 | 1 | 1 | 1 | 1 |
| Calc Unit | 0 | 0 | 0 | 0 | 0 |
| Blank Test | | | | | |
| VA Select | 1 | 1 | 1 | 1 | 1 |
| VA Temp | 230 | 230 | 130 | 200 | 230 |
| Purge | 1 | 1 | 1 | 1 | 1 |
| Preheat | 2 | 2 | 2 | 2 | 2 |
| Cooling | 2 | 2 | 2 | 2 | 2 |
| BG Wait | | | | | |
| BG Level | | | | | |

| File No. | 31<br>Polyethylen | 32<br>Polypropylene | 33<br>Polystylene | 34<br>Rubber | 35<br>S.B.R. |
|---|---|---|---|---|---|
| File Name | Polyethyl | Polypropy | Polystyle | Rubber | S.B.R |
| Delay | 1 | 1 | 1 | 1 | 1 |
| Min Titr | 3 | 3 | 3 | 3 | 3 |
| Titr Stop | 0 | 0 | 0 | 0 | 0 |
| End Sense | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Print Form | 3 | 3 | 3 | 3 | 3 |
| Print Intv | | | | | |
| Calc Form | 1 | 1 | 1 | 1 | 1 |
| Calc Unit | 0 | 0 | 0 | 0 | 0 |
| Blank Test | | | | | |
| VA Select | 1 | 1 | 1 | 1 | 1 |
| VA Temp | 180 | 200 | 200 | 150 | 150 |
| Purge | 1 | 1 | 1 | 1 | 1 |
| Preheat | 2 | 2 | 2 | 2 | 2 |
| Cooling | 2 | 2 | 2 | 2 | 2 |
| BG Wait | | | | | |
| BG Level | | | | | |

| File No. | 36<br>Silicon rubber | 37<br>Sodium tertrate | 38<br>Starch | 39<br>T.H.F. | 40<br>Toluene |
|---|---|---|---|---|---|
| File Name | Silicon r | Sodium te | Starch | T.H.F. | Toluene |
| Delay | 1 | 1 | 1 | 0 | 0 |
| Min Titr | 3 | 3 | 3 | 0 | 0 |
| Titr Stop | 0 | 0 | 0 | 0 | 0 |
| End Sense | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Print Form | 3 | 3 | 3 | 3 | 3 |
| Print Intv | | | | | |
| Calc Form | 1 | 1 | 1 | 1 | 1 |
| Calc Unit | 0 | 0 | 0 | 0 | 0 |
| Blank Test | | | | | |
| VA Select | 1 | 1 | 1 | 0 | 0 |
| VA Temp | 180 | 180 | 130 | | |
| Purge | 1 | 1 | 1 | | |
| Preheat | 2 | 2 | 2 | | |
| Cooling | 2 | 2 | 2 | | |
| BG Wait | | | | | |
| BG Level | | | | | |

| File No. | 41<br>Toner | 42<br>Vinyl chloride | 43<br>Wheat | 44<br>Xyrene | 45<br>CA-200<br>default |
|---|---|---|---|---|---|
| File Name | Toner | Vinyl chl | Wheat | Xyrene | CA-200 |
| Delay | 1 | 1 | 1 | 0 | 0 |
| Min Titr | 3 | 3 | 3 | 0 | 0 |
| Titr Stop | 0 | 0 | 0 | 0 | 0 |
| End Sense | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Print Form | 3 | 3 | 3 | 3 | 3 |
| Print Intv | | | | | |
| Calc Form | 1 | 1 | 1 | 1 | 0 |
| Calc Unit | 0 | 0 | 0 | 0 | |
| Blank Test | | | | | |
| VA Select | 1 | 1 | 1 | 0 | 0 |
| VA Temp | 180 | 130 | 150 | | |
| Purge | 1 | 1 | 1 | | |
| Preheat | 2 | 2 | 2 | | |
| Cooling | 2 | 2 | 2 | | |
| BG Wait | | | | | |
| BG Level | | | | | |

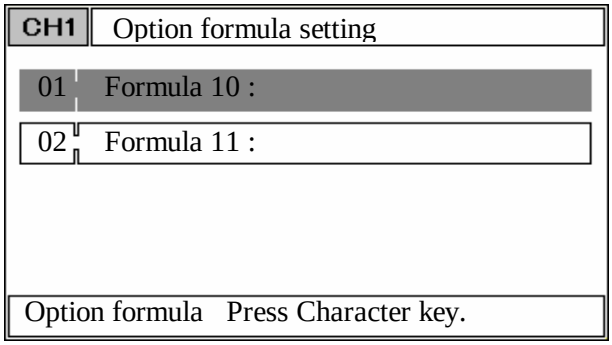
| File No. | 46<br>VA-200<br>default | 47<br>VA-210<br>default | 48<br>VA124S<br>default | 49<br>VA-121<br>default | 50<br>VA-122<br>default |
|---|---|---|---|---|---|
| File Name | VA-200/CA | VA-210/CA | VA124S/CA | VA-121/CA | VA-122/CA |
| Delay | 1 | 1 | 1 | 1 | 1 |
| Min Titr | 3 | 3 | 3 | 3 | 3 |
| Titr Stop | 0 | 0 | 0 | 0 | 0 |
| End Sense | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Print Form | 3 | 3 | 3 | 3 | 3 |
| Print Intv | | | | | |
| Calc Form | 1 | 1 | 1 | 1 | 1 |
| Calc Unit | | | | | |
| Blank Test | | | | | |
| VA Select | 1 | 2 | 3 | 0 | 0 |
| VA Temp | 200 | 150 | 200 | (600) | (600) |
| Purge | 1 | | | | |
| Preheat | 2 | | | | |
| Cooling | 2 | | | | |
| BG Wait | | | 150 | | |
| BG Level | | | 0.2 | | |

* Values in brackets are set by vaporizers.

## 6-4-3. Option formula setting

An option formula can be set in Formula 10 and 11.
Press [Function/Character] key at a formula to input and set a formula at the input window.

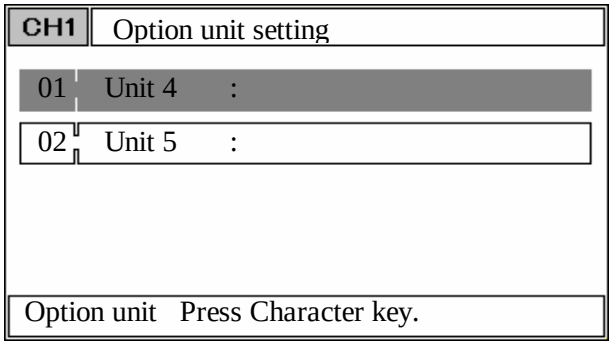
Up to 16 characters can be inputted.




## 6-4-4. Option unit setting

An option unit can be set in Unit 4 and 5.
Press [Function/Character] key at an unit to input and set an unit at the input window.

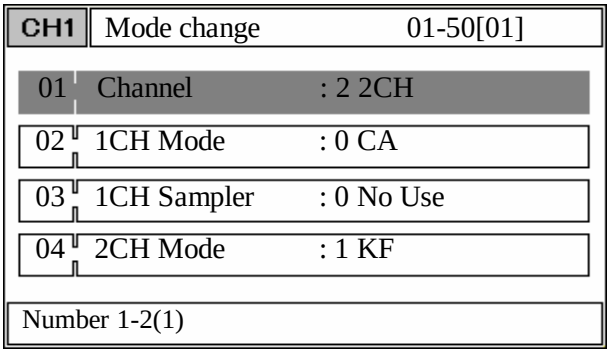
Up to 9 characters can be inputted.



# 6-5. Setting

Settings are saved even after power-off.

## 6-5-1. Mode change




(1) Channel

Set 1CH or 2CH use.
1CH or 2CH can be switched.
Default is 1CH.

(2) 1CH Mode

Set 1CH measurement mode.
CA mode or KF mode can be switched.
Default is CA mode.

(3) 1CH Sampler

Set 1CH sampler use.
“No Use” or “VA-124S” can be switched.
Default is “No Use”.

(4) 2CH Mode

Set 2CH measurement mode.
CA mode or KF mode can be switched.

Default is CA mode

(5) 2CH Sampler

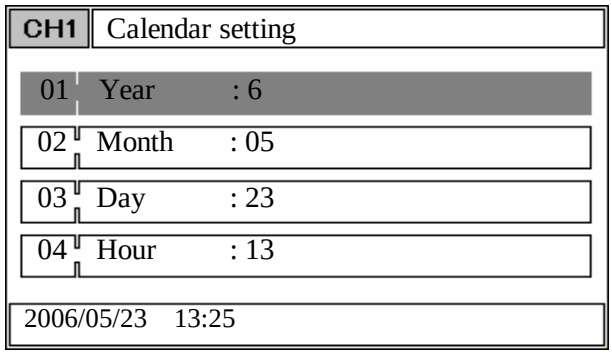
Set 2CH sampler use.
“No Use” or “VA-124S” can be switched.
Default is “No Use”.

