



**Oxford FM503
Moisture Analyser
Instruction Manual**

**Analytical Products Ltd
Oxford, England OX3 8ST**

This manual and Marks

All safety messages are identified by the following, “WARNING” or “CAUTION”, of ANSI Z535.4 (American National Standard Institute: Product Safety Signs and Labels). The meanings are as follows:

 WARNING	A potentially hazardous situation which, if not avoided, could result in death or serious injury.
 CAUTION	A potentially hazardous situation which, if not avoided, may result in minor or moderate injury.



This is a hazard alert mark.



This mark is the IEC417 mark for "Caution. Hot surface".
Do not touch parts affixed with this mark without adequate protection.



This mark informs you about the operation of the product.

- ❑ This manual is subject to change without notice at any time to improve the product.
- ❑ Product specifications are subject to change without any obligation on the part of the manufacturer.
- ❑ Under the copyright laws, the instruction manual described in it are copyrighted, with all rights reserved.



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1. Safety and Compliance

WARNING

- ❑ Do not use a sample that could make a dangerous chemical reaction and cause an explosion or poisonous gas, when the sample is dried.
- ❑ Keep flammables away from the analyzer.
Parts of the analyzer become very hot. Materials placed near it might catch fire.
- ❑ Do not use the analyzer in ambient ignitable gas. It may cause explosion and fire.
- ❑ Use a power source (voltage, frequency, outlet type) adapted to the specification of the analyzer. If excessive voltage is used, the analyzer may overheat and be damaged or cause a fire.
- ❑ Turn off the power switch and remove the power cord from the power outlet, when replacing the halogen lamp. Touching an electrode of the halogen lamp connector carelessly, it may cause to receive an electric shock.
- ❑ Do not disassemble the analyzer. It may cause an error, damage, receiving an electric shock or fire. If the analyzer needs service or repair, contact the local dealer.
- ❑ Avoid getting the analyzer wet. It is not a water-resistant structure. If there is leakage of liquid into the analyzer, it may cause damage to the analyzer or receiving electric shock.
- ❑ Do not look at the active halogen lamp to protect your eyes from damage.
- ❑ Do not drop, hit or crack the glassware including the halogen lamp, to avoid an injury.
- ❑ When the halogen lamp is used beyond 5000 hours, we recommend replacing the lamp with a new one to avoid trouble.
- ❑ When discarding a halogen lamp, do not break it to avoid scattering glass and injury.

CAUTION

- ❑ Do not touch the heater cover, the halogen lamp, glass-housing, pan handle, sample pan and sample without adequate protection, it could cause a burn or scald. Parts of the analyzer are very hot when a measurement finishes. For operation, use the specified grips of the heater cover and pan handle. Use the standard accessory tools.
- ❑ Do not touch parts affixed with the  mark, because they may get very hot and dangerous.
- ❑ When the analyzer is used in a room where hot air does not diffuse, it may unexpectedly overheat. In this case, adjust the drying temperature or move the analyzer to a place with adequate ventilation.
- ❑ Avoid leaving the analyzer in direct sunlight, as that could cause discoloration of the case or a malfunction.

Compliance with FCC Rules

Please note that this device generates, uses and can radiate radio frequency energy. This device has been tested and has been found to comply with the limits of a Class A computing device pursuant to Subpart J of Part 15 of FCC rules. These rules are designed to provide reasonable protection against interference when this device is operated in a commercial environment. If this unit is operated in a residential area, it may cause some interference and under these circumstances the user would be required to take, at his own expense, whatever measures are necessary to eliminate the interference.

(FCC = Federal Communications Commission in the U.S.A.)

Compliance with Council Directives



This device features radio interference suppression and safety regulation in compliance with the following Council Directives

Council directive 89/336/EEC	EN61326	EMC directive
Council directive 73/23/EEC	EN61010-1	Low voltage directive



2. Precautions



2.1. Installing the Analyzer

---Caution for Measurement Safety ---

- ❑ Do not install the analyzer in a dangerous place.
- ❑ Maintain the following ambient condition to operate the analyzer.
5°C to 40°C (41°F to 104°F), 85%RH or less (no condensation)
- ❑ Keep flammables away from the analyzer.
- ❑ Do not put anything on the heater cover.
- ❑ Do not install the analyzer in a small airtight room. If the analyzer is used in an airtight room, hot air does not diffuse, the sample may unexpectedly overheat. In this case, the safety circuit of the halogen lamp activates. Move the analyzer to a place with adequate ventilation or adjust the drying temperature.
- ❑ There is the voltage label on the back panel of the analyzer.
Confirm that voltage, frequency and outlet type is correct for your local voltage.
- ❑ Confirm that the rated voltage of the halogen lamp is correct for your power supply voltage. (Refer to 14.4.Troubleshooting)

Voltage Label	Power Supply Voltage	The Rated Voltage of Halogen Lamp
100 - 120 V	AC 100 V to AC 120 V	AC 120 V
200 - 240 V	AC 200V to AC 240 V	AC 240 V

- ❑ Ground the analyzer using the ground terminal of the power cord.
- ❑ Do not change the setting of the I/II switch on the rear of the analyzer. If the incorrect setting is used, it may damage the analyzer or cause a fire.

---Caution for Precision Measurement---

Confirm the following condition, because the weighing sensor (S.H.S.) is very sensitive.

- ❑ The weighing surface should be solid and free from vibration, drafts and as level as possible.
- ❑ Install the analyzer in a stable place avoiding vibration and shock.
- ❑ Install the analyzer where it not affected by heaters or air conditioners.
- ❑ Ensure a stable power source.
- ❑ Keep the analyzer away from equipment that generates magnetic fields.
- ❑ Discharge static electricity.

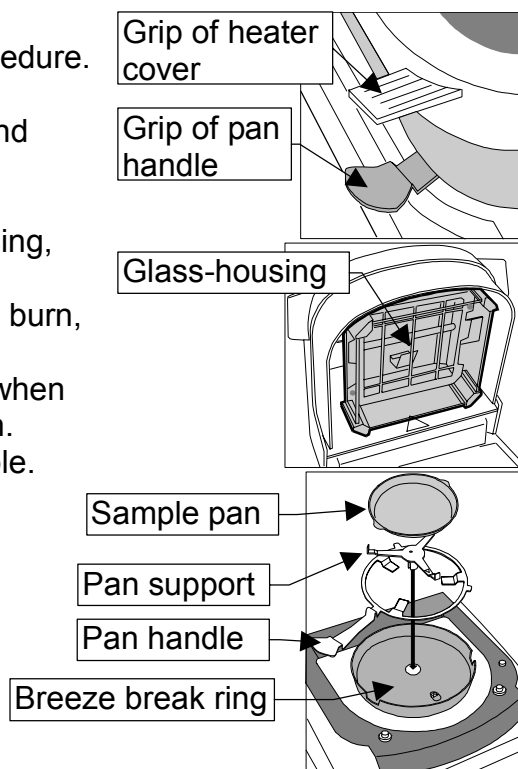
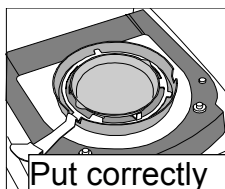


2.2. During Use

---Caution for Measurement Safety ---

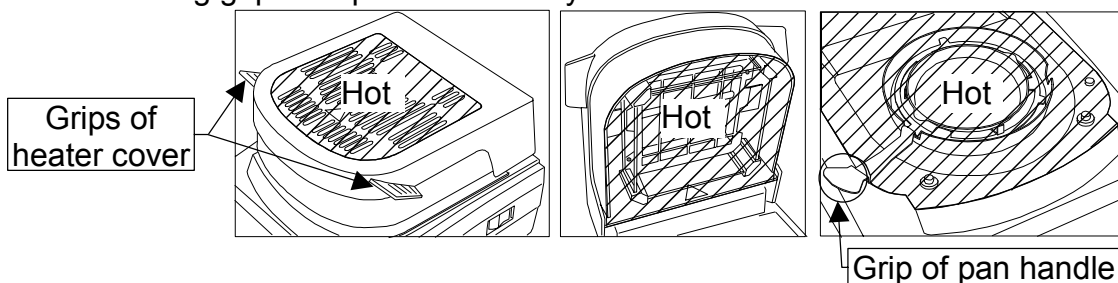
Operate the analyzer using the following procedure.

- ❑ Put the sample pan in the correct position.
- ❑ Handle the grip of the heater cover to open and close it.
- ❑ Use the pan handle to move the sample pan.
- ❑ Do not touch hot parts around the glass-housing, when the cover is opened.
- ❑ The glass-housing is very hot. It may cause a burn, if touched.
- ❑ The sample pan and pan handle is very hot, when finishing measurement. Allow them cool down.
- ❑ Use the tweezers or spoon to move the sample.



Grips and Hot Parts.

- ❑ Hot parts are as follows:
Use the following grips to operate the analyzer.



Do Not Measure a Dangerous Sample.

- ❑ Do not use an explosive, flammable or noxious substance as a sample.
Do not use a sample that makes a dangerous substance by drying it.
Do not use unknown substances.
- ❑ When a sample surface becomes dry first and the inner pressure increases, the sample may explode. Do not use such a sample.
- ❑ Turn off the power switch if a sample catches fire.
- ❑ The case of the analyzer is made of a flame-retardant substance (UL94V0).

Do Not Put any Flammable Matter Around the Analyzer.

- ❑ During and after measurement, parts of the analyzer become very hot. Do not put flammable matter near the analyzer.
- ❑ Do not put any thing on the heater cover.

Caution for Heating (Drying).

- ❑ When the drying temperature is set to 200°C and measurement is started, the thermostat of the halogen lamp may work after 30 minutes. When the halogen lamp has cooled down, the next measurement can be started. If necessary, change the drying time and temperature.
- ❑ When a measurement is started and the time passes one hour, the maximum temperature is automatically regulated to 160°C for safety.

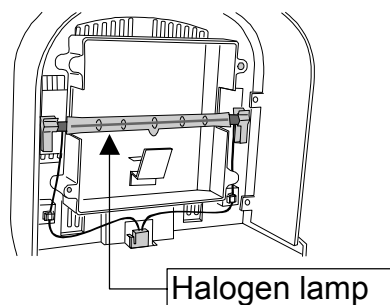
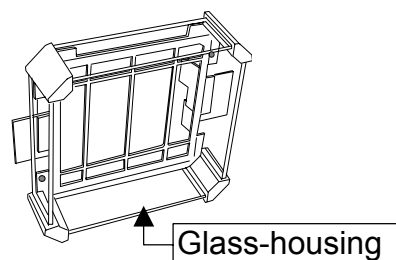
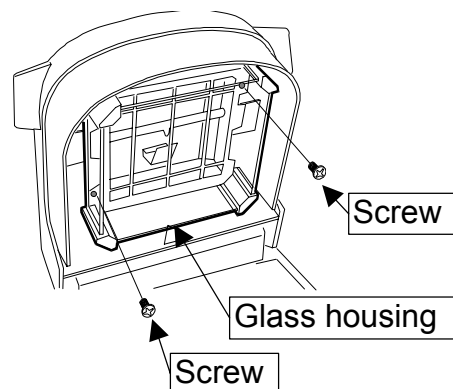
Operation to Stop Measurement

- ❑ During measurement, the **STOP** key is always effective. If there is an error or danger, press the **STOP** key.



2.3. After Use and Maintaining the Analyzer

- ❑ Put dust cover on the analyzer after it is cool.
- ❑ Clean the glass-housing carefully.
- ❑ Clean fingerprints from the halogen lamp to keep its life. Refer to "14.2.Replacement of the Halogen Lamp".
- ❑ Avoid mechanical shock to the analyzer.
- ❑ Do not disassemble the analyzer.
- ❑ Protect the analyzer from excessive dust.
- ❑ Use the packing box (special container) to move the analyzer.
- ❑ Clean the analyzer with a lint free cloth that is moistened with warm water and a mild detergent.
- ❑ Do not use organic solvents to clean the analyzer.
- ❑ Do not disassemble or remodel the analyzer.





3. Outline and Features

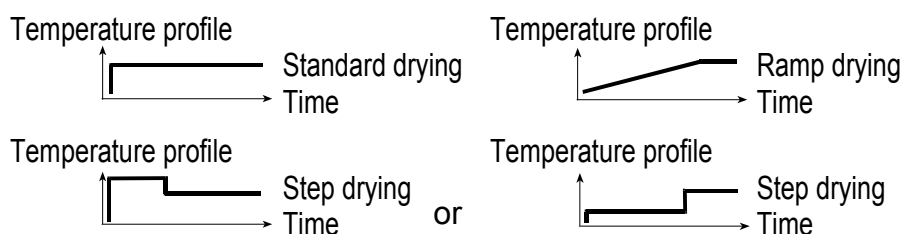
- The moisture analyzer is built using a super hybrid sensor (S.H.S.) adopted in an analytical balance. Therefore, the result is more precise and gets greater repeatability.
- An analyzer using the S.H.S. has high sensitivity, needs only a sample quantity of a few grams, and the measurement time becomes shorter.
- A 400W halogen lamp is used as the heating source and the temperature on the sample pan can reach 200°C within two minutes.
- There are five drying programs.
 - Standard mode**..... The moisture content can be obtained with settings of the drying temperature and accuracy.
 - Quick mode**..... Sample is heated up for approximately three minutes at 200°C so that measurement time becomes shorter. The moisture content can be obtained with settings of the drying temperature and accuracy.
 - Automatic mode** When the change of moisture content per one minute is less than the preset termination value, the measurement is automatically stopped and the result is obtained.
 - Timer mode** The sample is dried for a preset time and the result is obtained.
 - Manual mode**..... This mode can stop the measurement by key operation and the result is decided.

- The temperature profiles can be used to drying programs without quick mode.

Standard drying Maintains a constant drying temperature.

Ramp drying..... Increases the drying temperature gently.

Step drying Uses multiple steps of the drying temperature.



- The analyzer can store and recall proper individual settings for each sample using a program number (PROG No.).

Maximum number FM503 20 sets

- The data memory function can store results and output them at one time.

Maximum number FM503 results of 100

□

□

□

- The analyzer can calibrate the weighing sensor (Use special mass.) and drying temperature (Use temperature calibrator for FM503). The analyzer can output the data required at GLP, GMP and ISO at the end of the calibration.
- The analyzer has a self check function that can detect function errors.
- The analyzer displays the current change of moisture content per one minute [%/ min] in realtime. It can be used for the reference to find the analyzing mode.
- The sample pans included in the standard accessory can be used repeatedly.
- A test sample, a standard accessory, is included to check the moisture accuracy.
- A reference card is built into the bottom of the analyzer.