(6) Language

Set a language.
“English” or “Japanese” can be switched.
Default is “English”.

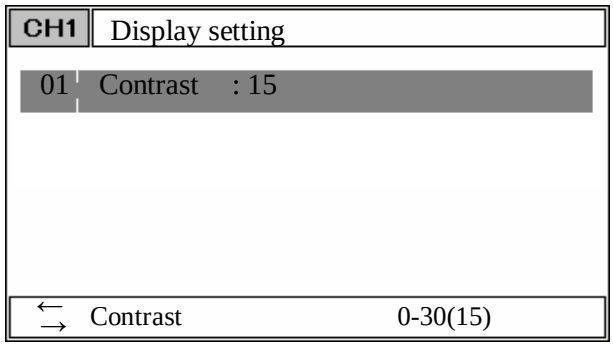
## 6-5-2. Calendar setting

Set the unit date and time. Input numbers and press [Enter] key. Date and time setting is changed. After setting, press [Escape] key.



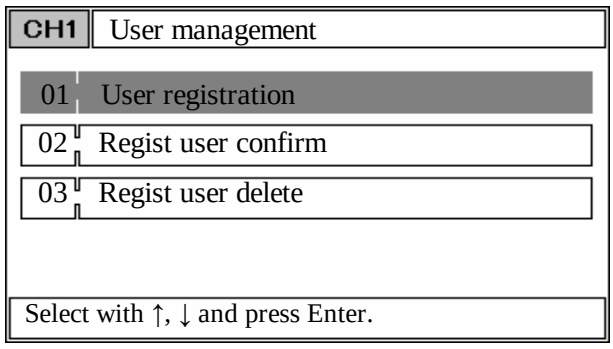

## 6-5-3. Display setting

Set the window contrast. Change settings with [←] [→] keys or by number input. After setting, press [Escape] key.



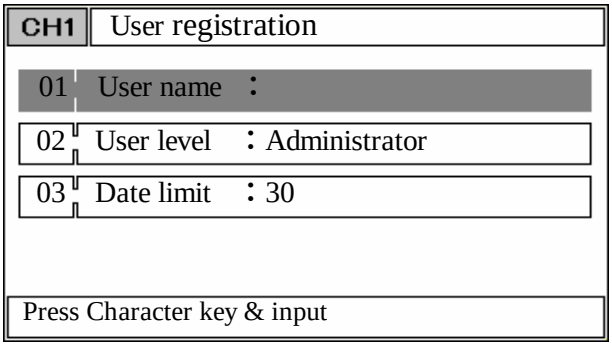

## 6-5-4. User management

Register users and set registered user level and a password limit.
Check and delete registered users.



(1) User registration

Register users and set registered user levels and password limits. Up to 50 users can be registered.




1. User name
Register user names.
Up to 13 characters can be inputted.

2. User level
Set user levels.
“Administrator” or “Developer” or “Operator” can be set.

* When using this user management function first, register “Administrator” first.
The unit use restriction by user commission levels are as follows.

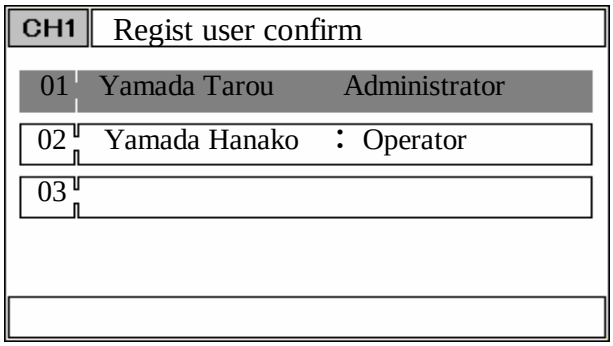
| Unit functions | Administrator | Developer | Operator |
|---|---|---|---|
| Sample parameter change | ○ | ○ | ○ |
| Titration parameter change | ○ | ○ | × |
| Function Menu | | | |
| Recalculation | ○ | ○ | × |
| Statistical calculation | ○ | ○ | ○ |
| Reagent consumption | ○ | ○ | ○ |
| File setting | ○ | × | × |
| Setting | ○ | × | × |
| Communication setting | ○ | × | × |
| Validation | ○ | ○ | × |
| Option Menu | | | |
| USB memory | ○ | ○ | ○ |
| Evac. unit operation | ○ | ○ | ○ |

3. Password term

Set password terms. When the same password is used and the term is over, a warning is indicated at the unit start.

(2) Regist user confirm

Registered users and commission levels are listed.

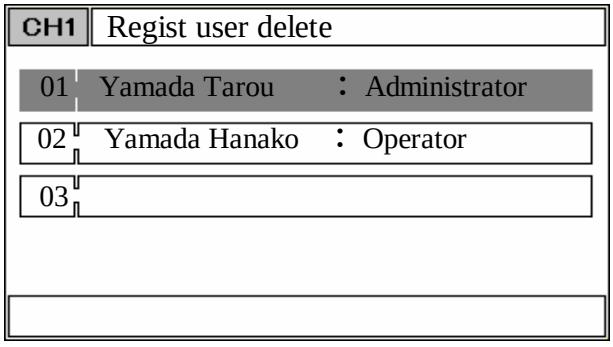



(3) Regist user delete

Select user names to delete and press [Enter] key.

* Do not delete “Administrator” user.

If “Administrator” user isn’t registered, the user management function can’t be used.

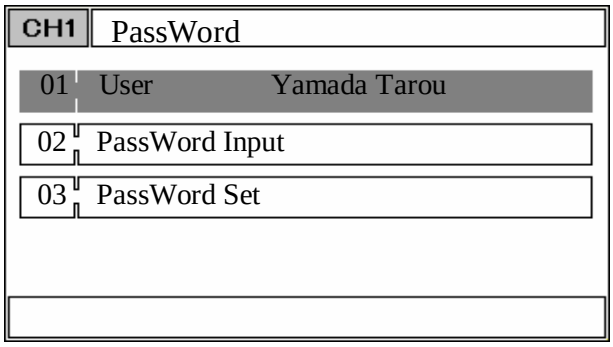



(4) PassWord Set

After user registration, the password input window is indicated at power re-supply.

1. Select users at “User” with [←] and [→] keys.

2. Input a password into “PassWord Input” and press [Enter] key to display the titration window.




3. Press [Enter] key at “PassWord Set” to display “PassWord Set” window.
(A password is not registered after user registration. Set a password.)
Input a password into “New Password 1” and press [Enter] key.
Input the same password into “New Password 2” and press [Enter] key.

* To change a password after the second time, input a current password into “Old password” and press [Enter] key.

## 6-5-5. Other details

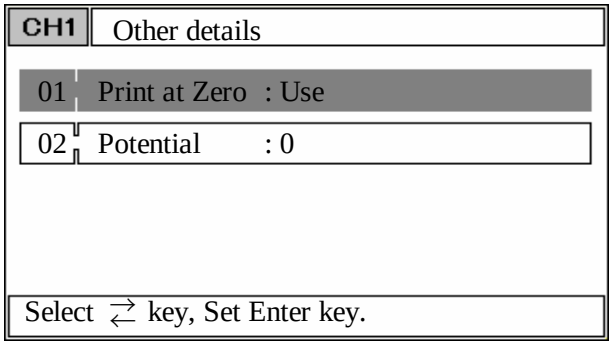
(1) Print at Zero

When moisture is not detected and result is "0 μg", select "Use" or "No use".

The default is "Use".

(2) Potential

When using reagents of different titration speed, set electrolysis control start potential. The standard value is 100mV. When using electrolysis solution of fast reaction speed, set larger values than the standard value. When using electrolysis solution of slow reaction speed, set smaller values than the standard value. When using RdH® anode solution, set it to 200mV.



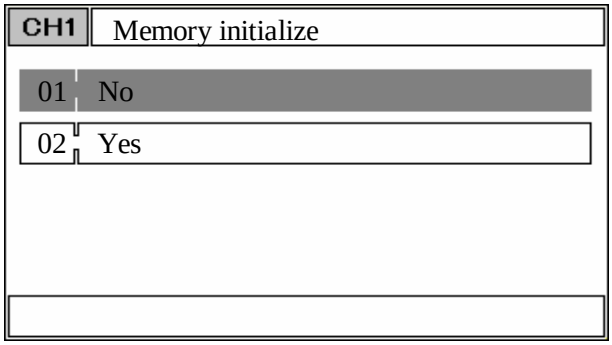

## 6-5-6. Memory initialize

**POINT**

By setting the unit to default by memory initialization, all mode switch settings are set to default. (Refer to 6-5-1. Mode change.)
In addition, all measurement data are canceled. To return to the condition before memory initialization, run export previously and back up settings. (Refer to 7-2. USB memory.)