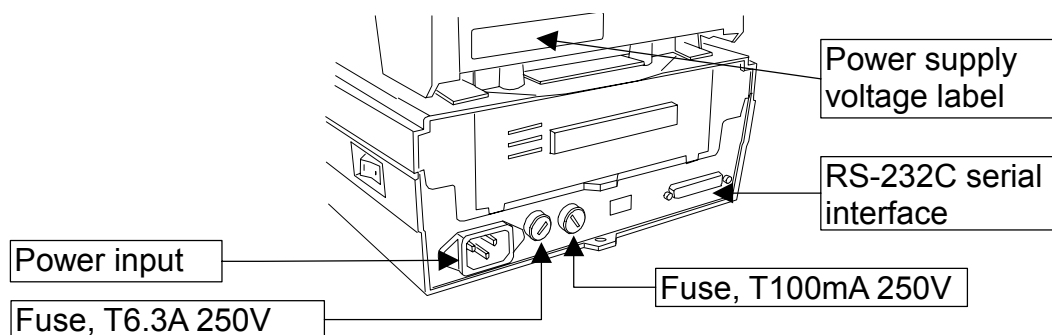
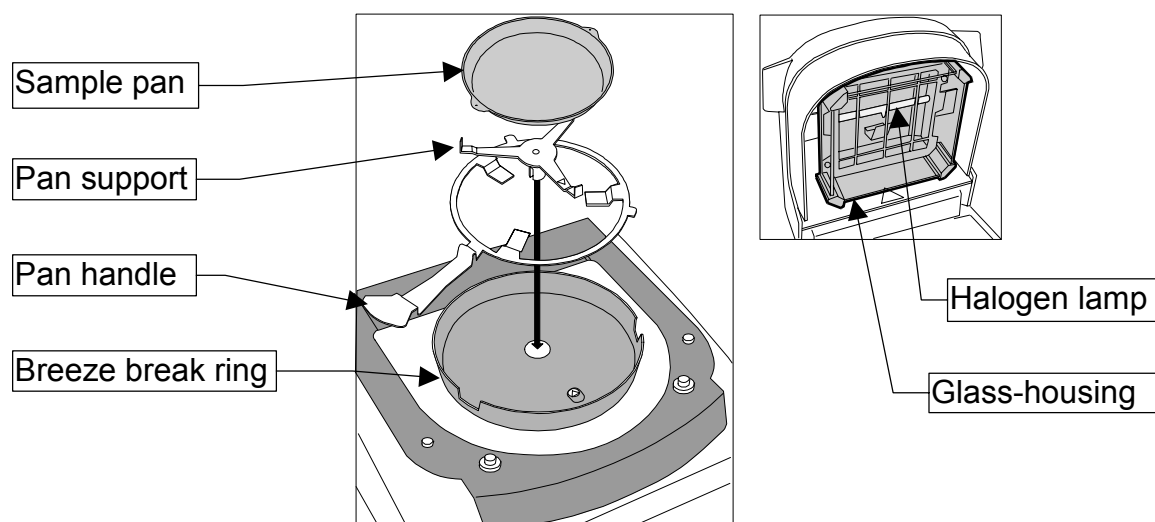
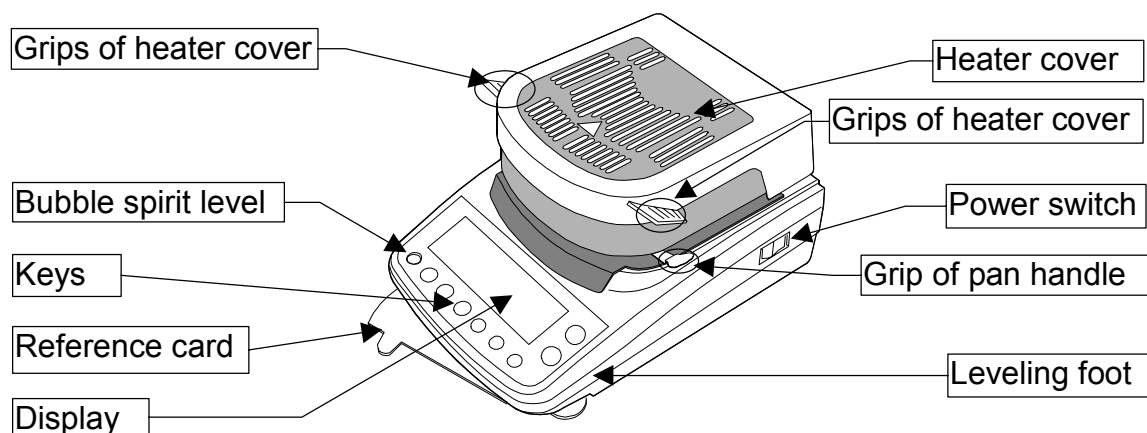
Principle and Use

- The moisture analyzer, based on the principle of thermogravimetric analysis, dries a sample using a halogen lamp and obtains the moisture content in % and other results by the difference between the wet weight and dry weight.

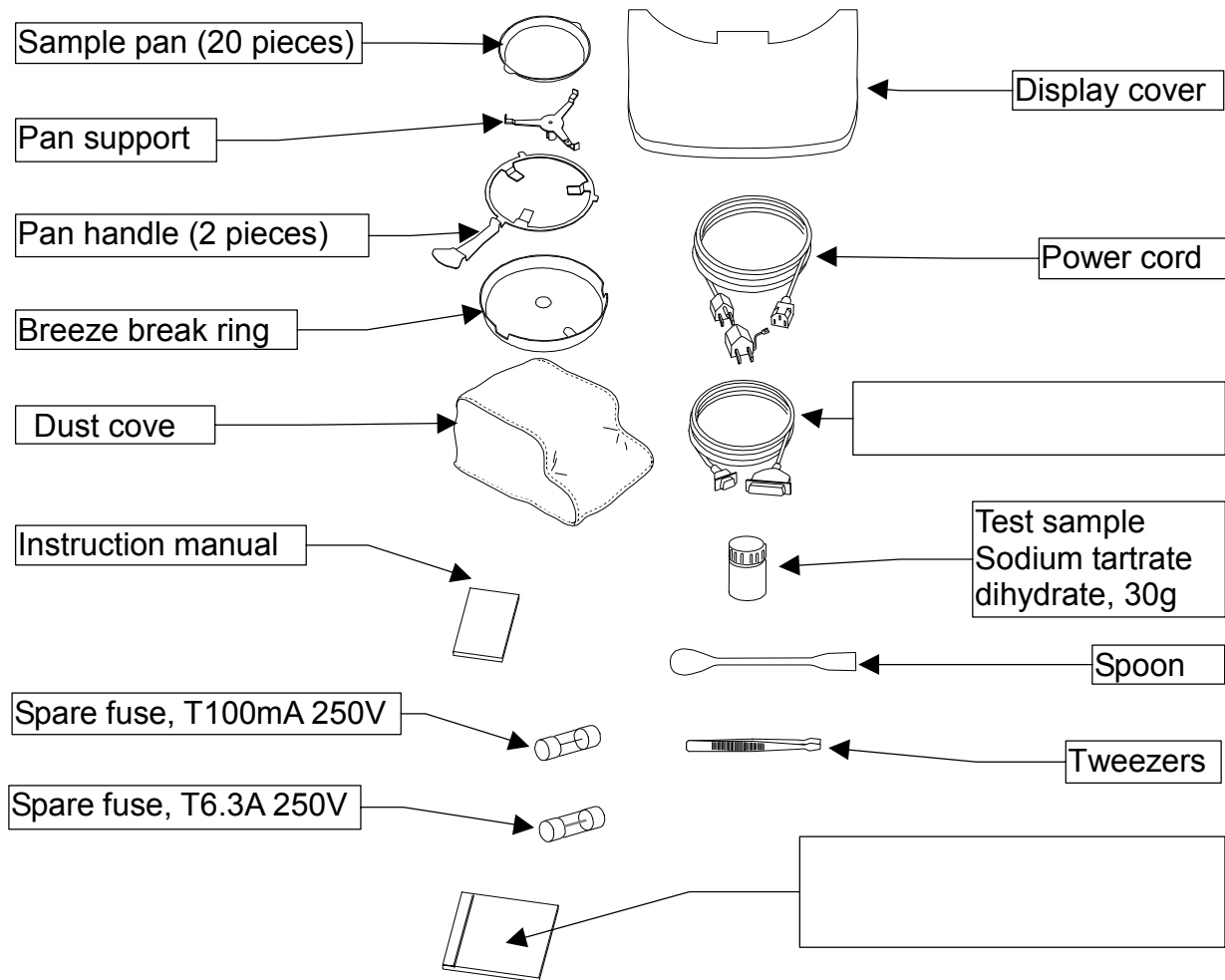


4. Packing List and Names of each part

- ❑ Keep the packing box to move the analyzer.
- ❑ Packing list as follows:



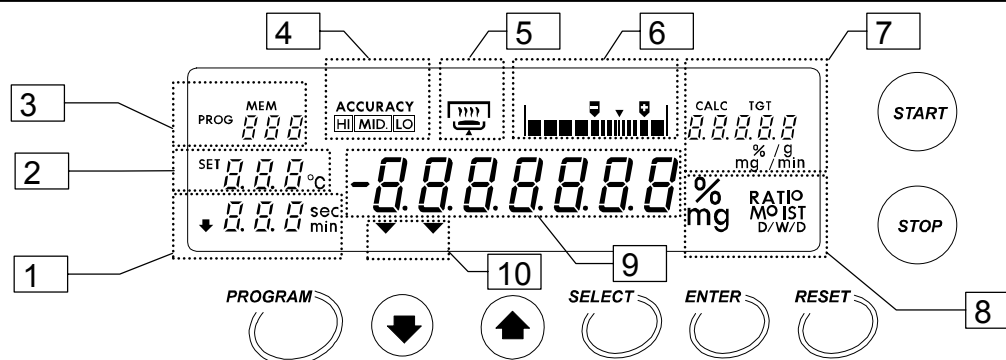
Standard Accessories




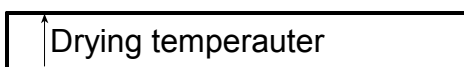
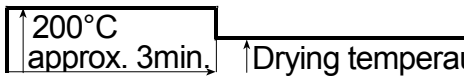


Caution Please confirm that the analyzer is correct for your local voltage, receptacle type and power cord.



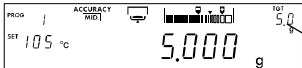
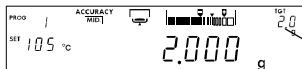
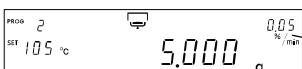

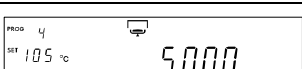
4.1. Display and Keys










	Name	State and Meaning		
1	Time	At gram display	Preset time is displayed at timer mode	
		At measurement	Process time	
2	Temperature of sample pan	At gram display	Set temperature of sample pan	
		At measurement	Current temperature of sample pan	
3	PROG: Program No.	At gram display	Program number of measurement program	
	MEM: Data No.	Storing data	Data number of data memory function	
	Mode	At setting	Symbol of mode (Std, QuC, U-R, U-t, U-n)	
4	Accuracy	Accuracy indicator of measurement		
5		Indicator of heater cover, sample and drying process		
		Lights when heater cover is closed		
		Blinks during measurement. Disappears when not measuring		
		Sample mark: Lights when the sample is 0.1 g or more.		
6	Level indicator	Sample needs at least 0.1 g or more to start measurement.		
		Reference of sample quantity for standard mode and quick mode.		
		Proper sample quantity range		
7	Target quantity	At gram display	Standard mode	Target quantity of sample [g]
			Quick mode	
			Automatic mode	Preset termination value [%/min.]
8	Drying rate	At measurement	Current drying rate [%/min.]	
	Measurement unit			
8	% MOIST /W	Moisture content is based on W	$\frac{W - D}{W} \times 100$	W: Wet sample mass D: Dried sample mass
	% MOIST /D	Moisture content (Atro) is based on D	$\frac{W - D}{D} \times 100$	
	% MOIST D/W	Dry content	$\frac{D}{W} \times 100$	
	% MOIST W/D	Ratio	$\frac{W}{D} \times 100$	
	g	Gram value		
9	Value	At gram display	Sample quantity [g]	
		At measurement	Current moisture content [%]	

	Name	State and Meaning	
10	Drying programs		
	Standard drying ▽ ▽	Maintains a constant drying temperature.	 Drying temperauter
	Quick drying ▽ ▽	Quick mode	 200°C approx. 3min., Drying temperauter
	Ramp drying ▼ ▽	Increases the drying temperature gently.	 Drying temperauter
	Step drying ▼ ▼	Uses multiple steps of the drying temperature.	 Drying temperauter

Display Samples for Drying Program

Mode	Symbols (during settings)	Gram display (after settings and before measurement)
Standard mode	<i>Std</i>	 Target quantity
Quick mode	<i>QuC</i>	 Target quantity
Automatic mode	<i>U-R</i>	 Preset termination value of analyzing mode
Timer mode	<i>U-t</i>	 Preset time
Manual mode	<i>U-n</i>	

Key Operation and Key Functions

Keys		Function and action
	PROGRAM	Stores or recalls measurement program with the program number during the gram display. Selects a temperature program while the drying temperature is selected.
	SELECT	Selects item in the measurement program.
	↓ , ↑	Changes value of item in the measurement program.
	ENTER	Stores current condition in the measurement program number. Output data at measurement.
	START	Start prepared measurement Sample needs at least 0.1 g or more to start measurement.
	STOP	Stop current measurement
	RESET	Sets the display to zero in the unit of gram. Cancel key.



5. Preparations (Installation, Initialization, Motion Check)



5.1. Installing the Analyzer

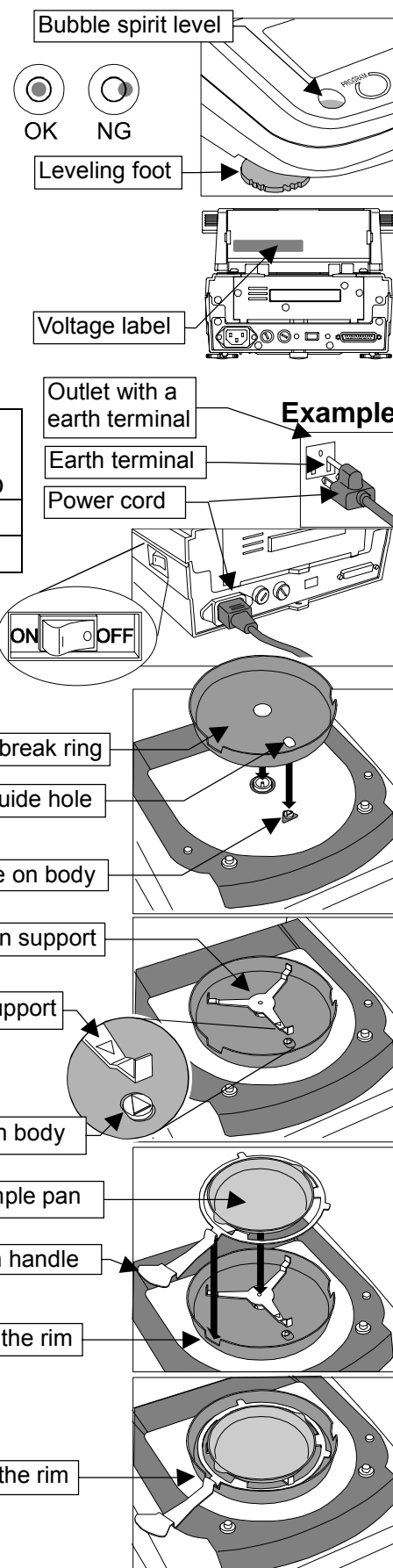
1. Select the place to install the analyzer.
Refer "2.1.Installing the Analyzer".
2. Level the analyzer by adjusting the leveling feet and confirm it using the bubble spirit level.
3. Read the power supply voltage label on the back of the heater cover.

Confirm that voltage, frequency and outlet type is correct for your local voltage.

Confirm that the rated voltage of the halogen lamp is correct to your power supply voltage.

Voltage Label	Power Supply Voltage	The Rated Voltage of the Halogen Lamp
100 - 120 V	AC 100 V to AC 120 V	AC 120 V
200 - 240 V	AC 200V to AC 240 V	AC 240 V

4. Confirm that the power switch is "OFF" position.
5. Connect the power cord. Ground the analyzer with the earth terminal on the power cord.
6. Align the guide hole of the breeze break ring to the guide on body.
7. Install the pan support.
Align together the Δ signs on the pan support and body.
8. Put the sample pan on the pan handle.
And hook the pan handle on the notch in the rim of the breeze break ring.





5.2. Setting the Clock and Calendar (Initialization)

Adjust the built-in clock and calendar before use.

5.2.1. Operation

1. Turn on the analyzer.
The gram unit (of weighing mode) is displayed.
2. Press and hold the **SELECT** key to display **CL Adj**.
3. Press the **ENTER** key to display the calendar.
Example: 15th April, 2002

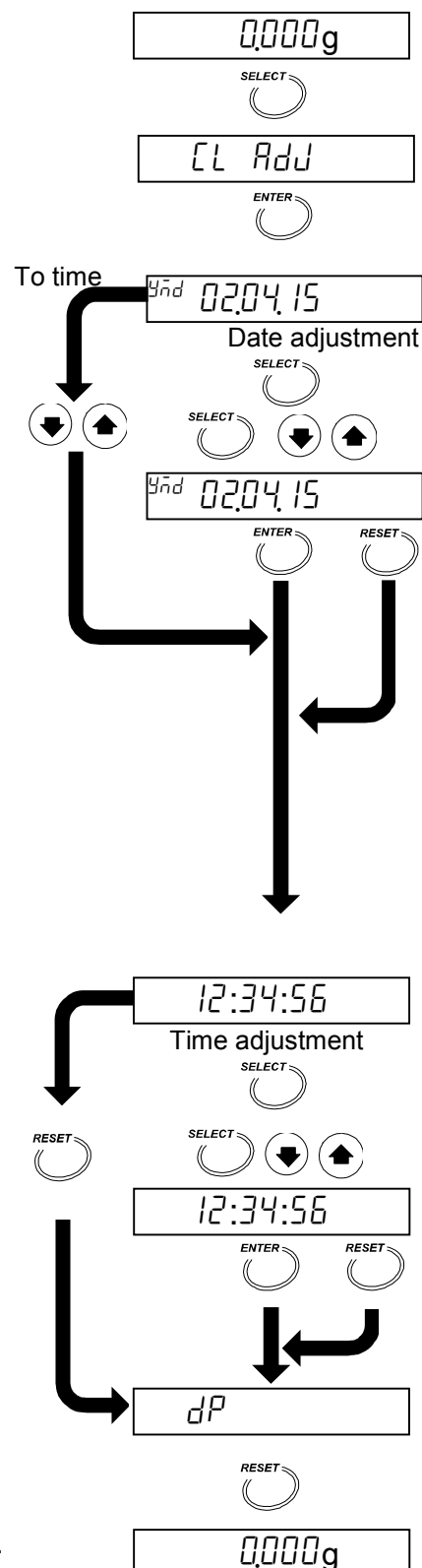
4. To skip the calendar settings.
Press the **↓** or **↑** key to proceed step 5.
To adjust the calendar settings.
Press **SELECT** key. Adjust the calendar using the following keys.
 - SELECT** key Selects a figure.
 - ↓, ↑** key Selects a value for the figure.
 - ENTER** key Stores the current date and proceeds to step 5.
 - RESET** key Cancels the adjustment and proceeds to step 5.

Symbols and arrangement of the calendar

$\overline{y}nd$ Year, month, day
 $\overline{n}d\overline{y}$ Month, day, year
 $d\overline{n}\overline{y}$ Day, month, year

The arrangement of the calendar is used for the report of GLP, GMP and ISO.

5. Time is displayed.
6. To finish the adjustment.
Press the **RESET** key to proceed step 7.
To adjust the clock.
Press the **SELECT** key. Adjust the clock using the following keys.
 - SELECT** key Selects a figure.
 - ↓, ↑** key Selects a value for the figure.
 - ENTER** key Stores time and proceeds to step 7.
 - RESET** key Cancels the adjustment and proceeds to step 7.
7. When finishing the adjustment, **dP** is displayed.
Press the **RESET** key to return to the weighing mode.

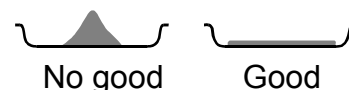




5.3. Proper Operation for Precision Measurement

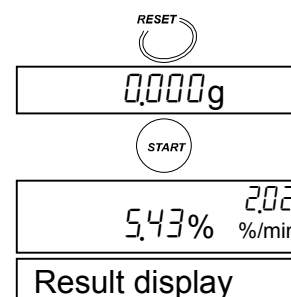
5.3.1. Operation of the sample

- ❑ Use a proper sample quantity. If the sample quantity is small, precise results may not be possible. If the sample quantity is too much, the measurement time becomes long.
- ❑ If the measurement is repeated, maintain the same sample quantity.
- ❑ Crush grain samples to a small, uniform powder for a quick drying process.
- ❑ Spread the sample as evenly as possible.
- ❑ The analyzer is designed to measure the moisture content of the sample by its weight change. If the sample includes volatile matter, it may vaporize during drying causing a measurement error.
- ❑ When measuring a liquid or liquid state sample that may make a film on the surface, we recommend you use a glass fiber sheet (accessory SMO012).



5.3.2. Operation of the analyzer

- ❑ Press the **RESET** key to display the zero value before each measurement.
- ❑ Check that the displayed sample weight is stable before measurement. Press the **START** key to start a measurement.
- ❑ Select the proper analyzing mode to finish a measurement. Use the change of moisture content per one minute [%/min] that is displayed during measurement as a reference value.
- ❑ The analyzer needs a pre-heating process before measurement. When measuring samples repeatedly or continuously, the first result is always different from the other results.
- ❑ The pre-heating process is as follows: Put a sample pan, instead of a sample, on the pan. Press the **START** key to heat it. The analyzer temperature becomes equilibrium.
- ❑ Use a sample on the sample pan that has cooled to room temperature. When a sample is put on a hot sample pan, the moisture content is diffused before measurement, and precise results are not possible. We recommend you use multiple sample pans.
- ❑ Do not pile up sample pans during a measurement.





6.1.1. ACCURACY

The settings are as follows: Specify an ACCURACY.

			ACCURACY		
	Product	Minimum scale	HI	MID.	LO
Preset Termination value	FM503	0.01%	0.02 %/min	0.05 %/min	0.10 %/min
		0.1%	0.10 %/min	0.20 %/min	0.50 %/min
	FM50	0.05%	0.05 %/min	0.10 %/min	0.50 %/min
		0.1%	0.10 %/min	0.20 %/min	
		1%			
Sample quantity			10 g	5 g	1 g
Use			Precise result	↔	Quick measurement

6.1.2. Operation

Analyzing mode 0.10 %/min (Automatic selection)

Data memory function..... Not used

%	MOIST
	W

1. Turn on the analyzer.
The gram unit (of weighing mode) is displayed.

Enter the Standard Mode

2. Press the **SELECT** key several times to display a mode and press the **↓** or **↑** key to select **Std**.

Select ACCURACY

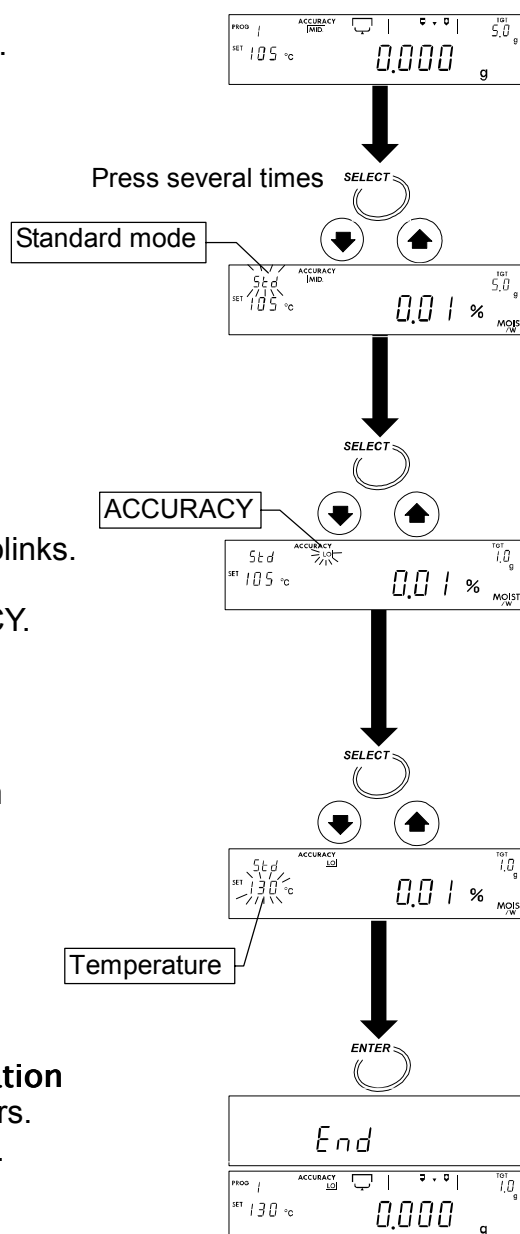
3. Press the **SELECT** key to select ACCURACY.
When ACCURACY is selected, **HI**, **MID**, or **LO** blinks.
4. Press the **↓** or **↑** key to select **LO** of ACCURACY.

Set Drying Temperature at the Sample Pan

5. Press the **SELECT** key to select the drying temperature.
6. Press the **↓** or **↑** key to set 130 °C.

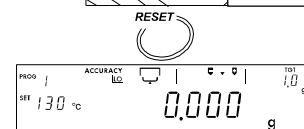
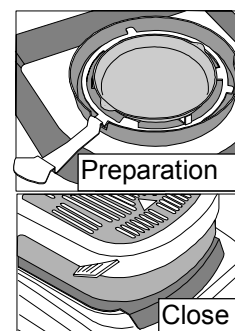
Store the Parameters and Finish the Operation

7. Press the **ENTER** key to store the parameters.
The weighing mode is automatically displayed.



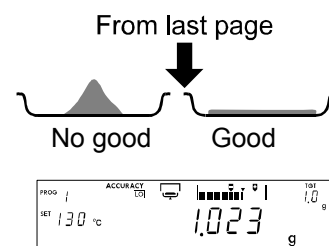
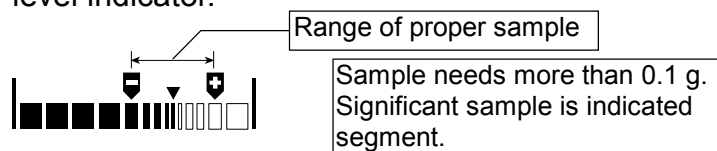
Put a Sample on the Pan

8. Put the breeze break ring, pan support, pan handle and sample pan in order. (With no sample.)
9. Close the heater cover.
10. When displaying a stable value, Press the **RESET** key. Avoid mechanical vibration, breeze and environmental noise during measurement. If it deviates from zero display, press the **RESET** key.



To next page

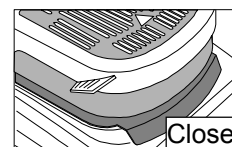
11. Open the heater cover. Put in a sample using the level indicator.



Caution

**The sample needs to be more than 0.1 g.
Spread the sample evenly.**

12. If the key is pressed during gram display, mode, measurement unit and minimum scale value are displayed. If the **ENTER** key is pressed, the sample mass is output.



Start the Measurement

13. Close the heater cover. Press the **START** key after a stable value is displayed.

14. If the **SELECT** key is pressed during measurement, other units can be displayed temporarily and its measurement values can be output.

Drying temperature

Drying rate

Drying time

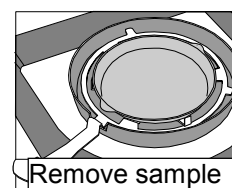
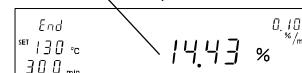
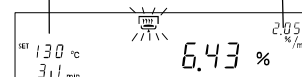
Result

Caution

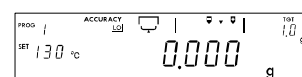
Do not press the **SELECT key while sampling data.**

Finish the Measurement

15. When the change of moisture content per one minute (drying rate) reaches the preset termination value, the measurement is completed and the buzzer beeps.
16. Open the heater cover and remove the sample using the pan handle.



17. Press the following key to return to gram display.
ENTER key..... Outputs (Prints) result.
SELECT key Returns to the weighing mode.
RESET key..... Returns to the weighing mode and displays zero.



18. If the same condition is used, proceed to step 8.
If changing the condition, proceed to step 2.

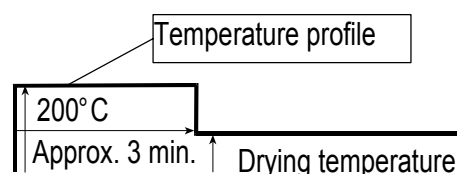
The sample pans can be washed and reused.
There is the Reference card on the bottom of the analyzer.



6.2. Quick Mode Operation

The quick mode can obtain the moisture content with settings of ACCURACY and drying temperature.

Sample is heated up at 200°C for approximately three minutes so that moisture content is measured quickly.



6.2.1. ACCURACY

ACCURACY of measurement can be set either **HI**, **MID**, or **LO**.

The sample quantity is automatically selected by ACCURACY.

The termination value of the analyzing mode is automatically selected by ACCURACY and minimum scale value of % display.

Analyzing mode is the program to finish the measurement when a change of moisture content per one minute becomes smaller than a preset termination value.

The settings are as follows: Specify an ACCURACY.

			ACCURACY		
	Product	Minimum scale	HI	MID.	LO
Preset Termination value	FM503	0.01%	0.05 %/min	0.10 %/min	0.20 %/min
		0.1%	0.10 %/min	0.20 %/min	0.50 %/min
	FM50	0.05%	0.10 %/min	0.20 %/min	0.50 %/min
		0.1%			
		1%			
Sample quantity			5 g	2 g	1 g
Use			Precise result	↔	Quick measurement

6.2.2. Operation

This operation explanation uses the following example:

Refer to "7.Selection of Measurement Method" for detail.

Input Parameters

Mode..... Quick mode
 Drying temperature 130 °C
 ACCURACY..... **LO**
 Sample quantity Approximately 1 g (Automatic selection)
 Analyzing mode 0.20 %/min (Automatic selection)

Stored Parameters (Factory Settings for the FM503

Temperature profile..... Quick drying
 Measurement unit Moisture content is based
 on a wet sample
 Minimum scale value of % display 0.01 %
 Minimum scale value of gram display ... 0.001 g
 Data memory function..... Not used

% MOIST
/W

1. Turn on the analyzer.
The gram unit (of weighing mode) is displayed.

Enter the Quick Mode

2. Press the **SELECT** key several times to display a mode and press the **↓** or **↑** key to select **QUC**.

Select ACCURACY

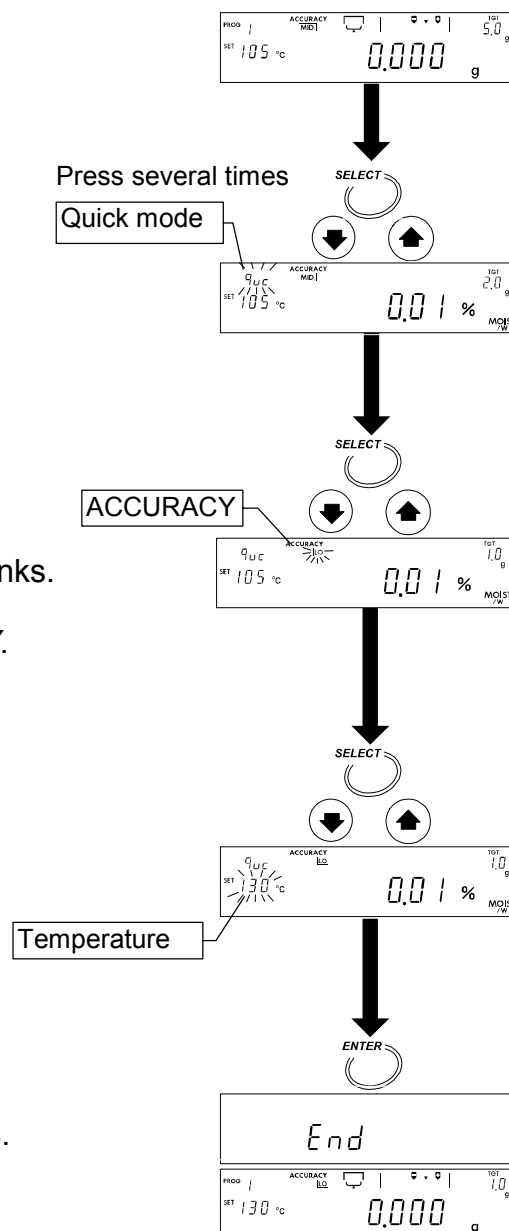
3. Press the **SELECT** key to select ACCURACY.
When ACCURACY is selected, **HI**, **MID**, or **LO** blinks.
4. Press the **↓** or **↑** key to select **LO** of ACCURACY.

Set Drying Temperature at the Sample Pan

5. Press the **SELECT** key to select the drying temperature.
6. Press the **↓** or **↑** key to set 130 °C.

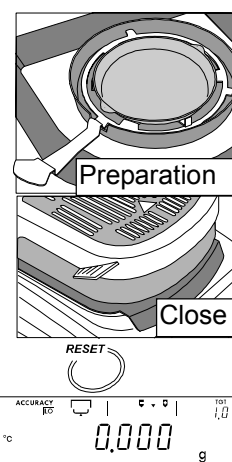
Store Parameters and Finish the Operation

7. Press the **ENTER** key to store the parameters.
The weighing mode is automatically displayed.



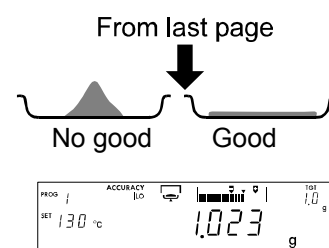
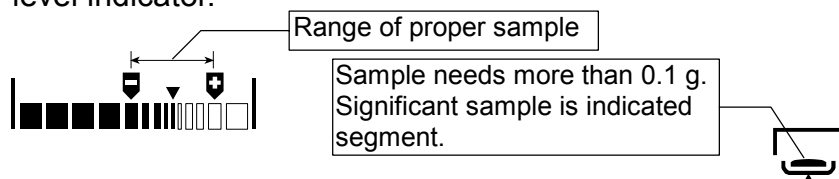
Put a Sample on the Pan

8. Put the breeze break ring, pan support, pan handle and sample pan in order. (With no sample.)
9. Close the heater cover.
10. When displaying a stable value, Press the **RESET** key.
Avoid mechanical vibration, breeze and environmental noise during measurement. If it deviates from zero display, press the **RESET** key.