Initialize all memories and reset them to default.

Select "Yes" and press [Enter] key.



# 6-6. Communication setting

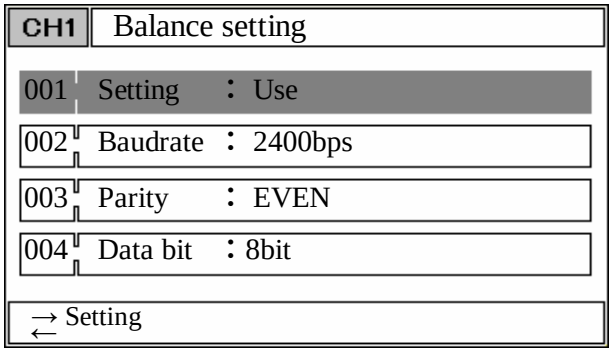
Set communication of a balance port and OPTION 1 and 2.
To use OPTION 1 and 2, connect an optional personal computer interface.
Settings are saved even after power-off.

## 6-6-1. Balance setting

Balance communication setting can be changed.

Press [Function/ C. Select] key and select "Communication setting" and "Balance setting". Select items with [ ↑ ] [ ↓ ] keys and change contents with [←] [→] keys.

Set "Setting" to "Use" and set items by balance communication settings.




For balance setting, refer to balance connection manuals and instruction manuals.

## 6-6-2. OPTION 1 setting

OPTION 1 communication setting can be changed. (It is valid at personal computer interface connection.)
To communicate with a personal computer, set "Setting" to "PC input output".
For personal computer setting, refer to the attached computer interface instruction manual.

## 6-6-3. OPTION 2 setting

OPTION 2 communication setting can be changed. (It is valid at personal computer interface connection.)
To connect a dot printer, set "Setting" to "Printer".

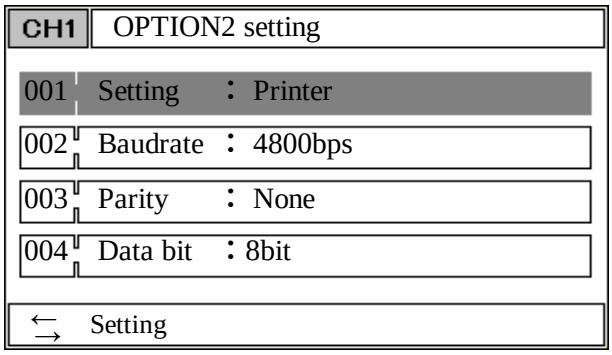
(Check that items except "Setting" are default as follows.)

Baudrate : 4800bps

Parity : None

Data Bit : 8bit

Stop Bit : 1bit



# 6-7. Validation

By selecting “Hardware validation” to check, the following five tests are run orderly and check the connection.

## 6-7-1. Hardware validation

Check functions of “Display Test”, “`Printer Check”, “Memory Test”, “Calendar Check”, and “Calculation Check”.

(1) Display check




Check patterns are indicated in the window. After pressing [Enter] key,
“Is the Display test result was correct?” is indicated.
Select “Yes” when the test is OK.
Select “No” when the test is NG.
For “Yes”, “OK” is printed.
For “No”, “NG” is printed.

(2) Printer check

“Is the Printer check result was correct?” is indicated.
Select “Yes” when the test is OK.
Select “No” when the test is NG.
For “Yes”, “OK” is printed. For “No”, “NG” is printed.

(3) Memory check

The memory is checked automatically.

For “Yes”, “OK” is printed. For “No”, “NG” is printed.

(4) Calendar check

“Is the Calendar check result was correct?” is indicated.
Select “Yes” when printed result is same as current time.
Select “No” when printed result is different from current time.
For “Yes”, “OK” is printed. For “No”, “NG” is printed.

(5) Calculation check

When concentration is calculated automatically by known moisture content and weight and it is 100.0 %, “OK” is printed.

## 6-7-2. Measurement validation

The methods for checking that moisture measured values are correct are as follows.

(1) With AQUAMICRON® water standard solution (0.2, 1.0mg$H_2O$/ml)

For 1.0mg$H_2O$/m, Values of 3 times measurement should be within ±3% of the guaranteed values.

For 0.2 mg$H_2O$/m, Values should be within ±5% of the guaranteed values.

(2) With water (Example: 5 μl sampling with a microsyringe)

The most recommended method including absolute amount check

(3) With AQUAMICRON® solid water standard solution (3.83±0.05%)

The values of 3 times measurement should be within ±5%.

(4) With sodium tartrate dehydrate (Theoretical moisture amount15.65%), tungsten sodium dehydrate (Theoretical moisture amount 10.92%) (Example: 20 to 40mg sampling by a sampler for high concentration.)

The method is applied at water vaporizer use and carrier gas leak also can be checked.
Check moisture content in a drying process before the use.

**POINT**

Use distilled water or refined water by the ion exchange method or by the combination of the reverse osmosis method or the distillation method or the ion exchange method.

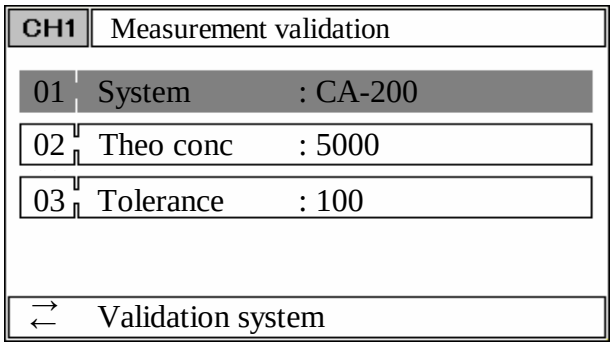
(5) Measurement validation

*In case of CA-200 validation by water*

Use water and a calibrated microsyringe. We recommend 5 μl (5000 μg) water.

1. Select a unit to validate. (Fixed parameters are used as titration parameters.)

CA-200
CA-200/VA-200
CA-200/VA-210
CA-200/VA-124S
CA-200/VA-121
CA-200/VA-122
CA-200/VA-230




2. Input a theoretical value by μg or % unit.

Example: 5000 μg Theoretical value: [5] key + [0] key + [0] key + [0] key + [Enter] key

3. Input tolerance by μg or % unit.

Example: 100 μg Tolerance: [1] key + [0] key + [0] key + [Enter] key

4. After setting, press [Escape] key to turn to the validation titration window.

5. The contents set at (1) to (4) are printed.

**POINT**

Recommended values are included in titration parameters and they can be changed if necessary. Change the formula "Calc Form" to the formula for standard sample. Unit are set by selected formulas.

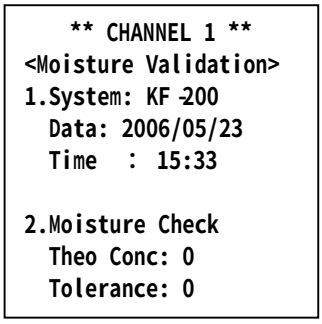
6. Measure moisture. Refer to 5. Moisture Measurement Mode.

7. After measurement, result is indicated and printed.

To repeat measurement, select "Yes" to return to the titration window.

Select "No" to print statistical calculation result and the judgement.

(Only when all results are within tolerance ranges, "OK" is printed.)




**POINT**

If normal measured values can't be obtained by these methods, electrolyte or detection electrodes or working electrodes or moisture meters or parameters can be wrong. Operators can't calibrate the unit, therefore contact our distributors.
Refer to Section 9: Troubleshooting.

# Section 7: Option

Press [Option] key to select a function.

**1. USB memory**

1. Export

   1. Measurement result export
   2. Titration parameter export
   3. System setting export

2. Import
   1. Titration parameter import
   2. System setting import

## 7-1. USB memory

It can be used as a backup of setting values before memory initialization.

### 7-1-1. Export

Export measurement result, titration parameters, and system settings from the unit memory to an USB memory.

Exported data can be displayed in Microsoft Excel®.

The data destination is an USB memory "\CA200\DATA" folder

* Exported titration parameters and system settings can be imported.

Refer to 7-2-2. Import for details.

**POINT**

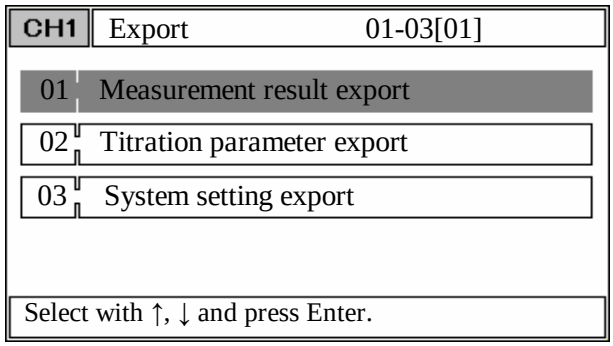
Never remove an USB memory during export or import.