To next page

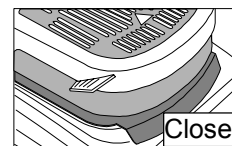
11. Open the heater cover. Put in a sample using the level indicator.



Caution

**The sample needs to be more than 0.1 g.
Spread the sample evenly.**

12. If the key is pressed during gram display, mode, measurement unit and minimum scale value are displayed. If the **ENTER** key is pressed, sample mass is output.



Start the Measurement

13. Close the heater cover. Press the **START** key after a stable value is displayed.
14. If the **SELECT** key is pressed during measurement, other units can be displayed temporarily and its measurement values can be output.

Drying temperature

Drying rate

Drying time

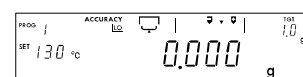
Result

Caution

Do not press the **SELECT key while sampling data.**

Finish the Measurement

15. When the change of moisture content per one minute (drying rate) reaches the preset termination value, the measurement is completed and the buzzer beeps.
16. Open the heater cover and remove the sample using the pan handle.
17. Press the following key to return to gram display.
ENTER key..... Outputs (Prints) result.
SELECT key Returns to the weighing mode.
RESET key..... Returns to the weighing mode and displays zero.



18. If the same condition is used, proceed to step 8.
If changing the condition, proceed to step 2.

The sample pans can be washed and reused.
There is the Reference card on the bottom of the analyzer.



6.3. Program Number

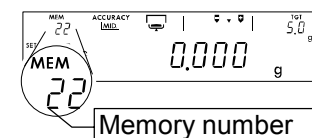
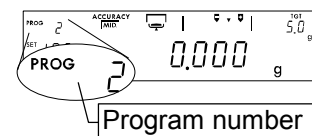
The measurement conditions of all program numbers are set to the standard mode at the factory. The analyzer can store and recall proper individual settings for each sample with the program number (PROG No.).

Maximum number FM503 20 sets

The same measurement program is stored in all program numbers with factory settings.

Mode.....Standard mode

Drying program.....Standard drying

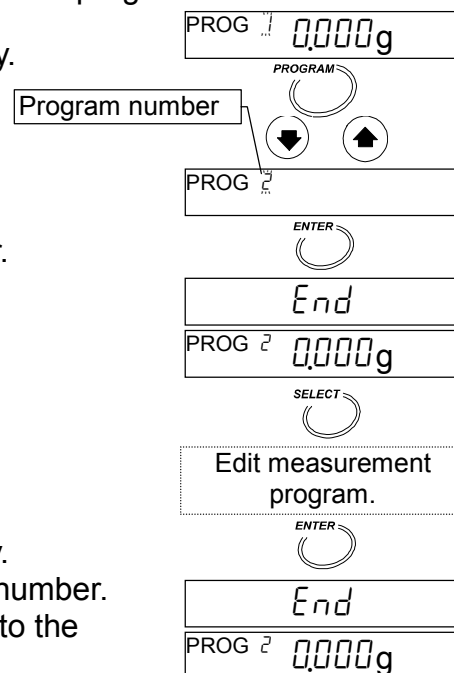


Caution If the data memory function is active, the data memory number (MEM) is displayed, in place of the program number (PROG).

6.3.1. Storing a Measurement Program to a Program Number

Displaying or recalling a PROG number, a measurement program can be renewed.

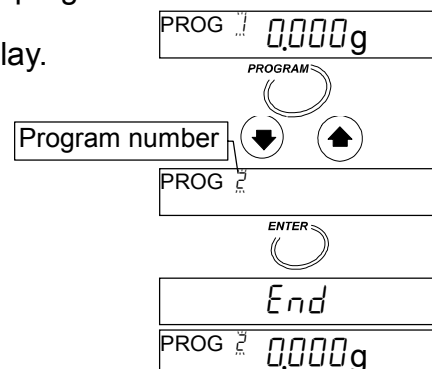
1. Press and hold the **PROGRAM** key in gram display.
2. Press the \downarrow or \uparrow key to select a program number
3. Press the **ENTER** key to use the selected number.
4. Press the **SELECT** key to edit the parameters.
5. Edit parameters of a measurement program.
Refer to "7.Selection of Measurement Method"
6. Press the following key to return to the gram display.
ENTER key..... Stores parameters to the selected number.
RESET key..... Cancels the operation and returns to the weighing mode.



6.3.2. Recalling a Measurement Program with a Program Number

Stored measurement programs can be recalled with a program number.

1. Press and hold the **PROGRAM** key in the gram display.
2. Press the \downarrow or \uparrow key to select a program number
3. Press the **ENTER** key to use the selected number.





7. Measurement Programs



7.1. List of Measurement Programs

There are five drying programs.

	Measurement Programs				
	Sample Mass	ACCURACY	Analyzing Mode to Finish Measurement	Drying Program	
				Temperature Profile	Drying Temperature
Standard Mode <i>Std</i>	Measurement condition is automatically selected by ACCURACY and minimum value of % display. When drying rate is less than preset termination value, measurement is completed automatically.			Standard drying Ramp drying Step drying	50°C to 200°C
Quick Mode <i>Quc</i>				Quick drying	
Automatic Mode <i>U-R</i>	0.1g to 50g	—	When drying rate is less than preset termination value, measurement is completed automatically.	Standard drying Ramp drying Step drying	
Timer Mode <i>U-t</i>			Sample is dried for a preset time. 1min. to 480min.		
Manual Mode <i>U-n</i>			Measurement is completed by the STOP key. Max. 480 min.		

Drying rate: Change of moisture content per one minute [%/min]

7.1.1. ACCURACY of the Standard Mode and Quick Mode

ACCURACY of measurement can be set either **[HI]**, **[MID.]** or **[LO]**.

The sample quantity is automatically selected by ACCURACY.

The termination value of the analyzing mode is automatically selected by ACCURACY and minimum scale value of % display.

The analyzing mode is the program to finish the measurement when a change of moisture content per one minute becomes smaller than a preset termination value.

The settings are as follows: Specify an ACCURACY.

Drying rate: Change of moisture content per one minute [%/min]

Standard Mode

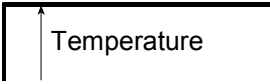
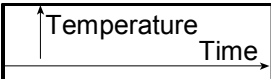
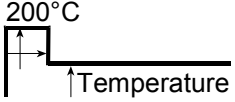
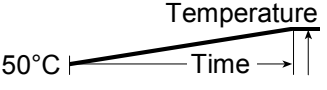
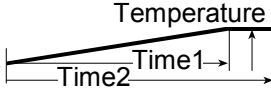
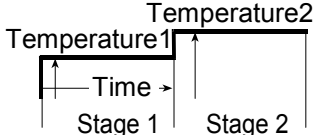
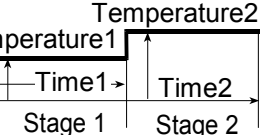
			ACCURACY		
	Product	Minimum scale	HI	MID.	LO
Preset Termination value	FM503	0.01%	0.02 %/min	0.05 %/min	0.10 %/min
		0.1%	0.10 %/min	0.20 %/min	0.50 %/min
	FM50	0.05%	0.05 %/min	0.10 %/min	0.50 %/min
		0.1%	0.10 %/min	0.20 %/min	
		1%			
Sample quantity			10 g	5 g	1 g
Use			Precise result	↔	Quick measurement

Quick Mode

			ACCURACY		
	Product	Minimum scale	HI	MID.	LO
Preset Termination value	FM503	0.01%	0.05 %/min	0.10 %/min	0.20 %/min
		0.1%	0.10 %/min	0.20 %/min	0.50 %/min
	FM50	0.05%	0.10 %/min	0.20 %/min	0.50 %/min
		0.1%			
		1%			
Sample quantity			5 g	2 g	1 g
Use			Precise result	↔	Quick measurement

7.1.2. Drying Program

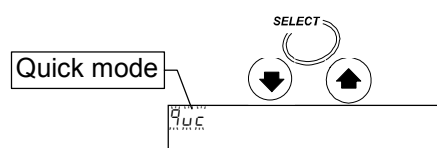
Temperature Profile

	Standard Mode, Automatic Mode, Manual Mode	Timer Mode	Quick Mode
Standard drying ▽ ▽			—
Quick drying ▽ ▽	—	—	
Ramp drying ▼ ▽			—
Step drying ▼ ▼			—

"Temperature 1" can be set higher than "temperature 2" in step drying.

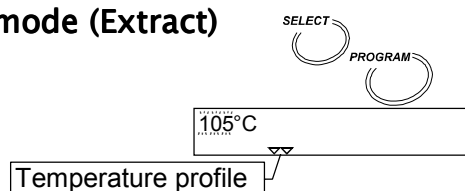
How to Select quick mode (Extract)

Press the **SELECT** key during the gram display.
Display **9uc** using the **↓** or **↑** key.

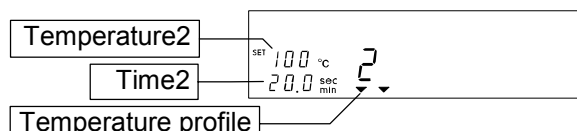
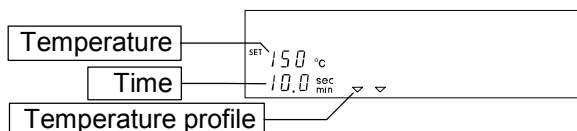
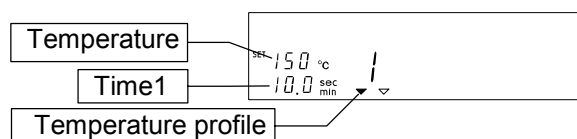


How to Select a Temperature Profile without quick mode (Extract)

Press the **SELECT** key during the gram display.
Press the **PROGRAM** key. Symbols of temperature profile are displayed in order.



Display examples during settings



Drying Temperature at the Sample Pan

Drying temperature range.....50°C to 200°C, 1°C interval.

When a measurement is started and one hour passes, the maximum temperature is automatically regulated to 160°C for safety.

7.1.3. Analyzing Mode of the Automatic Mode

When the change of moisture content per one minute is less than the preset value, the measurement is automatically completed.

Preset Termination value to complete measurement	Range	
	FM503	FM50
2.00 %/min	↑	↑
1.00 %/min		
0.50 %/min		
0.20 %/min	↓	↓
0.10 %/min	Available range	Available range
0.05 %/min	(Factory setting)	(Factory setting)
0.02 %/min	↓	↓
0.01 %/min		
0.005 %/min	↓	Unavailable item

7.1.4. Analyzing Mode of the Timer Mode

Sample is dried for a preset measurement time.

Drying Time 1 minute to 480 minutes.

Setting interval : 1 minute during 1 minute to 60 minutes.

5 minutes during 60 minutes to 480 minutes.

Factory setting: 10 minutes.

7.1.5. Measurement Unit

	Formula	Unit
Moisture content is based on wet sample mass *1	$\frac{W - D}{W} \times 100$	% MOIST /W
Moisture content (Atro) is based on dried sample mass	$\frac{W - D}{D} \times 100$	% MOIST /D
Dry content	$\frac{D}{W} \times 100$	% RATIO D/W
Ratio *2	$\frac{W}{D} \times 100$	% RATIO W/D
Gram value	—	g

W: Wet sample mass

D: Dried sample mass

*1: Factory settings

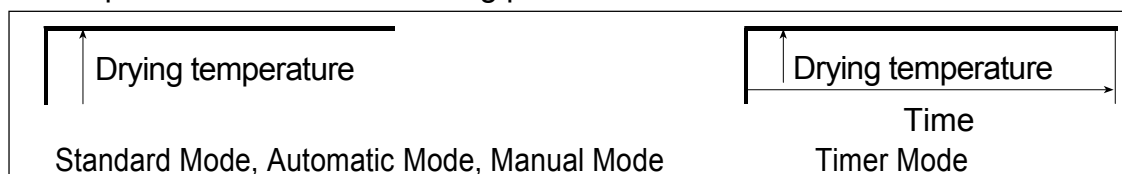
*2: When result reaches to 999%, measurement is stopped.



7.2. Procedures to Store a Measurement Program

7.2.1. Standard Drying

This explanation uses the following parameters.



Common Items

Program number..... 2 (PROG 2)
 Drying program Temperature profile Standard drying ▽ ▽
 Drying temperature..... 160°C
 Measurement unit Moisture content % MOIST
/W
 Minimum scale value during measurement . 0.01 %
 Minimum scale value of gram display 0.001 g
 Sample quantity Approximately 5 g
 Data memory function..... Not used

Items for Standard Mode

Mode..... Standard mode (Symbol: Std)
 ACCURACY..... MID.
 Analyzing mode to finish a measurement Automatic setting by ACCURACY

Items for Automatic Mode

Mode..... Automatic mode (Symbol: U-R)
 Analyzing mode to finish measurement 0.05 %/min

Items for Timer Mode

Mode..... Timer mode (Symbol: U-t)
 Analyzing mode to finish measurement 10 minutes

Items for Manual Mode

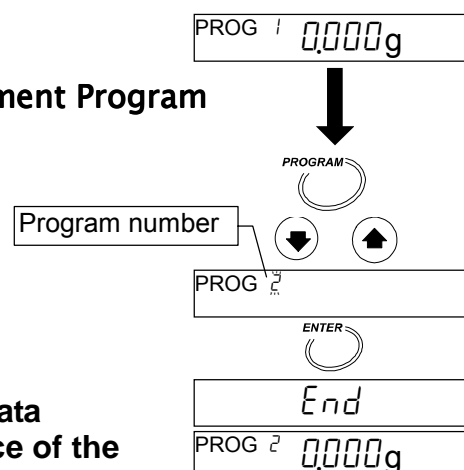
Mode..... Manual mode (Symbol: U-n)

Procedure

1. Display the gram unit (of the weighing mode).

Select a Program Number to Edit the Measurement Program

2. Press the PROGRAM key and press the ↓ or ↑ key to select a program number.
3. Press the ENTER key to use the number.
4. The analyzer displays End and returns to the weighing mode.



Caution If the data memory function is active, the data memory number (MEM) is displayed in place of the program number (PROG).

Select a Mode

- Press the **SELECT** key several times to select a mode symbol, it will blink. Select a mode using the **↓** or **↑** key.

If standard mode is used, select **Std**.

If automatic mode is used, select **U-R**.

If timer mode is used, select **U-t**.

If manual mode is used, select **U-n**.

Set ACCURACY for the Standard Mode

- Select ACCURACY with the **SELECT** key. Select **MID** with the **↓** or **↑** key. When ACCURACY is selected, **HI**, **MID** or **LO** blinks.

Set the Drying Program

- Select drying temperature with the **SELECT** key. Select standard drying $\nabla\nabla$ of the drying program with the **PROGRAM** key.

Set the Drying Temperature

- Set 160°C with the **↓** or **↑** key.

Set the Preset Termination Value for Automatic Mode

- Select the preset termination value with the **SELECT** key. Select 0.05 [%/min] with the **↓** or **↑** key.

Set the Drying Time for the Timer Mode

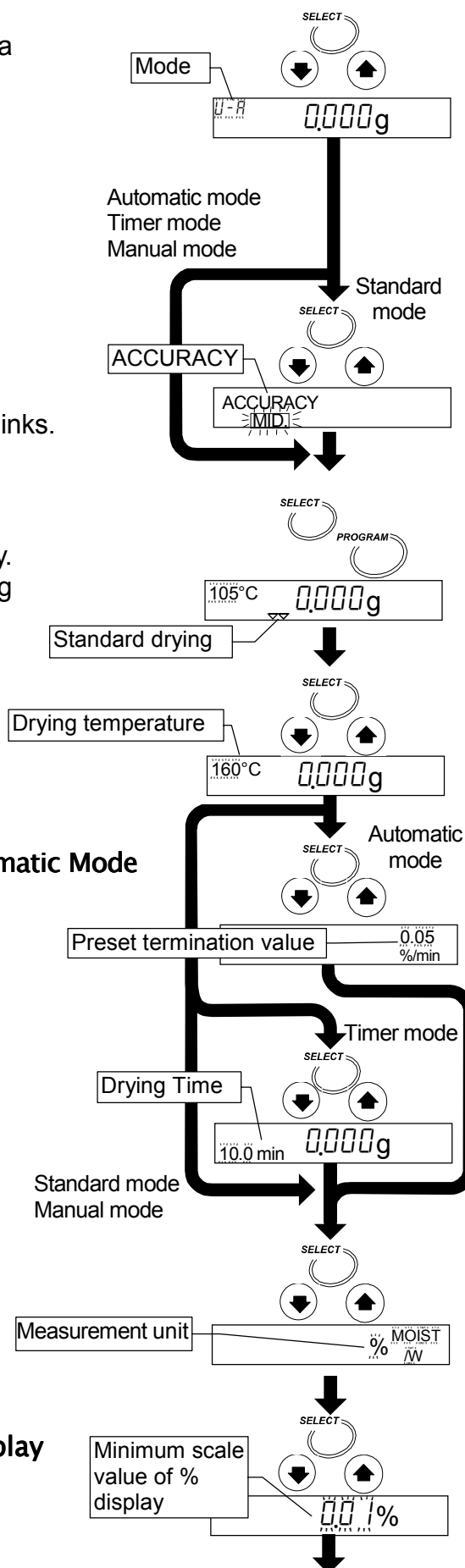
- Select time with the **SELECT** key. Select 10.0 [min] with the **↓** or **↑** key.

Set the Measurement Unit

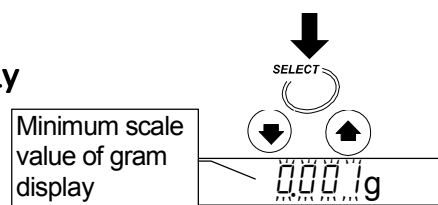
- Select a measurement unit with the **SELECT** key. Select a moisture content (based on a wet sample) with the **↓** or **↑** key.

Set the Minimum Scale Value of the % Display

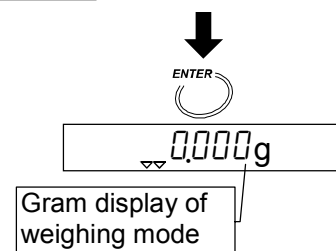
- Select % display with the **SELECT** key. Select 0.01 [%] with the **↓** or **↑** key.



- Set the Minimum Scale Value of the Gram Display**
13. Select gram display with the **SELECT** key.
Select 0.001 [g] with the **↓** or **↑** key.



- Store the Parameters and Finish the Operation**
14. Press the **ENTER** key to store the new parameters for the measurement program to program number 2. Pressing the key, the weighing mode is automatically displayed. When PROG 2 is recalled, the settings can be used.



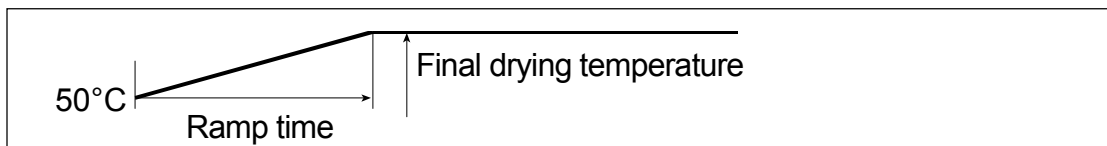
To cancel the new parameters and return to the weighing mode, press the **RESET** key.

7.2.2. Ramp Drying

Standard Mode, Automatic Mode or Manual Mode

Refer to page 33 for Timer Mode

This explanation uses the following parameters.



Common Items

Program number..... 3 (PROG 3)
Drying program Temperature profile Ramp drying ▼▼
 Final drying temperature 160°C
 Ramp time..... 5.0 minutes
Measurement Unit..... Moisture content % MOIST
W
Minimum scale value during measurement . 0.01 %
Minimum scale value of gram display 0.001 g
Sample quantity Approximately 5 g
Data memory function..... Not used

Items for Standard Mode

Mode..... Standard mode (Symbol: Std)
ACCURACY..... MID.
Analyzing mode to finish measurement Automatic setting by ACCURACY

Items for Automatic Mode

Mode..... Automatic mode (Symbol: U-A)
Analyzing mode to finish measurement 0.05 %/min

Items for Manual Mode

Mode..... Manual mode (Symbol: U-n)

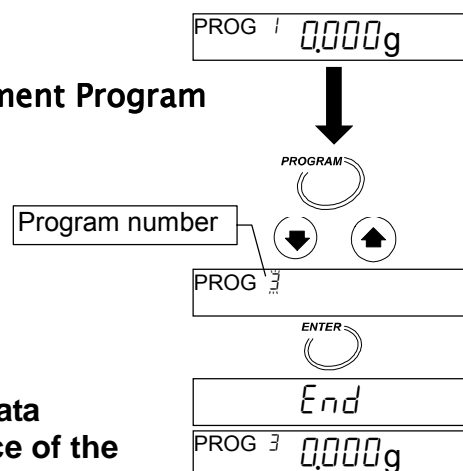
Procedure

1. Display gram unit (of the weighing mode).

Select a Program Number to Edit the Measurement Program

2. Press the PROGRAM key and press the ↓ or ↑ key to select a program number.
3. Press the ENTER key to use the number.
4. The analyzer displays End and returns to the weighing mode.

Caution If the data memory function is active, the data memory number (MEM) is displayed in place of the program number (PROG).



Select a Mode

- Press the **SELECT** key several times to select a mode symbol, it will blink. Select a mode using the **↓** or **↑** key.
If standard mode is used, select **Std**.
If automatic mode is used, select **U-R**.
If manual mode is used, select **U- \bar{n}** .

Set ACCURACY for Standard Mode

- Select ACCURACY with the **SELECT** key.
Select **MID** with the **↓** or **↑** key.
When ACCURACY is selected, **HI**, **MID** or **LO** blinks.

Set the Drying Program

- Select drying temperature with the **SELECT** key.
Select ramp drying ∇ of drying program with the **PROGRAM** key.

Set the Final Drying Temperature

- Set 160°C with the **↓** or **↑** key.

Set the Ramp Time

- Set 5.0 minutes with the **↓** or **↑** key.

Set the Preset Termination Value for Automatic Mode

- Select preset termination value with the **SELECT** key. Select 0.05 [%/min] with the **↓** or **↑** key.

Set the Measurement Unit

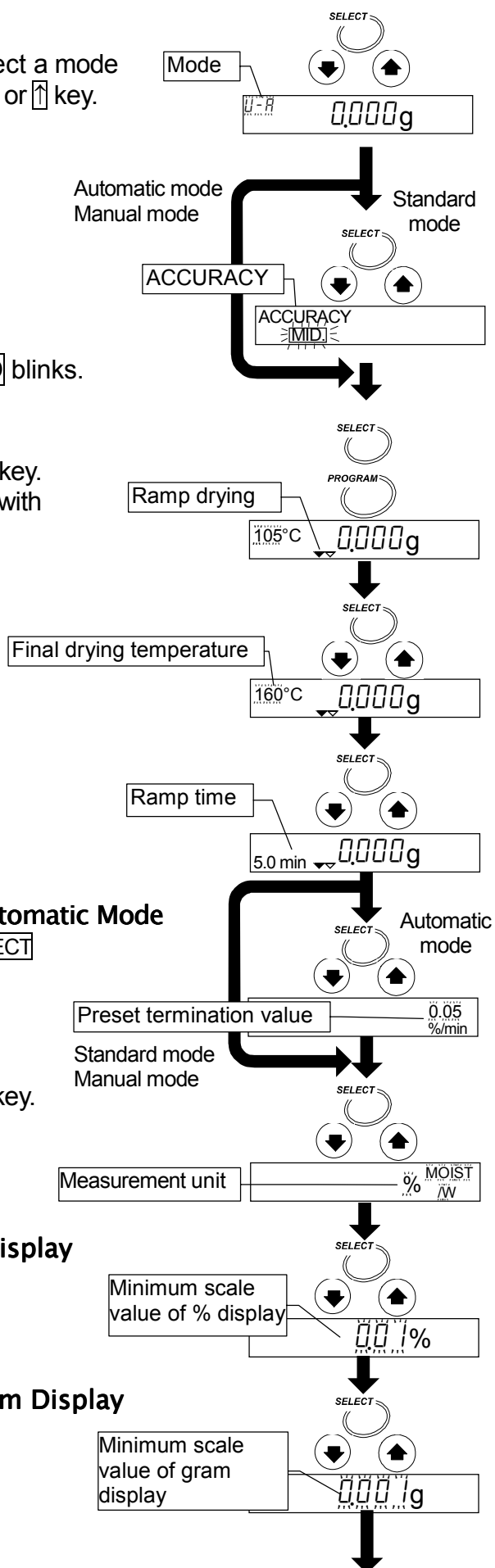
- Select measurement unit with the **SELECT** key.
Select a moisture content (based on a wet sample) with the **↓** or **↑** key.

Set the Minimum Scale Value of the % Display

- Select % display with the **SELECT** key.
Select 0.01 [%] with the **↓** or **↑** key.

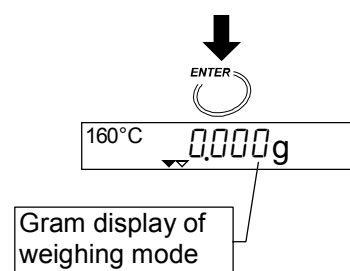
Set the Minimum Scale Value of the Gram Display

- Select gram display with the **SELECT** key.
Select 0.001 [g] with the **↓** or **↑** key.



Store Parameters and Finish the Operation

14. Press the **ENTER** key to store the new parameters of the measurement program to program number 3. Pressing the key, the weighing mode is automatically displayed. When PROG 3 is recalled, the settings can be used.

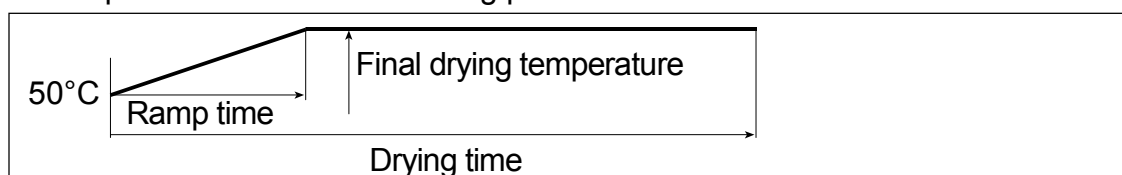


To cancel the new parameters and return to the weighing mode, press the **RESET** key.

Timer Mode

Refer to page 31 for Standard Mode, Automatic Mode or Manual Mode

This explanation uses the following parameters.



Common Items

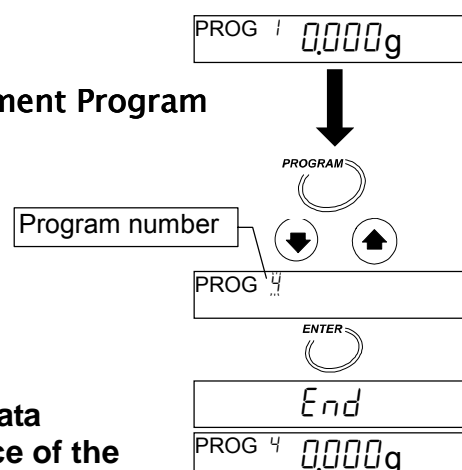
Program number.....	4 (PROG 4)
Mode.....	Timer mode (Symbol: U-t)
Drying program	Temperature profile Ramp drying ▼▼
	Final drying temperature 160°C
	Ramp time..... 5.0 minutes
	Drying time..... 10.0 minutes
Measurement unit	Moisture content % MOIST
Minimum scale value during measurement .	0.01 %
Minimum scale value of gram display	0.001 g
Sample quantity	Approximately 5 g
Data memory function.....	Not used

Procedure

1. Display gram unit (of the weighing mode).

Select a Program Number to Edit the Measurement Program

2. Press the **PROGRAM** key and press the **↓** or **↑** key to select a program number.
3. Press the **ENTER** key to use the number.
4. The analyzer displays **End** and returns to the weighing mode.



Caution If the data memory function is active, the data memory number (MEM) is displayed in place of the program number (PROG).

Select a Mode

5. Press the **[SELECT]** key several times to select a mode symbol, it will blink. Select **U-L** of the timer mode with the **↓** or **↑** key. (Press these keys several times to select it)

Set the Drying Program

6. Select drying temperature with the **[SELECT]** key. Select ramp drying **▼** of the drying program with the **[PROGRAM]** key.

Set the Final Drying Temperature

7. Set 160°C with the **↓** or **↑** key.

Set the Ramp Time

8. Set 5.0 minutes with the **↓** or **↑** key.

Set the Drying Time

9. Set 10.0 minutes with the **↓** or **↑** key.

Set a Measurement Unit

10. Select a measurement unit with the **[SELECT]** key. Select moisture content (based on a wet sample) with the **↓** or **↑** key.

Set the Minimum Scale Value of the % Display

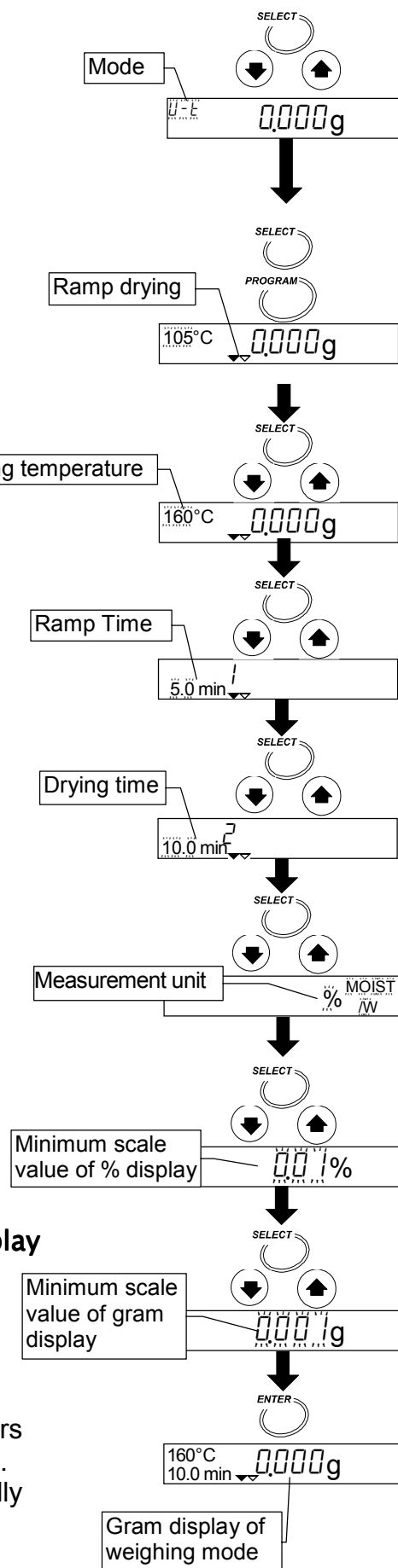
11. Select the % display with the **[SELECT]** key. Select 0.01 [%] with the **↓** or **↑** key.

Set the Minimum Scale Value of the Gram Display

12. Select gram display with the **[SELECT]** key. Select 0.001 [g] with the **↓** or **↑** key.

Store the Parameters and Finish the Operation

13. Press the **[ENTER]** key to store the new parameters of the measurement program to program number 4. Pressing the key, the weighing mode is automatically displayed. When PROG 4 is recalled, the settings can be used.
To cancel the new parameters and return to the weighing mode, press the **[RESET]** key.

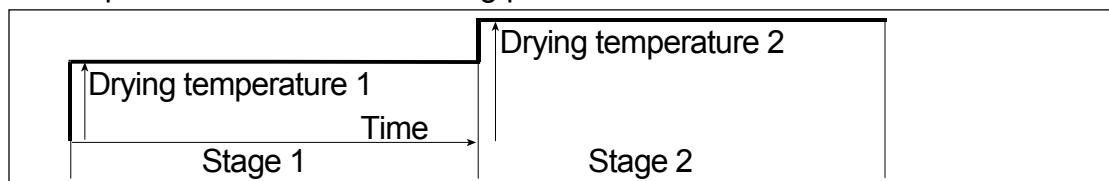


7.2.3. Step Drying

Standard Mode, Automatic Mode or Manual Mode

Refer to page 37 for Timer Mode

This explanation uses the following parameters.