(1) Measurement result export

1. Connect a USB memory to “USB A” in the unit back.
2. Select “Measurement result export” and press [Enter] key.

   The check window is displayed.

3. Select “Yes” and press [Enter] key.




Export is run. The check window is cancelled and result export is completed.

* File name is “Data(1) (Year month date time minute second). csv”.
(For CH2, it is “Data(2) (Year month date time minute second). csv”.)
Refer to 7-2-3. Result format for details.

(2) Titration parameter export

1. Connect a USB memory to “USB A” in the unit back.
2. Select “Titration parameter export” and press [Enter] key.

   The check window is displayed.

3. Select “Yes” and press [Enter] key.

Export is run. The check window is cancelled and titration parameters export is completed.

* File name is “Para(1). csv”.

(For CH2, it is “Para(2). csv”.)

(3) System setting export

1. Connect a USB memory to “USB A” in the unit back.
2. Select “System setting export” and press [Enter] key.

   The check window is displayed.

3. Select “Yes” and press [Enter] key.

Export is run. The check window is cancelled and system setting export is completed.

* File name is “System(1).csv”.

(For CH2, it is “System(2).csv”.)

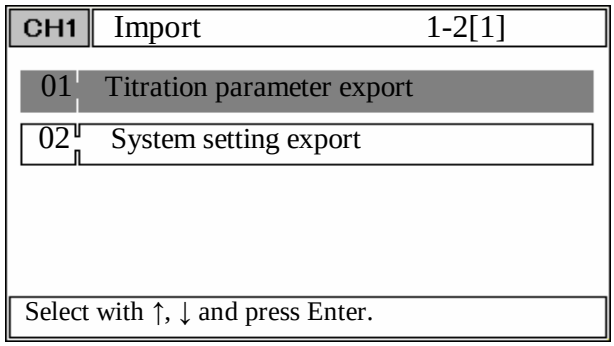
**POINT**

1. For “Titration Parameters” and “System Setting”, just one setting file can be saved in the same USB memory every channel.
2. By exporting titration parameters and system setting to the same USB memory, they are overwritten in a current file.
3. Don’t change an exported file name and a folder name. If changed, they can’t be imported normally.

## 7-1-2. Import

(1) Titration parameter export

1. Connect a USB memory to “USB A” in the unit back.




2. Select “Titration parameter export” and press [Enter] key.
   The check window is displayed.

3. Select “Yes” and press [Enter] key.
   Import is run. The check window is cancelled and titration parameters export is completed.

(2) System setting export

1. Connect a USB memory to “USB A” in the unit back.
2. Select “System setting export” and press [Enter] key.
   The check window is displayed.
3. Select “Yes” and press [Enter] key.

Import is run. The check window is cancelled and system setting export is completed.

4. Turn off and on the power switch.

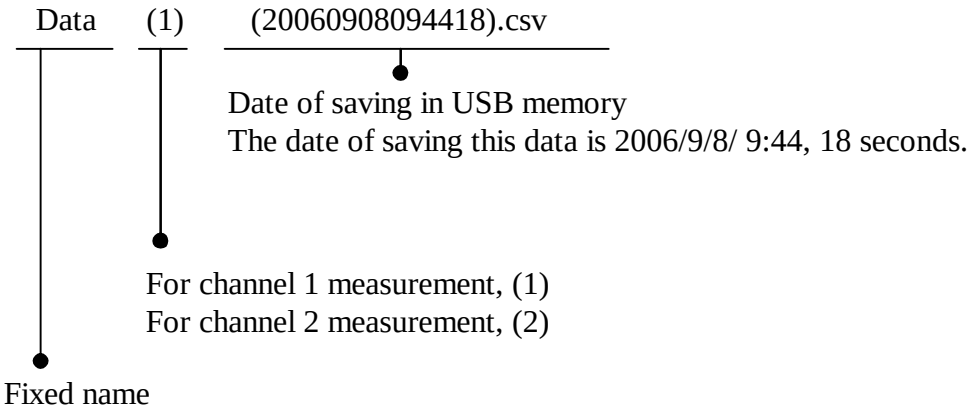
## 7-1-3. Result format

Result data are saved in csv format (Data format of items divided by “”).

“CA200” folder and “Data” folder in the inside are prepared at data export to an USB memory.

Data are saved in the folder.

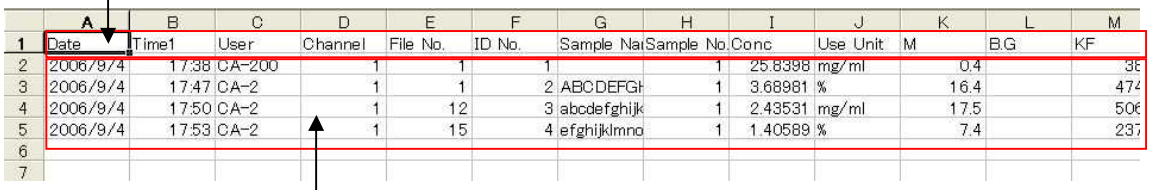
(1) File name




(2) Data indication

When opening a file from spreadsheet software, set the file type to “Text file (*.csv)”.

The first line: Measurement data items are indicated.



| | A | B | C | D | E | F | G | H | I | J | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Date | Time1 | User | Channel | File No. | ID No. | Sample Na | Sample No. | Conc | Use Unit | M | B.G | KF |
| 2 | 2006/9/4 | 17:38 | CA-200 | 1 | 1 | 1 | | 1 | 25.8398 | mg/ml | 0.4 | | 38 |
| 3 | 2006/9/4 | 17:47 | CA-2 | 1 | 1 | 2 | ABCDEFGH | 1 | 3.68981 | % | 16.4 | | 474 |
| 4 | 2006/9/4 | 17:50 | CA-2 | 1 | 12 | 3 | abcdefghijk | 1 | 2.43531 | mg/ml | 17.5 | | 506 |
| 5 | 2006/9/4 | 17:53 | CA-2 | 1 | 15 | 4 | efghijklmno | 1 | 1.40589 | % | 7.4 | | 237 |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |

After the second line: 1 measurement data are indicated every line.

(3) Data items

Data items are indicated in the following list order from the left.

* The sorting order is fixed. “No input” and “No display by some modes” data are blank. (Some defaults are saved.) For data values, refer to titration and sample parameters.

| Names | Remarks |
|---|---|
| Date | Measurement year, month, date |
| Time1 | Measurement time and minute |
| User | Name of operators logged in at the unit start. |
| Channel | Measurement channel |
| File No. | Titration file number used for measurement |
| ID No. | Saved data number |
| Sample Name | Measured sample name |
| Sample No. | When measurement is run by the same sample or the same titration file, a number is added. |
| Conc | Measurement result |
| Use Unit | Measurement unit |
| M | Measured moisture content |
| B.G. | Electrolysis rate (background) at measurement start<br>Data are saved at coulometric method measurement. |
| KF | KF reagent injection volume used for measurement<br>Data are saved at volumetric method measurement. |
| Time2 | Measurement time |
| W | Sample parameters |
| w | |
| L | |
| S | |
| G | |
| t | |
| B | |
| X | |
| Y | |
| File Name | Titration parameters |
| Delay | |
| Min Titr | |
| Titr Stop | |
| End Sense | |
| Print Form | |
| Print Intv | |
| Calc Form | |
| Calc Unit | |
| Blank Test | |
| CA Gain | Control start potential (Refer to 6-5-5. Other details in CA-200 instruction manual.)<br>CA mode (coulometric method) parameter |

| Names | Remarks |
|---|---|
| BRT Select | KF mode (volumetric method) titration parameters |
| B1 Min Dro | |
| B1 Max Vol | |
| B1 Gain | |
| B1 Factor | |
| B2 Min Dro | |
| B2 Max Vol | |
| B2 Gain | |
| B2 Factor | |
| End mV | |
| KF Over In | |
| KF Vol In | |
| W/w Vol In | |
| Wait Time | |
| VA Select * | Titration parameter (Vaporizer type selection) |
| VA Temp | Titration parameters at vaporizer use<br><br>* If you don't use a vaporizer, defaults are saved. |
| Purge * | |
| Pre heart * | |
| Cooling * | |
| BG Wait * | |
| BG Level * | |
| Room Temp | |
| Start Temp | |
| End Temp | |
| Temp Intv * | |

## 7-2. Evac. unit

When an evac. unit is connected, operate it manually. Refer to the instruction manual for details.

It is not used usually at CA mode.

# Section 8: Maintenance and Inspection

## 8-1. Inspection

Inspect the following points and measure in normal conditions.
If you find troubles, solve and inspect them again.
When they are unknown or found in the unit, contact our distributors.