"Temperature 1" can be set higher than "temperature 2" in step drying.

Common Items

Program number.....	5 (PROG 5)
Drying program	Temperature profile .....Step drying ▼▼
	Drying temperature 1 .....120°C
	Drying temperature 2 .....160°C
	Time.....5.0 minutes
Measurement Unit.....	Moisture content
	Minimum scale value during measurement . 0.01 %
	Minimum scale value of gram display 0.001 g
Sample quantity.....	Approximately 5 g
Data memory function.....	Not used

Items for Standard Mode

Mode.....	Standard mode (Symbol: Std)
ACCURACY.....	MID
Analyzing mode to finish measurement	Automatic setting by ACCURACY

Items for Automatic Mode

Mode.....	Automatic mode (Symbol: U-R)
Analyzing mode to finish measurement	0.05 %/min

Items for Manual Mode

Mode.....	Manual mode (Symbol: U-n)
-----------	-----------------------------------------

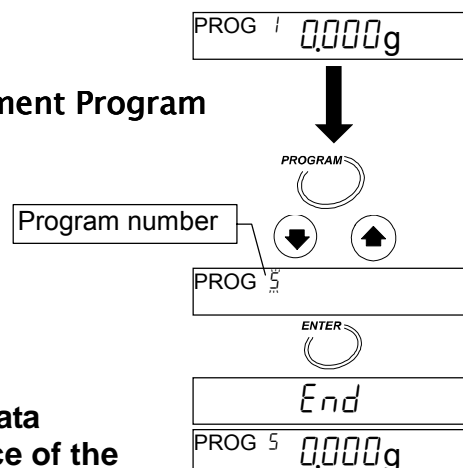
Procedure

1. Display gram unit (of the weighing mode).

Select a Program Number to Edit the Measurement Program

2. Press the PROGRAM key and press the ↓ or ↑ key to select a program number.
3. Press the ENTER key to use the number.
4. The analyzer displays End and returns to the weighing mode.

Caution If the data memory function is active, the data memory number (MEM) is displayed in place of the program number (PROG).



Select a Mode

- Press the **SELECT** key several times to blink a mode symbol, it will blink. Select a mode using the **↓** or **↑** key.
If standard mode is used, select **Std**.
If automatic mode is used, select **U-A**.
If manual mode is used, select **U- \bar{n}** .

Set ACCURACY for the Standard Mode

- Select ACCURACY with the **SELECT** key.
Select **MID** with the **↓** or **↑** key.
When ACCURACY is selected, **HI**, **MID** or **LO** blinks.

Set the Drying Program

- Select drying temperature 1 with the **SELECT** key. Select step drying **▼▼** of the drying program with the **PROGRAM** key.

Set Drying Temperature 1

- Set 120°C to drying temperature 1 with the **↓** or **↑** key.

Set the Time

- Select time with the **SELECT** key.
Set 5.0 minutes with the **↓** or **↑** key.

Set Drying Temperature 2

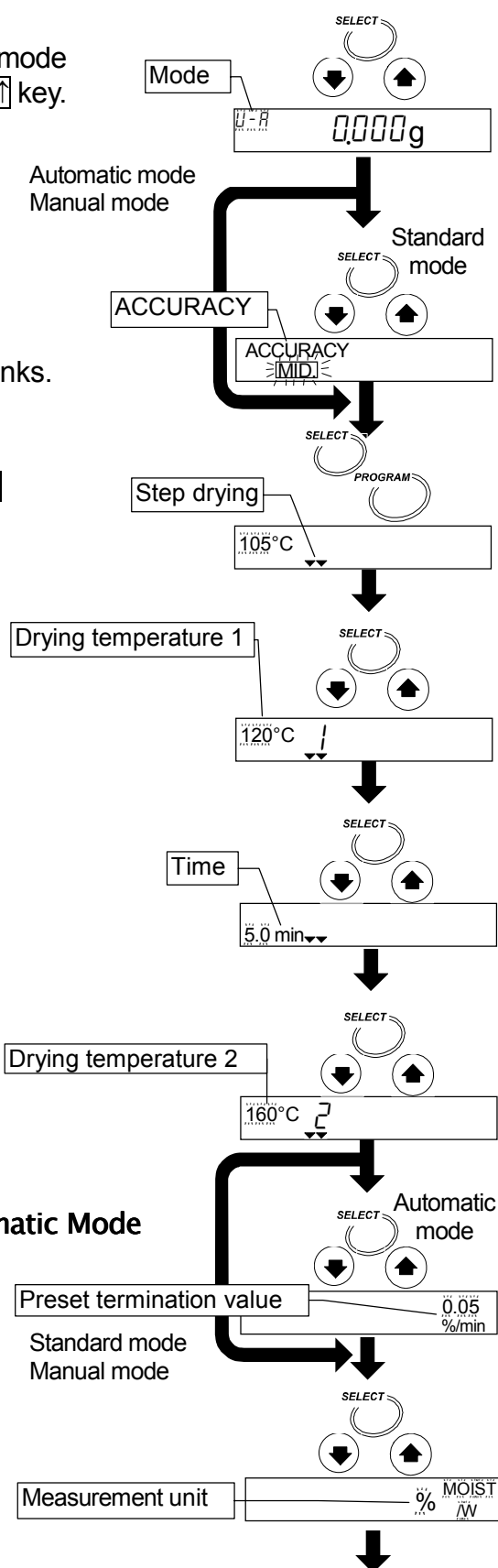
- Select drying Temperature 2 with the **SELECT** key.
Set 160°C with the **↓** or **↑** key.

Set the Preset Termination Value for Automatic Mode

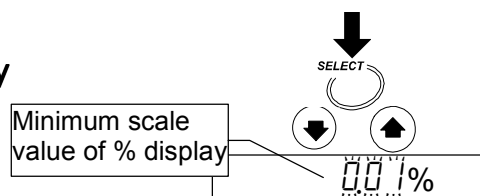
- Select a preset termination value with the **SELECT** key. Select 0.05 [%/min] with the **↓** or **↑** key.

Set Measurement Unit

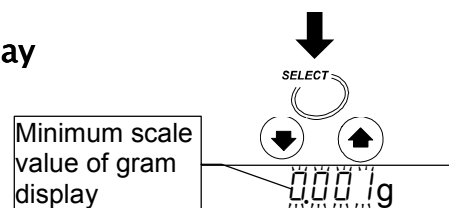
- Select measurement unit with the **SELECT** key.
Select moisture content (based on a wet sample) with the **↓** or **↑** key.



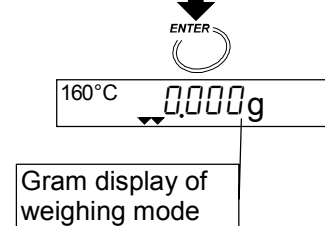
- Set the Minimum Scale Value of the % Display**
13. Select the % display with the **SELECT** key.
Select 0.01 [%] with the **↓** or **↑** key.



- Set the Minimum Scale Value of the Gram Display**
14. Select the gram display with the **SELECT** key.
Select 0.001 [g] with the **↓** or **↑** key.



- Store the Parameters and Finish the Operation**
15. Press the **ENTER** key to store the new parameters of the measurement program to program number 3.
Pressing the key, the weighing mode is automatically displayed.
When PROG 3 is recalled, the settings can be used.

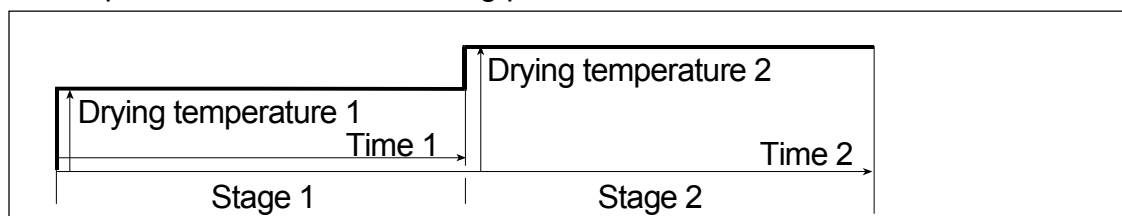


To cancel new parameters and return to weighing mode, press the **RESET** key.

Timer Mode

Refer to page 35 for Standard Mode, Automatic Mode or Manual Mode

This explanation uses the following parameters.



"Temperature 1" can be set higher than "temperature 2" in step drying.

Common Items

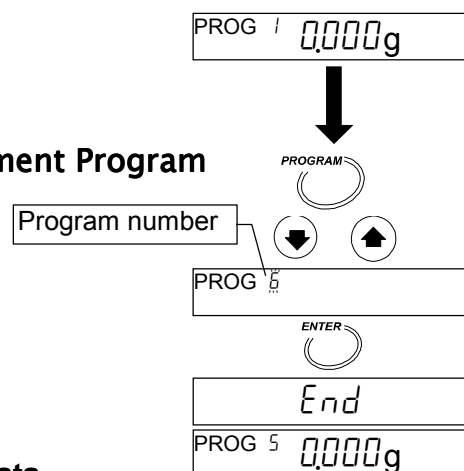
Program number.....	6 (PROG 6)
Mode.....	Timer mode (Symbol: U-t)
Drying program	Temperature profile Step drying ▼▼
	Drying temperature 1 160°C
	Drying temperature 2 120°C
	Time 1..... 5.0 minutes
	Time 2..... 10.0 minutes
Measurement unit	Moisture content % MOIST /W
Minimum scale value during measurement .	0.01 %
Minimum scale value of the gram display	0.001 g
Sample quantity	Approximately 5 g
Data memory function.....	Not used

Procedure

1. Display gram unit (of the weighing mode).

Select a Program Number to Edit the Measurement Program

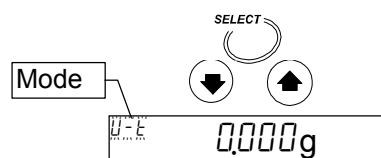
2. Press the **PROGRAM** key and press the \downarrow or \uparrow key to select a program number.
3. Press the **ENTER** key to use the number.
4. The analyzer displays **End** and returns to the weighing mode.



Caution If the data memory function is active, the data memory number (MEM) is displayed in place of the program number (PROG).

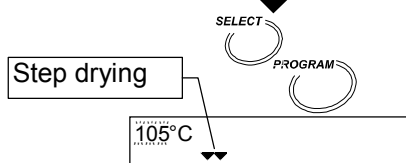
Select a Mode

5. Press the **SELECT** key several times to select a mode symbol, it will blink. Select **U-E** of the timer mode with the \downarrow or \uparrow key. (Press these keys several times to select it)



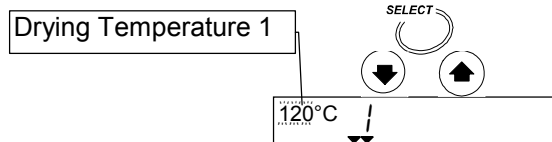
Set the Drying Program

6. Select drying temperature with the **SELECT** key. Select step drying $\nabla\nabla$ of the drying program with the **PROGRAM** key.



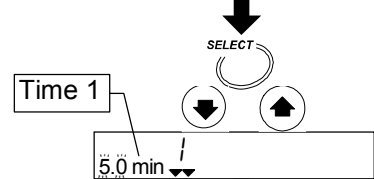
Set Drying Temperature 1

7. Set 120°C with the \downarrow or \uparrow key.



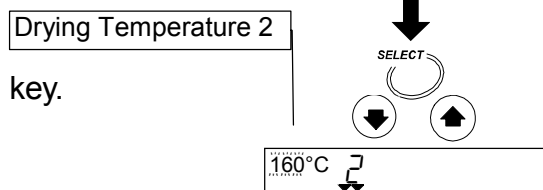
Set Time 1

8. Select time 1 with the **SELECT** key. Set 5.0 minutes with the \downarrow or \uparrow key.



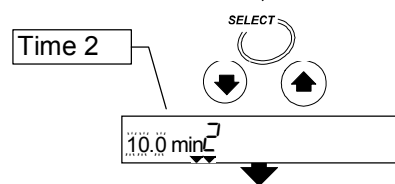
Set Drying Temperature 2

9. Select Drying Temperature 2 with the **SELECT** key. Set 160°C with the \downarrow or \uparrow key.

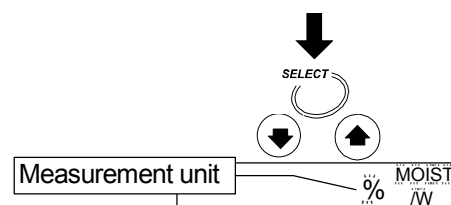


Set Time 2

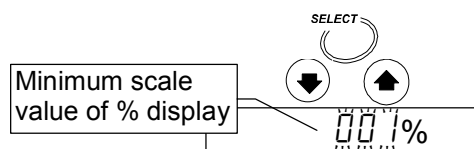
10. Select time 2 with the **SELECT** key. Set 10.0 minutes with the \downarrow or \uparrow key.



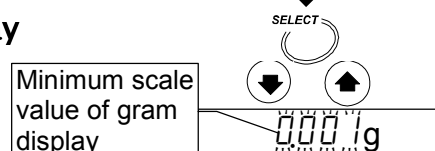
- Set the Measurement Unit**
11. Select measurement unit with the **SELECT** key.
Select the moisture content (based on wet sample) with the **↓** or **↑** key.



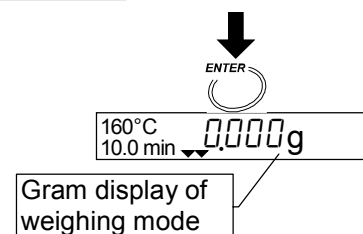
- Set the Minimum Scale Value of the % Display**
12. Select the % display with the **SELECT** key.
Select 0.01 [%] with the **↓** or **↑** key.



- Set the Minimum Scale Value of the Gram Display**
13. Select the gram display with the **SELECT** key.
Select 0.001 [g] with the **↓** or **↑** key.



- Store the Parameters and Finish the Operation**
14. Press the **ENTER** key to store the new parameters of the measurement program to program number 6.
Pressing the key, the weighing mode is automatically displayed.
When PROG 6 is recalled, the settings can be used.



To cancel the new parameters and return to the weighing mode, press the **RESET** key.



8. Check Function



8.1. Self-Check Function (Motion Check)

Use the self-check function to check whether there is an error or inaccurate result. During the check, the heater is turned on and the temperature sensor is checked.

Caution

Do not put flammable matter near the analyzer.


Do not put anything on the heater cover.

8.1.1. Operation

1. Display the gram unit (of the weighing mode).

0.0000g

2. Press and hold the **PROGRAM** key to display **[CH]**.

Press and hold 

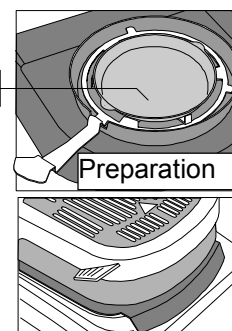
[CH]

3. Put the breeze break ring, pan support, pan handle and sample pan in order. (Do not put a sample on the pan.)

Close the heater cover.

Press the **ENTER** to start the check.

Do not put sample



If **[CLOSE]** is displayed, the heater cover is not closed. When it is closed, check is started."

4. The check function needs approximately one minute.

Good result...Displays **[CH PASS]**, sounds buzzer and returns to weighing mode automatically.

Checking

ENTER

[CH PASS]

Good result

[CH PASS]

Error..... The buzzer sounds and an error code is displayed. Refer to 14.5. Error Message for details.

Weighing mode

0.0000g

Example: **[CH no]**

Error 0

Ht Err



- ❑ Sodium tartrate dihydrate is the standard accessory to check the accuracy of measurement for the analyzer.

- ❑ The moisture content of 15.0 to 16.0% is obtained by the method below.
(Unit % is based on wet sample)

- The test sample can not be used repeatedly. Dispose of it as flammable matter.

Measurement

- | | | | |
|------------------------|------------------|---|------------|
| Measurement unit | Moisture content | % | MOIST |
| | | | ΔW |

- Put a sample pan, instead of a sample, on the pan. Press the START key to heat it. The analyzer temperature becomes equilibrium.