### 8-1-1. Daily inspection

(1) Titration cell

1. Check that ground parts are not stuck. Rotate electrodes, a plug, and a cock by about 30 degrees and check that they move smoothly.
2. Check a detection electrode and a cathode solution cell and that platinum part and a septum (ceramic) are not contaminated.
3. Anode solution volume should be 150ml or less and electrodes should be under the liquid level. However, when total moisture content measured after anode solution change is 800mg or more for anode solution 100ml, change solution.
4. Cathode solution color should be yellow or red-brown. If it is dark-brown, change it. However, when total moisture content measured after cathode solution change is 150mg or more for cathode solution 5ml, change the solution.

(2) Dehydration in a titration cell

Check that a titration cell can be dehydrated within 30 minutes.

(Refer to 5-2. Titration cell dehydration.)

(3) Water standard solution measurement inspection

Measure water standard solution (AQUAMICRON® water standard solution 1mg or 0.2mg: API corporation-made) or water for inspection.

1. For AQUAMICRON® water standard solution 1mg: Measurement values should be within ±3% of guaranteed values and repeatability should be within 3%.

2. For AQUAMICRON® water standard solution 0.2mg: Measurement values should be within ±5% of guaranteed values and repeatability should be within 5%.

3. For water: Inject 5 µl water with a 10 µl microsyringe more than 2 times. The recovery average should be 95 to 105%.

## 8-1-2. Regular inspection

Check the following points every 6 to 12 months.

(1) Visual check of the main unit, a stirrer, and a titration cell

1. Contamination and dust
2. Parts fixing condition
3. Connector connection and fitting conditions
4. Detection electrode, cathode solution cell, and titration cell contamination and cracks and defectives
5. Titration cell parts conditions

(2) Total operation inspection

Check the following points.

1. Dehydration in a titration cell
2. Water standard solution measurement
3. Measurement of samples of known moisture concentration

# 8-2. Titration cell handling

## 8-2-1. Maintenance

(1) Glassware keeping

Keep the attached appliances of a titration cell dry in a desiccator just before the use. Before using left appliances, dry it with a hair dryer etc.

(2) Rubber packing change

Change rubber packing in the following case.
When use times are frequent or a thick needle is used, a hole is made and air comes in. The background does not lower or measurement does not reach the end point by air.

(3) Needle end check

If a needle end curves and foreign matter adheres to it, repair it with sandpaper or a file. By using without repair, samples adhere to the inner wall of a titration cell and an electrode. Measurement time is longer and measurement values are lower.

(4) Grease refill

Rotate each ground part of a titration cell every week and spread exclusive grease lightly on stuck positions.

**POINT**

If the ground surfaces are tightly stuck, separate them as follows.
Method 1

1. Discharge electrolyte in a titration cell and wash it with ethanol and water.
2. Wet the surrounding of stuck part with a little acetone.
3. Put on protective gloves, catch the stuck part lightly with pliers, and move it slightly right and left.

Method 2

1. Put a titration cell into 5% KCl water solution and immerse the whole.
2. Left it all day and night.
3. Put on protective gloves, catch the stuck part lightly with pliers, and move it right and left.

(5) Silica gel

Change silica gel when silica gel blue turns to light red. Silica gel which absorbed moisture contains electrolyte so dispose of it for safety.

## 8-2-2. Washing

When cell parts are contaminated, moisture attached to there and the baseline is unstable.
Wash it as follows and keep it in a desiccator with desiccant.

(1) Generator solution cell washing

1. Discharge all reagents.

2. Remove all parts of a generator solution cell and remove grease and attachments with ethanol (acetone).

3. Wash them with a soft sponge and mild detergent.

4. Wash them with pure water, pour ethanol, and dry them in the air, dry them fully in a desiccator (about 50 to 105 degrees Celsius).

* Wash equally parts remove at “2”.

(2) Detection electrode washing

1. Remove attachment with ethanol (acetone).
   When the removal at the glass border surface is insufficient, wipe it with soft paper.
   Take care not to crack glass part contacting platinum.

2. Wash it with pure water, pour ethanol on it, wipe it with soft paper, and dry it fully with a hair dryer.

(3) Cathode solution cell washing (Mainly platinum electrode and ceramic part washing)

1. Discharge cathode solution without contacting a lead.

2. Remove attachments with paper containing ethanol.

3. Pour ethanol into a cathode solution cell, set a rubber plug to a sealing plug setting port, and shake the cell fully to wash it.

4. After ethanol discharge, repeat “3” operation until the cell is clean. When contamination is not removed, pour acetone into a beaker and a cathode solution cell for a long time.

5. Wash them with pure water, pour ethanol, and dry them fully with a dryer.

**CAUTION**

At nonpyridine cathode solution use, by pouring acetone into a cathode solution cell without good wash, white deposits are generated by reaction.

# 8-3. Keeping of reagent for moisture measurement

The following API corporation reagents are taken as an examples.

Anode solution : AQUAMICRON®AX, AQUAMICRON®AKX

Cathode solution : AQUAMICRON®CXU

## 8-3-1. Keeping

For long-term keeping, keep it at the shade and cool space.
To keep AQUAMICRON®AX and AQUAMICRON®AKX, seal them to prevent vapor leakage and moisture interfusion.

## 8-3-2. Caution in handling

Place partial and overall ventilations in handling. Take care not to touch and inhale reagent.
If you touch reagent, wash it with much water.
For other details, refer to AQUAMICRON X-series instructions attached to a reagent bottle.

## 8-3-3. Reagent change

(1) Moisture measurement power of AQUAMICRON®AX and AQUAMICRON®AKX 100ml is about 800mg and 300mg. When they are diluted by samples and 150ml or more, electrolysis efficiency is low and measurement values are high. Discharge all and replace them with new reagent.

(2) Moisture measurement power of AQUAMICRON®CXU 5ml is about 150mg. By new cathodic reaction, air bubbles occur during measurement. If measurement continues, reagent is red-brown. If measurement continues further, reagent is dark-brown and a liquid level is up gradually by electro-osmosis. In this case, replace reagents with new ones. Take out old reagents with a pipette and inject new ones. Do not add new reagents to old ones. When reagents absorb much moisture, titration end points can't be detected. Change reagents every week.

# Section 9: Troubleshooting

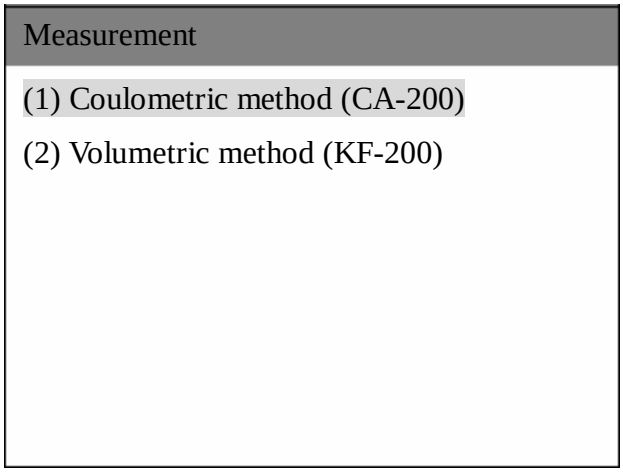
## 9-1. Help

By pressing [Help] key, the unit troubles can be checked.

When you can't solve troubles even by checking Help functions and the instruction manual, contact our local distributors.

By pressing [Help] key, the help window is displayed.

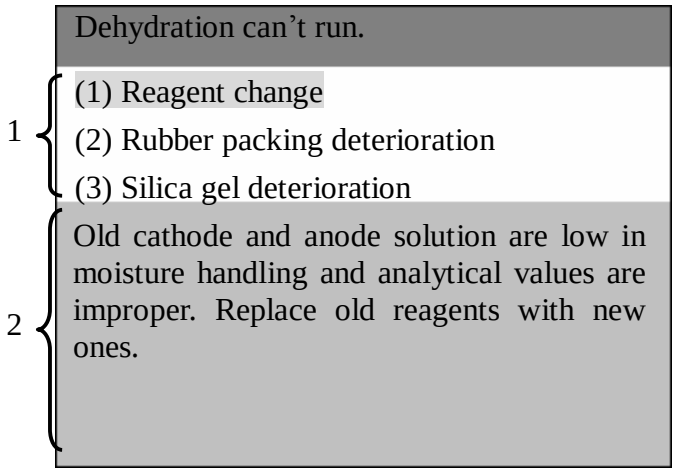
Select check contents with [↓] [↑] keys and press [Enter] key.




By selecting troubles, the right window is indicated.

Detailed troubles and troubleshooting are indicated in "1" and "2".

To exit Help Menu, press [Help] key again.



# 9-2. Troubleshooting

When troubles occur, check the following items and take measures.

If the condition is still bad even after taking measures, contact our local distributors.

## Power is not supplied even by turning on the power switch.

| Expected trouble causes | Countermeasures |
|---|---|
| A power cable is not connected correctly. | Check that the power cable does not come off and loose.<br>After removing it, connect it again. |
| A fuse is blown. | Replace it with the specified one (voltage and property).<br>If a fuse is blown easily after the change, an inner electric circuit can be wrong.<br>Contact our local distributors for repair. |
| Troubles except the above | Contact our local distributors for repair. |

## Data from a balance can not be read.

Read a instruction manual of a balance interface again and check the following items.

| Expected trouble causes | Countermeasures |
|---|---|
| Troubles in balances<br>1) Balance power is not ON.<br>2) Balances are unstable.<br>3) Balance reading and communication switches are OFF. | <br>Turn on the power switch.<br>Do the necessary settings.<br>Level the stand.<br>Check that the switch is not broken. |
| Troubles in communication cables<br>1) Communication cables are off and loose.<br>2) Communication cables are not fit for balances and the moisture meter. | <br>Check a power cable does not come off and loose.<br>After taking off the cable, connect it again.<br>Contact our local distributors. |
| Troubles in communication<br>Communication is not set for a balance. | Check communication setting. Refer to 6-6-1. BALANCE PORT. |
| The use of an unsuitable balance for moisture meters | Contact our local distributors for machine types. |

## Hardware 1

| Expected trouble causes | Countermeasures |
|---|---|
| Key input is wrong. | Contact our local distributors. |
| Indications are garbled. | Press [Function/C. Select] key to select "Validation" and "Display Test" from "Hardware Validation Test". |
| Printed characters are wrong. | Press [Function/C. Select] key to select "Validation" and "Printer Test" from "Hardware Validation Test". |
| Time indication is wrong. | Press [Function/C. Select] key to select "Setting" and "Clock Data Input". |

## Hardware 2

| Expected trouble causes | Countermeasures |
|---|---|
| The window is not displayed even by turning on the power switch. (Power is on.) | Contact our local distributors. |
| No printer paper feed<br>(Characters are printed in the same position.) | Press [Feed] key and check paper feed.<br>The printer can be jammed.<br>Turn off the power switch and remove jammed paper with tweezers.<br>When the printer does not recover even after that, contact our local distributors. |
| A stirrer does not rotate or rotation is unstable. | Remove a stirrer cable and connect it again.<br>When the stirrer does not recover even after that, contact our local distributors. |

## The background doesn't lower.

When troubles are not solved even after titration cell dehydration, run the following. (Refer to 5-2. Titration cell dehydration).

| Expected trouble causes | Countermeasures |
|---|---|
| 1. D/T connection mistake | Check connection and connect it again.<br>(Refer to Illustration 2-2. Connection of a stirrer to the unit.) |
| 2. Cable removal and looseness | After removing a cable, connect it again. |
| Detection electrode<br>1. Electrode contamination<br>2. Electrode breakage | Wash it. (Refer to 8-2-2. Washing.)<br>Change the broken one.<br>(Electrodes are consumables.)<br>Hydrofluoric acid sample causes glass corrosion. |
| Cathode solution cell<br>1. A cell isn't dried fully after washing.<br>2. Cell contamination<br>3. Cell breakage<br>4. Wire netting deformation<br>5. Ceramic contamination<br>6. Ceramic breakage | Wash it again with methanol and ethanol and use after drying fully.<br>Wash it. (Refer to 8-2-2. Washing.)<br>Change the broken one.<br>2 to 3mm space is required between a ceramic and wire netting. Adjust the netting with a tweezers.<br>Wash it. (Refer to 8-2-2. Washing.)<br>When anode solution mixes in cathode solution, potential is not down.<br>Change the broken one. |
| Generator solution cell<br>1. A cell isn't dried fully after washing.<br>2. Cell contamination<br>3. Cell breakage<br>4. Some plugs and electrodes are not set to a cell.<br>5. A sample injection plug rubber packing is not changed.<br>6. A sample injection plug rubber packing is not set correctly. | Wash it again with methanol and ethanol and use after drying fully.<br>Wash it. (Refer to 8-2-2. Washing.)<br>Change the broken one.<br>Assembly a cell correctly.<br>Change a rubber packing.<br>(Refer to 8-2-1. Maintenance.)<br>After removing a rubber packing, set it again. |

| Expected trouble causes | Countermeasures |
|---|---|
| Reagent<br>1. Reagent absorbed moisture.<br>2. Reagent was set many days ago.<br>3. Sample accumulation is over the specified volume.<br>4. Reagent volume is small.<br>5. Reagent combination is incorrect. | <br>Change it. (Refer to 8-3-1. Keeping.)<br>Change it. (Refer to 8-3-3. Dehydrating solvent change.)<br>Change it. (Refer to 8-3-3. Dehydrating solvent change.)<br>Inject the appropriate volume. (Refer to 4-1-2. Caution in measurement.)<br>Refer to reagent catalogues. |
| Sample<br>Sample can't be measured. | <br>Check reagent catalogues. |
| Grease<br>1. Exclusive grease is not used.<br>2. Sufficient grease isn't coated.<br>3. Too much grease is coated. | <br>Use exclusive grease (P/N: CAGREA).<br>(Some general-purpose grease contains moisture.)<br>Grease it again. (Refer to 8-2-1. Maintenance.)<br>Grease can contaminate reagents and electrodes.<br>Grease it again. (Refer to 8-2-1. Maintenance.) |
| Silica gel<br>Silica gel absorbed moisture. | <br>Change it. (Refer to 8-2-1. Maintenance.) |
| Stirrer troubles<br>1. Stirring speed is inappropriate.<br>2. A stirrer bar is not included.<br>3. A stirrer bar is too small. | Adjust stirring speed and a stirrer bar from the following viewpoints.<br>Is an electrode immersed in reagent?<br>Is the stirrer bar rotating disorderly?<br>Is the solvent stirred sufficiently? |

## Measurement requires considerable time and the end point isn't detected.

| Expected trouble causes | Countermeasures |
|---|---|
| Samples are not fit for reagents. | Check reagent catalogues. |
| Sample troubles | Refer to Table 4-1. Moisture content examples. Contact our distributors for unclear points. |

## Measurement value is high.

Check a value by direct injection with 5 μl water and a microsyringe.
When the measurement value is not within 5000±250 μg, an electric circuit can be wrong.
Contact our local distributors for repair. When the value is correct, take the following measures.

| Expected trouble causes | Countermeasures |
|---|---|
| Disturbance occurs. | Check reagent catalogues. |
| Cell troubles | Wash a titration cell. |

## Measurement value is low.

Check a value by direct injection with 5 μl water and a microsyringe.
When the measurement value is not within 5000±250 μg, an electric circuit can be wrong.
Contact our local distributors for repair. When the value is correct, take the following measures.

| Expected trouble causes | Countermeasures |
|---|---|
| Disturbance occurs. | Check reagent catalogues. |
| Background is high at measurement start. | Background should be as follows at measurement start.<br>Direction method: 0.1 μg/s or less |

## Potential is unstable.

| Expected trouble causes | Countermeasures |
|---|---|
| Cable connector looseness | Connect it again. |
| Detection electrode<br>Breakage and contamination at glass border | Replace it with new one. |
| Stirrer<br>Stirrer rotation speed is inappropriate. | Adjust the speed. |
| Stirrer rotation speed is unstable. | Change a stirrer bar. |
| A motor is wrong. | Contact our local distributors for repair. |

## Background remains zero.

Press [Titration] key to set titration to OFF and read a potential. When it is minus, inject check solution or a little water and check that it is plus. When it is not plus, take the following measures.

| Expected trouble causes | Countermeasures |
|---|---|
| Sample troubles<br>1. Samples with oxidizability<br>2. Samples are not fit for reagents. | Measurement by the direction method is impossible.<br>Check reagent catalogues. |
| Detection electrode<br>1. Electrode contamination<br>2. Electrode breakage | Wash it. (Refer to 8-2-2. Washing.)<br>Change the broken one.<br>(Electrodes are consumables.)<br>Hydrofluoric acid sample causes glass corrosion. |

## 9-3. Error messages

When errors occur, the following messages are displayed.
When errors are not cancelled even by the following measures, contact our local distributors.

***Error contents:*** Cathode solution consumption error

***Causes and measures:***

Cathode solution consumption is over preset values.
Change cathode solution and reset consumption to zero.

***Error contents:*** Anode solution consumption error

***Causes and measures:***

Anode solution consumption is over preset values.
Change anode solution and reset consumption to zero

***Error contents:*** Detection electrode error

***Causes and measures:***

A detection electrode can be disconnected or removed.
Check that a detection electrode is soaked in reagent.
For disconnection, change it.

***Error contents:*** Cathode solution error

***Causes and measures:***

This error occurs when detection potential is up and titration speed is not up.
A cathode solution cell can be disconnected or removed.
For disconnection, change the cell.

***Error contents:*** Divided by Zero

***Causes and measures:***

A concentration calculation denominator is zero.
Input numbers except a zero or change a calculation formula.