3. Press the **RESET** key to make zero display. Spread the sample as evenly as possible.

- Press the **START** key to start the measurement.
The result is displayed after 8 minutes normally.
If the results is between 15.0 to 16.0%, the analyzer works properly.

- Press the following key to complete the measurement.

ENTER

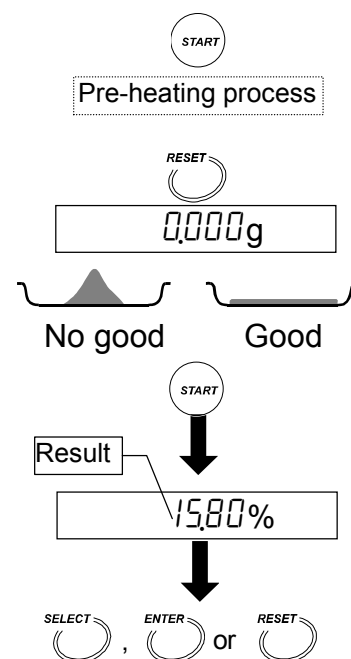
 key..... Outputs (Prints) the results.

SELECT

 key Returns to the weighing mode.

RESET

 key..... Returns to the weighing mode and displays zero.





9. Connecting to a Printer

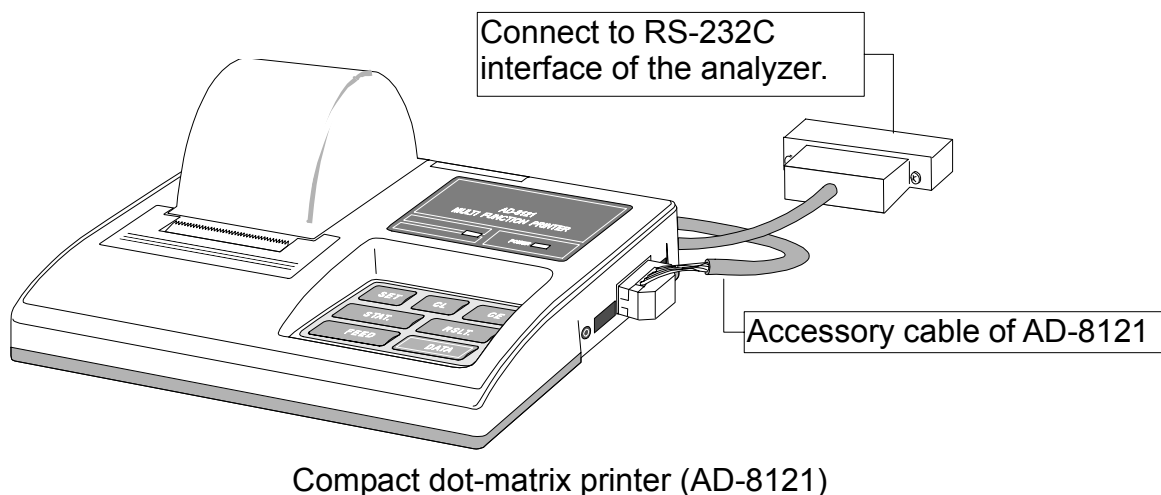
- The analyzer can be connected to a compact dot-matrix printer (AD-8121) using the RS-232C interface. The results and record adapted to GLP, GMP and ISO can be printed.
 - GLP: Good Laboratory Practice,
 - GMP: Good Manufacture Practice,
 - ISO: International Organization for Standardization
- The statistical calculation data of the result and the graph data of the change of moisture content per one minute can be printed using the function of the AD-8121.
- Use the AD-8121 accessory cable to connect them.

Setting List

Use	Analyzer settings			AD-8121 settings
	<i>Prt</i>	<i>S-d</i>	<i>info</i>	
Statistical calculation	0, 1	0	0, 1	MODE 1
Trace of change of moisture content per one minute	2	0	0, 1	MODE 2 Interval printing
Data for GLP, GMP and ISO	0, 1, 2	0	1	MODE 3 Dump printing

Refer to "13. Function Table" to detail of settings.

Read the instruction manual of the printer.





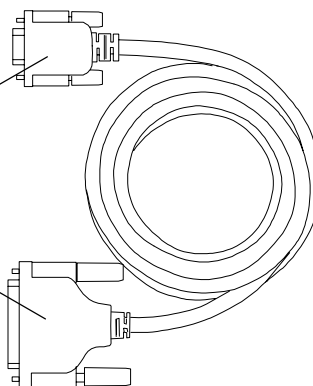
10. Connecting to a Computer

- ❑ The analyzer can be connected to personal computer using the RS-232C interface.
- ❑ The analyzer is of the Data Communication Equipment type (DCE).
Use a straight-through type cable.

RS-232C Cable (Option APL1012)
Length 2m, straight-through type

Computer side
D-Sub 9 pins
Female connector
Inch screw thread

Analyzer side
D-Sub 25 pins
Male connector
Metric screw thread



❑

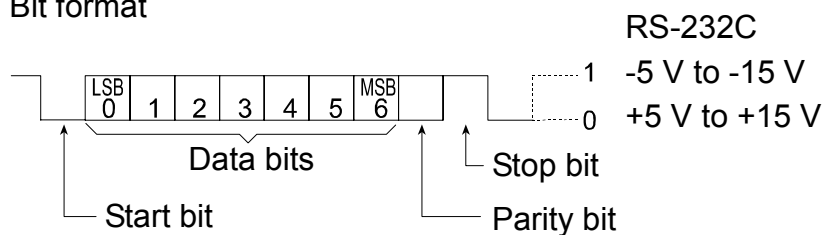
❑



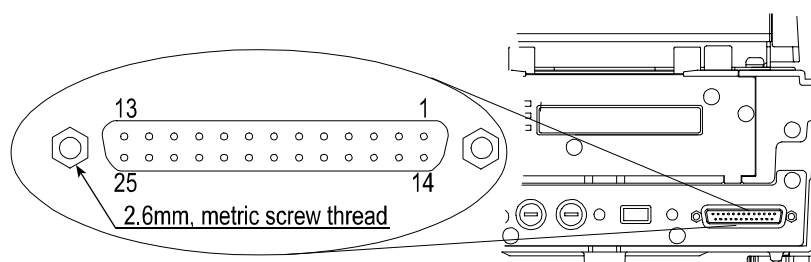
10.1. RS-232C Serial Interface

RS-232C Serial Interface

- Transmission system EIA RS-232C
- Transmission form Asynchronous, bi-directional, half duplex
- Data format
 - Baud rate 2400bps
 - Data bits 7bits
 - Parity EVEN
 - Stop bit 1bit
 - Code ASCII
 - Terminator CR LF (CR: 0Dh, LF: 0Ah)
 - Bit format



Pin Connections



Pin No.	FM503		Computer (DTE)	
	Signal Name *2	Description	Direction	Signal Name
1	FG	Frame ground	-	FG
2	RXD	Receive data	←	TXD
3	TXD	Transmit data	→	RXD
4	RTS	Ready to send *3	←	RTS
5	CTS	Clear to send *3	→	CTS
6	DSR	Data set ready	→	DSR
7	SG	Signal ground	-	SG
16, 18, 19, 21, 23	Internal use		Do not connect *1	
Other	Not used			

*1: Normal DOS/V cables do not use these terminals.

*2: Signal names of the analyzer side are the same as the DTE side with TXD and RXD reversed.

*3: RTS and CTS control are not used. CTS output is HI always.



10.2. Output Format

In Case of Format omitted Temperature Data (Function Table 5-d 0)

- The format consists of fifteen characters except the terminator.
- A polarity sign is placed before the data with the leading zeros. If the data is zero, the plus sign is used.
- The unit is g or %.
- Sign of ASCII code

C _R	0Dh	Carriage return
L _F	0Ah	Line feed
	20h	Space

Sample Mass Format (Gram Display)

S	T	,	+	0	0	0	0	1	.	2	3	4			g	C _R	L _F
---	---	---	---	---	---	---	---	---	---	---	---	---	--	--	---	----------------	----------------

Header
Mass data
Unit
Terminator

Positive Overload Format (Too heavy weighing, E display)

O	L	,	+	9	9	9	9	9	9	9	9	E	+	1	9	C _R	L _F
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	----------------	----------------

Header
Polarity
Overload
Terminator

Negative Overload Format (Too light weighing, -E display)

O	L	,	-	9	9	9	9	9	9	9	9	E	+	1	9	C _R	L _F
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	----------------	----------------

Header
Polarity
Overload
Terminator

Moisture Content (during weighing or after weighing)

S	T	,	+	0	0	0	0	1	2	.	3	4			%	C _R	L _F
---	---	---	---	---	---	---	---	---	---	---	---	---	--	--	---	----------------	----------------

Header
Moisture content
Unit
Terminator

In Case of Format included Temperature Data (Function Table 5-d 1)

- The first 3 figures are the temperature data.
- The format consists of nineteen characters except the terminator.

1	6	0	,	S	T	,	+	0	0	0	0	1	2	.	3	4			%	C _R	L _F
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	--	--	---	----------------	----------------

Header
Moisture content
Unit
Terminator

160°C at sample pan



10.3. Command

- The analyzer can be controlled by the following commands from the computer.
Add a terminator C_RL_F (0Dh、 0Ah) to each command.

Command	Description
Q	Outputs the current data.
SIR	Outputs data continuously
C	Stops data output by SIR command.
QM	Outputs the data during measurement.
START	Same as the START key
STOP	Same as the STOP key
RESET	Same as the RESET key
ENTER	Same as the ENTER key
SELECT	Same as the SELECT key
DOWN	Same as the \downarrow key
UP	Same as the \uparrow key
PROGRAM	Same as the PROGRAM key

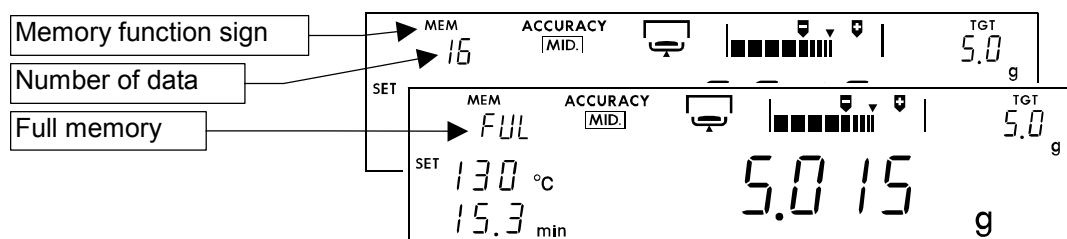


11. Data Memory Function

- The data memory function automatically stores each result when finishing a measurement.
- The maximum number of memory is 100 data in the FM503
- The stored data can be output to a printer at one time and can be output to a computer using the Windows applications of RsCom and Rskey stored in the standard accessory CD-ROM at one time.
- The stored data can be deleted at one time.
- The function can select either storing each result or not at *data* of the function table.
 - Data is stored at each measurement..... *data 1*
 - Data is not stored..... *data 0*
- When using the data memory function, **MEM** is displayed.
- When displaying **FULL**, the function can not store the next data. The function can store new data after deleting the stored data.

Caution

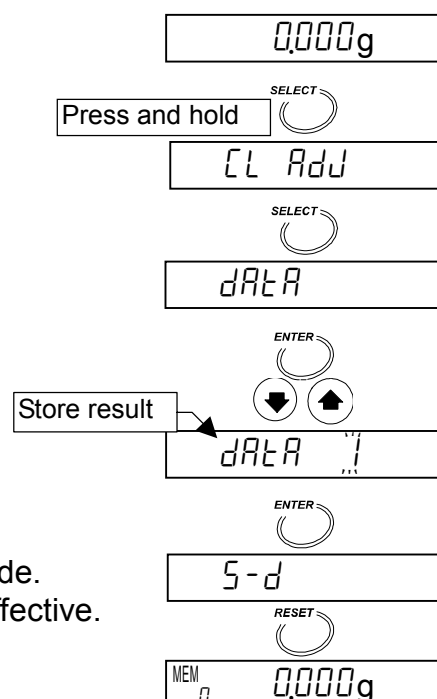
- When pressing the **STOP** key during a measurement except manual mode, the result is not stored.
- Set *data 1* before measurement, if it is necessary to store each result with data memory function.



11.1.1. Preparation

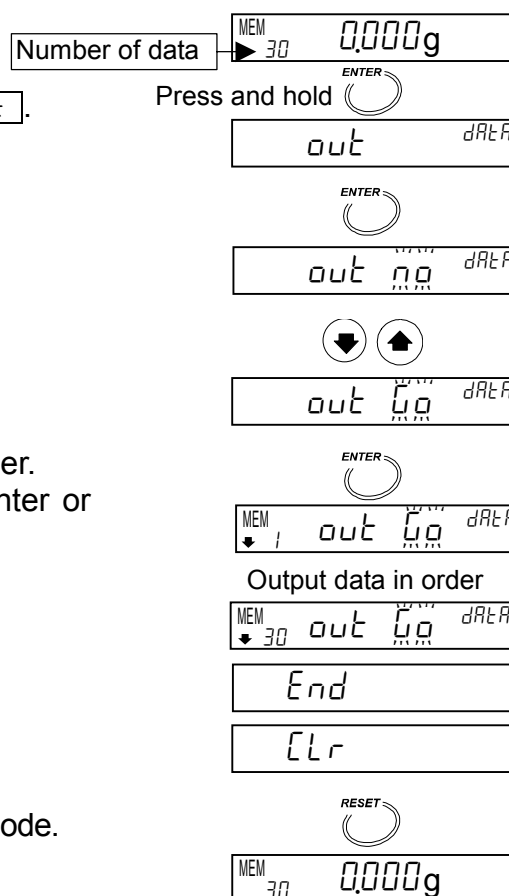
This example selects "store result" at *data* of the function table.

1. Display the gram unit (of the weighing mode).
2. Press and hold the **SELECT** key to enter the function table.
3. Press the **SELECT** key to display *data*.
3. Press the **SELECT** key several times and press the \downarrow or \uparrow key to display *data 1*.
5. Press the **ENTER** key to store the new settings. Press the **RESET** key to return to the weighing mode. **MEM** is displayed when the memory function is effective.



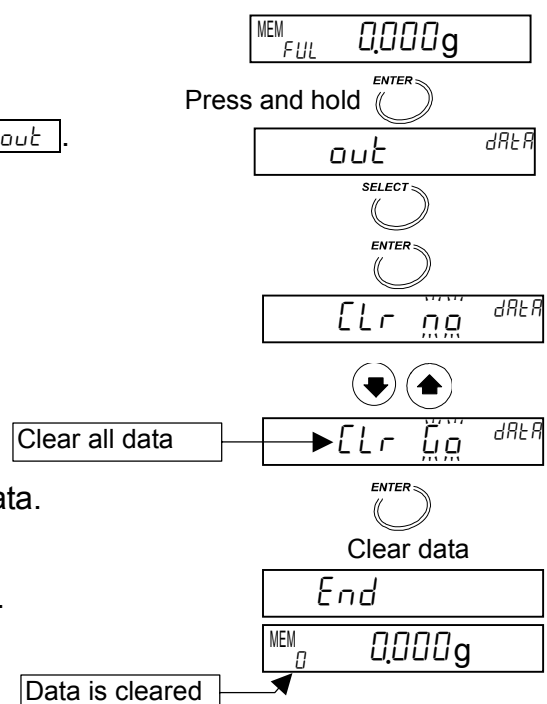
11.1.2. Output All Data at One Time

1. Display the gram unit (of the weighing mode).
2. Press and hold the **ENTER** key to display **out**.
3. Press the **ENTER** key to display **out no**.
4. Press the **↓** or **↑** key to display **out 0.0**.
5. Press the **ENTER** key to output the data in order.
Data is output to the peripheral equipment (printer or computer) connected to the RS-232C interface.
6. When output is finished, **End** is displayed.
7. Press the **RESET** key to return to the weighing mode.



11.1.3. Delete All Data at One Time

1. Display the gram unit (of the weighing mode).
2. Press and hold the **ENTER** key to display **out**.
3. Press the **SELECT** key to display **CLR**.
Press the **ENTER** key to enter the mode.
4. Press the **↓** or **↑** key to display **CLR 0.0**.
5. Press the **ENTER** key to delete all stored data.
6. When deleting is finished, **End** is displayed.