# Section 10: Specifications

| | |
|---|---|
| Measurement system | Coulometric titration (Coulometry) |
| End point detection | Constant current polarizing detection |
| Electrolysis control | Pulse electrolytic current control |
| Max. electrolytic current | 430mA |
| Titration speed | Max. 2.2mg$H_2O$/min |
| Background | Automatic correction, usually displayed (μg/sec) |
| Measurement range | 10μg to 100mg$H_2O$ |
| Repeatability | 10μg to 1mg: 5μg or less, 1mg or more: RSD within 0.5% |
| Detection sensitivity | 0.1μg |
| Display | 5.7 inches color LCD<br>Menu, Menu (file selection, multi-file selection, function and test menu selection), file numbers, sample names, measurement numbers, moisture content, result units, titration display signs, titration speed (detected potential), background values, vaporizer heating temperature, carrier gas flow, messages, passing time, measured concentration values, balance transfer weight |
| File | 20 files, 50 multi-files |
| Data | The past 200 data are saved automatically.<br>Last data print format, sample parameters change can be printed. |
| Additional function | Simultaneous measurement with 2-channel (option),<br>Ramp heating measurement by a water vaporizer (option)<br>Electronic balance connection, Computer connection |
| End point indication | A message and an electronic buzzer |
| Calender | Year, month, date, time, minute, second indication and printing |
| Calculation function | Fixed calculation: 10 formulas, Optional calculation: 2 formulas<br>Fixed unit: 4 formulas, Optional unit: 2 formulas<br>Statistical calculation (Internal statistical calculation and external statistical calculation), concentration recalculation |
| Printer | Thermal printing, alphabets, figures, signs or graphs |
| Use environment | Temperature : 15 to 40 degrees Celsius<br>Humidity : Under 80%, No dew condensation |
| Power | AC100/120V (50/60Hz) 80VA<br>AC220/240V (50/60Hz) 310VA |
| Dimensions | Main unit: 330 (W)×320 (D)×148 (H)<br>Stirrer: 120 (W)×180 (D)×148 (H) |
| Weight | Main unit: approx. 5kg<br>Stirrer: approx. 1kg |

# Section 11: Parts List

## 11-1. Titration cell

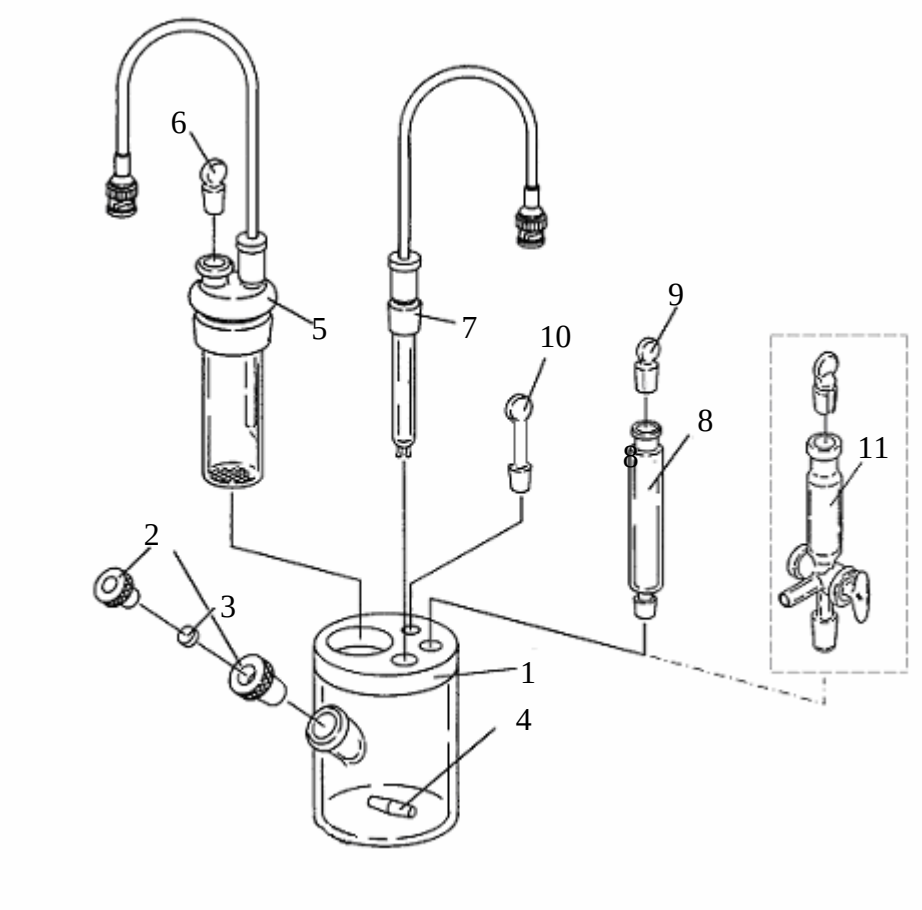



**Illustration 11-1. Titration cell**

| No. | Names | Numbers | Part numbers | Remarks |
|---|---|---|---|---|
| | Titration cell assembly without an outlet | 1 set | CAMCL4 | |
| 1 | Generator solution cell without an outlet | 1 set | CAMGC4 | With 2 |
| 2 | Sample injection plug | 2 pcs/set | CAMSTP | |
| 3 | Rubber packing 10×2 | 100 pcs/set | CAMGPC | |
| 4 | Stirrer bar | 2 pcs/set | CAROTR | |
| 5 | Cathode solution cell with a sealing plug (BNC) | 1 set | CA20CE | With 6 |
| 6 | Sealing plug for a cathode solution cell | 1 pc | CA10BP | |
| 7 | Detector electrode (BNC) | 1 pc | CAMDEB | |
| 8 | Drying tube (L) | 1 set | CAM011 | With 9 |
| 9 | Plug for a drying tube φ10 /12L | 2 pcs/set | CADRYS | A slit is included |
| 10 | Sealing plug (long) φ12 /12L | 2 pcs/set | CAMBLL | |

| No. | Names | Numbers | Part numbers | Remarks |
|---|---|---|---|---|
| 11 | Drying tube with a three-way cock<br>* for CA-100 | 1 set | VADRY | |
| | Titration cell set with a outlet | 1 set | CAMCL5 | With an outlet |
| | Generator solution cell with a outlet | 1 set | CAMGC5 | |
| | PTFE cock for the outlet | 1 pc | CAMCLT | |

* Use it when water vaporizers (VA series) are connected.

# 11-2. Sampler

| Names | Numbers | Part numbers |
|---|---|---|
| Syringe w/needle, 1ml | 2 pcs/set | CAMSYR |
| Syringe w/o needle, 1ml | 2 pcs/set | CAMSY1 |
| Syringe w/needle, 2ml | 2 pcs/set | KF1041 |
| Syringe w/o needle, 2ml | 2 pcs/set | CAMSY2 |
| Syringe w/o needle, 5ml | 1 pc | CAMSY5 |
| Syringe w/o needle, 10ml | 1 pc | CAMS10 |
| Needle, 1×100mm | 2 pcs/set | CAM027 |
| Needle, 2×100mm | 2 pcs/set | VAL18 |
| Powder sampler for CA, KF | 1 set | CAMSS |
| Cap for a powder sampler | 2 pcs/set | CAM036 |
| Airtight sampler | 1 set | CAM038 |
| Cap for an airtight sampler | 2 pcs/set | CAM039 |
| Sampler for high concentration, 0.5ml | 2 sets | CAM053 |
| Straight powder sampler | 1 set | CAM054 |
| Cap for a solid/straight powder sampler | 2 pcs/set | VA034A |
| High viscous sampler, 1.5ml 10 dia. | 1 set | CAM031 |
| High viscous sampler, 3ml 10 dia. | 1 set | CASM3 |
| High viscous sampler, 5ml 15 dia. | 1 set | CASM5 |
| High viscous sampler, 6ml 12 dia. | 1 set | CASM6 |
| Cap for a high viscous sampler, 1.5ml | 2 pcs/set | CAM032 |
| Cap for a high viscous sampler, 3ml | 2 pcs/set | CASM31 |
| Cap for a high viscous sampler, 5ml | 2 pcs/set | CASM51 |
| Cap for a high viscous sampler, 6ml | 2 pcs/set | CASM61 |
| Gas adapter (with a rubber packing) | 1 set | CAMSG |
| Packing for gaseous sample adaptor | 2 pcs/set | CAM045 |
| Gaseous sample adaptor for KF | 1 set | KFGSAD |
| Liquefied gas sampler | 1 set | CAM048 |
| Stainless steel body w/ valve | 1 pc | CAM049 |
| Needle, 1×120mm | 2 pcs/set | CAM050 |
| Extension needle | 1 pc | CAM051 |
| Lock type joint 1/8 for a liquified gas sampler | 1 pc | CALTP7 |
| Grease sampler 12 dia. for CA | 2 pcs/set | KF1013 |
| Grease sampler 15 dia. for KF | 2 pcs/set | KF1014 |
| Dropper bottle (for factor standardization) | 2 pcs/set | KF1042 |
| Viscous sampler (for sample measurement) | 2 pcs/set | CAM052 |
| Silicone rubber (S) 10/10/5t | 50 pcs/set | CAMSIG |
| Silicone rubber (L) 15/15/8t | 50 pcs/set | CASIGL |

## 11-3. Consumables

| Names | Numbers | Part numbers |
|---|---|---|
| Rubber packing 10×2 | 100 pcs/bag | CAMGPC |
| Grease 3g | 2 pcs/set | CAGREA |
| Silica gel, 500g | 1 pc | VASILC |
| Silicone rubber (S) 10×10×5 | 50 pcs/set | CAMSIG |
| Silicone rubber (L) 15×15×8 | 50 pcs/set | CASIGL |
| Printer roll paper | 5 pcs/set | PRIPR4 |
| Printer | 1 pc | CAEPRT |
| Polyethylene funnel (S) | 1 pc | CARTS |
| Polyethylene funnel (L) | 1 pc | KF1050 |
| Drain bottle 500ml | 1 pc | CAEVBL |
| Cotton ball | 5 bags/set | COTTON |
| Fuse, 2.5A | 2 pcs/set | FU25MS |
| Instruction manual | 1 pc | ZCAEMAE |
| Specifications of a balance interface | 1 pc | ZCAEBIE |
| Specifications of a computer interface | 1 pc | ZCAEIFE |

## 11-4. Option

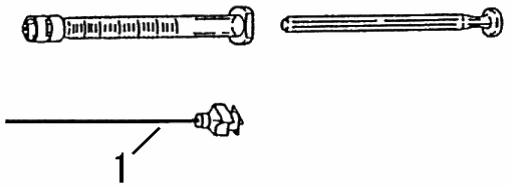
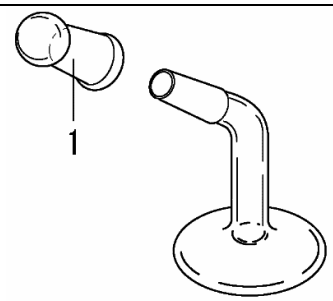
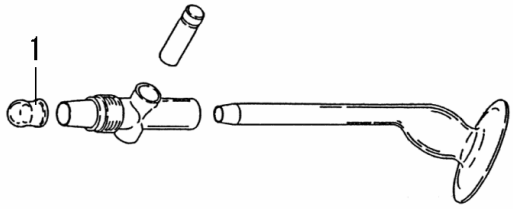
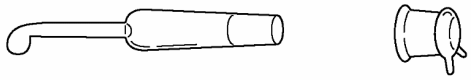
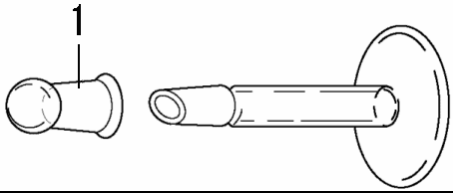
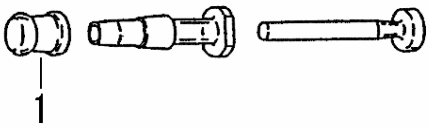
| Names | Numbers | Part numbers |
|---|---|---|
| BNC connector adaptor for a pin plug | 3 pcs/set | CABNPJ |
| CA stirrer | 1 pc | CAESTR |
| Dot printer | 1 pc | CAEPDA |
| Printer cable * for CAEPDA | 1 pc | CAEPRC |
| Printer roll paper (standard) * for CAEPDA | 10 pcs/set | PRIPR8 |
| Ribbon | 5 pcs/set | CA8RBN |
| Personal computer interface (RS232C) | 1 pc | CAEKB3 |
| Communication cable G<br>* For personal computer communication | 1 pc | GT7ECG |
| Fritless cathode solution cell | 1 set | CAMCES |

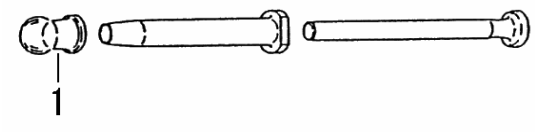
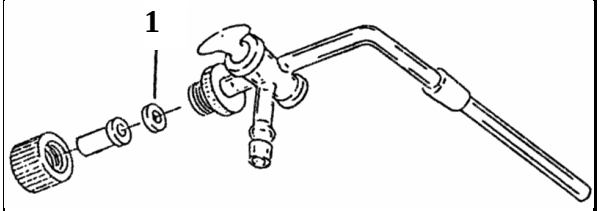
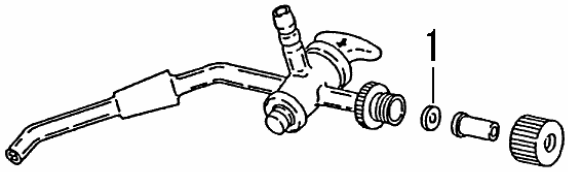
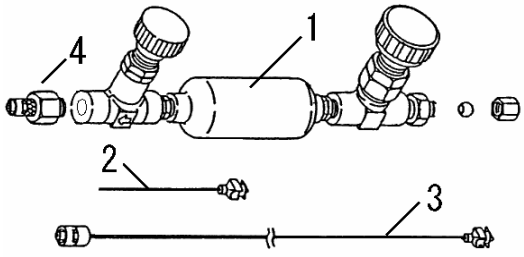
* We have channel unit extension kits for CA type (coulometric method) and KF type (volumetric method).

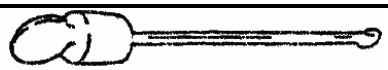
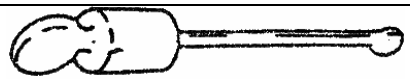
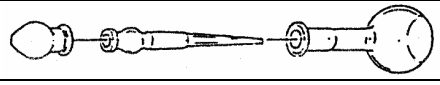
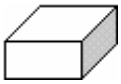
(Simultaneous measurement is possible by the combination of CA type and KF type.)

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# 11-5. Part pictures

| Part numbers | Names | Illustrations |
|---|---|---|
| CAMSYR<br>CAMSY1<br>KF1041<br>CAMSY2<br>CAMSY5<br>CAMSY10<br><br>1. Single item<br>CAM027<br>VAL18 | Syringe w/needle, 1ml<br>Syringe w/o needle, 1ml<br>Syringe w/needle, 2ml<br>Syringe w/o needle, 2ml<br>Syringe w/o needle, 5ml<br>Syringe w/o needle, 5ml<br><br><br>Needle, 1×100mm<br>Needle, 2×100mm | <br> |
| CAMSS<br><br>1. Single item<br>CAM036 | Powder sampler for CA, KF<br><br>Cap for a powder sampler |  |
| CAM038<br>1. Single item<br><br>CAM039 | Airtight sampler<br><br><br>Cap for an airtight sampler |  |
| CAM053 | Sampler for high concentration, 0.5ml |  |
| CAM054<br><br>1. Single item<br>VA034A | Straight powder sampler<br><br>Cap for a solid/straight powder sampler |  |
| CAM031<br><br>1. Single item<br>CAM032 | High viscous sampler, 1.5ml 10 dia<br><br>Cap for a high viscous sampler, 1.5ml |  |

| Part numbers | Names | Illustrations |
|---|---|---|
| CASM3<br>CASM5<br>CASM6<br><br>1. Single item<br>CASM31<br><br>CASM51<br><br>CASM61 | High viscous sampler, 3ml 10dia.<br>High viscous sampler, 5ml 15 dia.<br>High viscous sampler, 6ml 12 dia.<br><br>Cap for a high viscous sampler, 3ml<br><br>Cap for a high viscous sampler, 5ml<br><br>Cap for a high viscous sampler, 6ml |  |
| CAMSG<br><br>1. Single item<br>CAM045 | Gas adapter<br>(with a rubber packing)<br><br>Packing for a gaseous sample adaptor |  |
| KFGSAD<br><br>1. Single item<br>CAM045 | Gaseous sample adaptor for KF<br><br>Packing for a gaseous sample adaptor |  |
| CAM048<br><br>1. Single item<br><br>CAM049<br><br>1. Single item<br><br>CAM050<br><br>1. Single item<br><br>CAM051<br><br>1. Single item<br><br>CALTP7 | Liquefied gas sampler<br><br>Stainless steel body w/ valve<br><br>Needle, 1×120mm<br><br>Extension needle<br><br>Lock type joint 1/8 for a liquified gas sampler |  |

| Part numbers | Names | Illustrations |
|---|---|---|
| KF1013 | Grease sampler 12 dia. for CA |  |
| KF1014 | Grease sampler 15 dia. for KF |  |
| KF1042 | Dropper bottle (for factor standardization) |  |
| CAM052 | Viscous sampler (for sample measurement) |  |
| CAMSIG | Silicon rubber (S), 10/10/5t, small |  |
| CASIGL | Silicon rubber (L), 15/15/8t, large |  |

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