12. Calibration

- The moisture content is calculated with a ratio of wet weight and dried weight. Therefore, the absolute value of weighing does not influence the calculation of the moisture content, but it is necessary to get precise weighing for GLP, GMP and ISO. Use a 20g mass or a 50g mass to calibrate the weighing sensor.
- When calibrating the weighing sensor, you can output the calibration report adapted to GLP, GMP and ISO.
- There is a certified temperature calibrator (accessory FM-43, only for FM503 to calibrate the pan temperature for precise temperature control.
- When calibrating the temperature, you can output the calibration report adapted to GLP, GMP and ISO.
- The analyzer can store an ID number to be used in the calibration report. The number can be used for management and maintenance of the analyzer



12.1. Identification Number (ID No.)

- The ID number consists of the following seven characters.

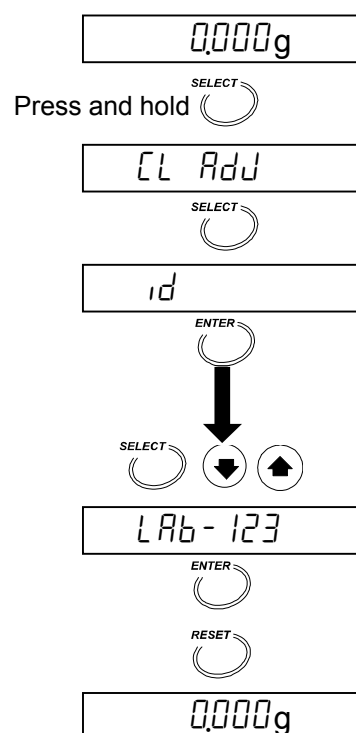
Characters	0	1	2	3	4	5	6	7	8	9	Space	-(hyphen)
Display	0	1	2	3	4	5	6	7	8	9		-

Characters	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Display	A	b	C	d	E	F	G	H	I	J	K	L	M	N	O	P	Q

Characters	R	S	T	U	V	W	X	Y	Z
Display	r	S	t	U	V	W	X	Y	Z

12.1.1. Setting the ID Number

1. Turn on the analyzer.
The gram unit (of weighing mode) is displayed.
2. Press and hold the **SELECT** key to enter the function table. Then **CL Add** is displayed.
3. Press the **SELECT** key several times to display **ID**.
4. Press the **ENTER** key.
5. Set the ID number using the following keys.
Example: LAB-123
SELECT key Selects a figure.
↓, ↑ key Selects a value for the figure.
ENTER key Stores the ID No. and proceeds to step 6.
6. Press the **RESET** key to return to the weighing mode.





12.2. Calibration of the Weighting Sensor

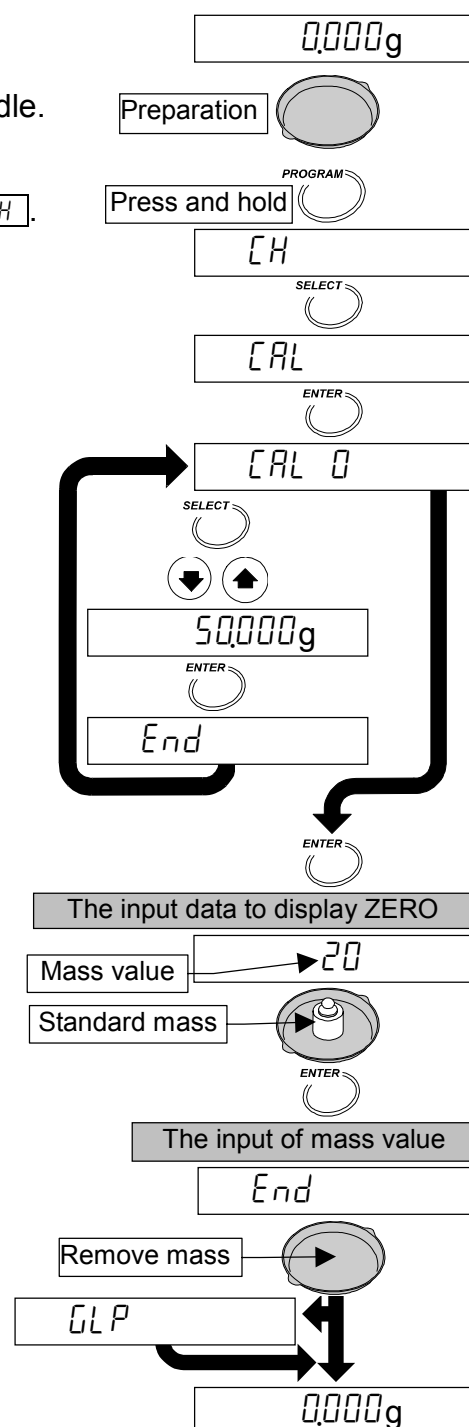
- A standard mass of 20g or 50g can be used for the calibration
- A 20g F1 standard mass is recommend.

Caution

- **Avoid vibration and drafts that affect the calibration. If affected, the analyzer may be unable to calibrate the weighing sensor.**
- **Use a 20g mass for the calibration, because the height between the weighing pan and glass-housing is 26 mm. If a tall mass is used, open the glass-housing and avoid external influence.**

12.2.1. Operation

1. Display the gram unit (of the weighing mode).
2. Install the weighing pan, pan support and pan handle.
Close the heater cover.
3. Press and hold the **PROGRAM** key to display **[CH]**.
4. Press the **SELECT** key to display **[CAL]**.
5. Press the **ENTER** key to display **[CAL 0]**.
6. If 20g mass is used, Press the **ENTER** key.
Proceed to step 8.
If 50g mass is used, Press the **SELECT** key.
Proceed to step 7.
7. Press the **↓** or **↑** key to select 50.000g.
Press the **ENTER** key to store it.
End, **[CAL 0]** are displayed in order.
8. When displaying **[CAL 0]**, press the **ENTER** key
to input "Data to display ZERO". The standard
mass value is displayed (Example: 20g).
9. Open the heater cover and put the standard mass
on the center of the pan and press the **ENTER**
key to input "mass value". **End** is displayed.
10. Remove the mass to return to the weighing mode
If the report for GLP, GMP and ISO is to be
output (Refer to page 54), **GLP** is displayed.
The output condition for the report is selected in
the function table.



Calibration Report Example for the Weighing Sensor Adapted to GLP, GMP and ISO

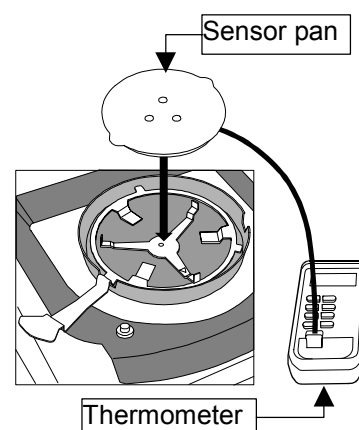
In case of the printer AD-8121, use MODE 3.

MODEL	.....	Manufacture
S/N	K1234567	..... Model
ID	LAB-123	..... Serial number
DATE	2002/04/15	..... ID number
TIME	13:57:24	..... Date
CALIBRATED		..... Time
WEIGHT		} Calibration type
CAL.WEIGHT		
20.000 g		} Calibration mass
SIGNATURE		
- - - - -		..... Signature



12.3. Calibration of Drying Temperature

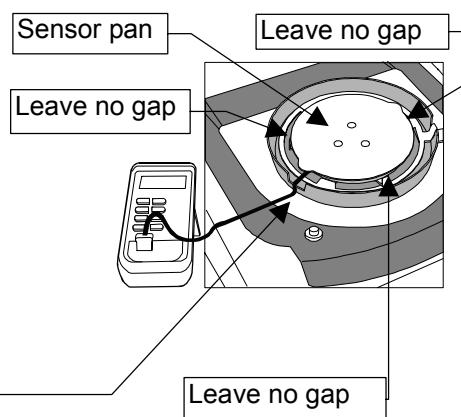
- ❑ The temperature calibrator (accessory FM43) adjusts the drying temperature on the pan. Put the sensor on the pan and input measurement data at 100°C and 160°C.
- ❑ Each adjustment needs fifteen minutes. The buzzer sounds at the end.
- ❑ **t-UP** is displayed after no adjustment for five minutes during the operation and calibration is stopped. Press any key to return to weighing mode.
- ❑ Refer to the instruction manual of the certified temperature calibrator (accessory FM43).



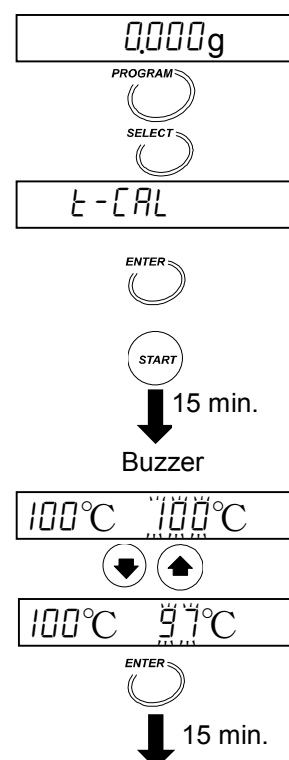
12.3.1. Operation

1. Replace the weighing pan with the sensor pan of the temperature calibrator.
2. Curve the sensor wire so it does not touch the heater cover and glass-housing when closing heater cover.
Level the sensor pan.
Do not leave a gap between the pan support and the sensor.

Level the sensor pan.
Curve the sensor wire so as not to touch heater cover.

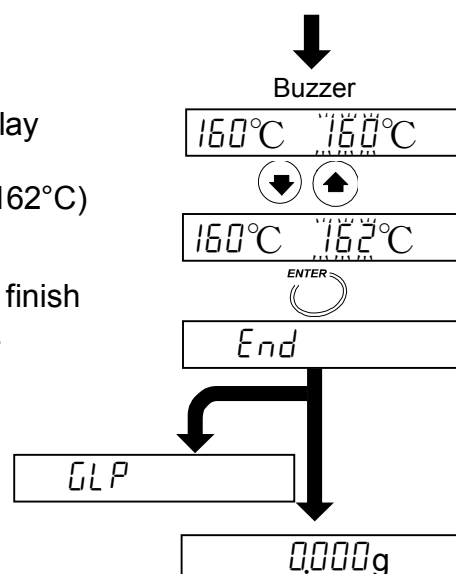


3. Turn on the analyzer.
Display the gram unit (of the weighing mode)
4. Press and hold the **PROGRAM** key
5. Press the **SELECT** key to display **t-CAL**.
6. Press the **ENTER** key.
7. Press the **START** key to start the 100°C measurement.
8. After fifteen minutes, the buzzer sounds and blinks **100°C**. Adjust the blinking value to the thermometer value using the **↓** or **↑** key. (Example: 97°C)
9. Press the **ENTER** key to store the new data and to start the 160°C measurement.

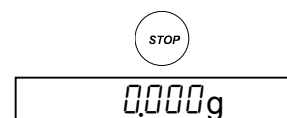


10. After fifteen minutes, the buzzer sounds and the display blinks 160°C. Adjust the blinking value to the thermometer value using the ↓ or ↑ key. (Example: 162°C)
11. Press the ENTER key to store the new data, to finish the adjustment and to return to the weighing mode.

If the report for GLP, GMP and ISO is output, GLP is displayed. Output condition is selected in the function table.



When the heater cover is opened during measurement or the STOP key is pressed, calibration is stopped and the analyzer displays the weighing mode.



Calibration Report Example for Temperature Sensor Adapted to GLP, GMP and ISO

In case of the printer AD-8121, use MODE 3.

MODEL	.....	Manufacture	
S/N	K1234567	.....	Model
ID	LAB-123	.....	Serial number
DATE	2002/04/15	.....	ID number
TIME	12:34:56	.....	Date
CALIBRATED		.....	Time
TEMPERATURE		} Calibration type	
TARGET	ACTUAL		
100 C	97 C	.....	100°C target value
160 C	162 C	.....	160°C target value
SIGNATURE		.....	measurement value
		.....	measurement value
		.....	Signature



13. Function Table

The function table can store the following parameters to control the analyzer.

Details of the Function Table

Item and Display Symbol		Parameter	Description	
Clock	<i>CL Adj</i>		Set date and time for the built-in clock. Refer to "5.2. Setting the clock and calendar"	
Decimal point	<i>dP</i>	0 *1	Dot " . "	Select decimal point of data.
		1	Comma " , "	
Data output mode	<i>Prt</i>	0 *1	Key mode	Data is output by the ENTER key
		1	Auto print mode	Data is output after measurement.
		2	Stream mode	Data is output continuously during measurement.
Data memory function	<i>dAtA</i>	0 *1	Not used.	
		1	Data is stored at each measurement	
Form selection	<i>S-d</i>	0 *1	Moisture content is output.	
		1	Moisture content and temperature are output.*2	
Output format adapted to GLP, GMP and ISO	<i>inFo</i>	0 *1	Not used	
		1	Outputs calibration report that includes date and time, when finishing weighing sensor calibration or temperature sensor calibration.	
ID number	<i>id</i>		Set ID number. Used for the calibration report.	
Factory settings	<i>CLr</i>		Resets the analyzer to the factory settings.	

*1: Factory settings

*2: Use this parameter when connected to a computer. The AD-8121 printer can not print this correctly.

13.1.1. Operation

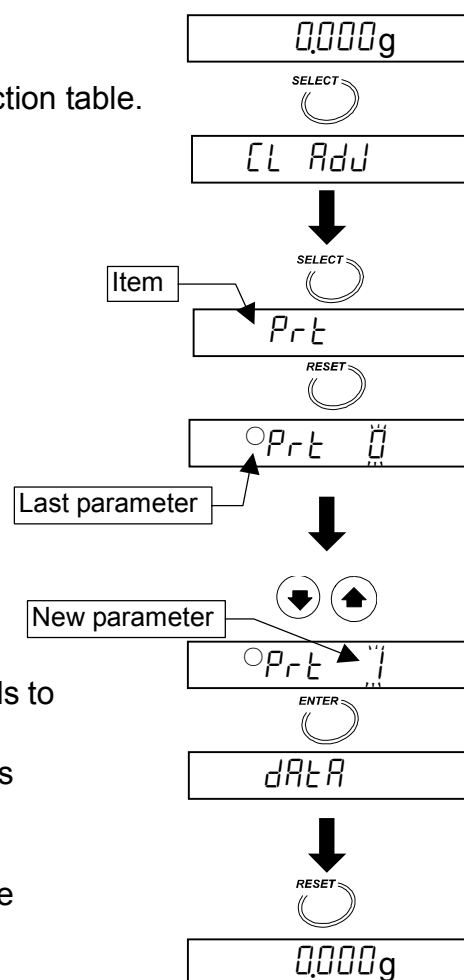
1. Display the gram unit (of the weighing mode).
2. Press and hold the **SELECT** key to enter the function table.

Select an Item

3. Select an item using the following keys.
Example: Data output mode *Prt* is selected.
SELECT key Selects a figure.
ENTER key..... Enters to the selected item.
RESET key..... Cancels the operation and returns to the weighing mode.

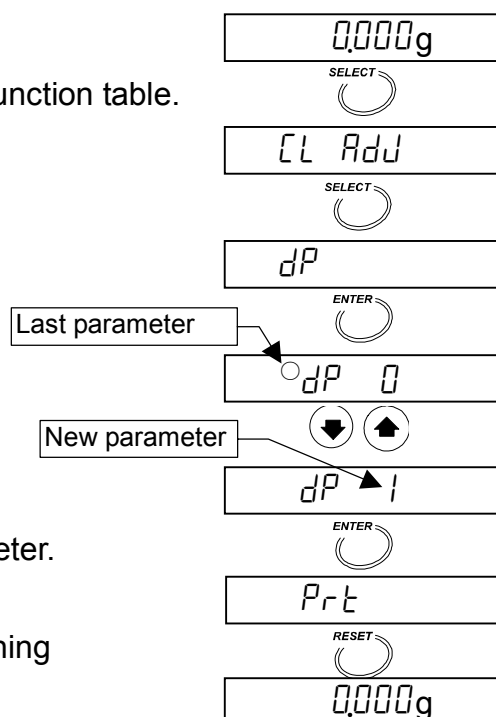
Select a Parameter

4. Select a parameter using the following keys.
Example: Auto print mode *Prt 1* is selected.
↓, **↑** key Selects a parameter.
ENTER key..... Stores the parameter and proceeds to the next item.
RESET key..... Cancels the operation and returns to the weighing mode.
5. If you want to finish the operation, press the **RESET** key to return to the weighing mode.



Example, Use Comma for Decimal Point

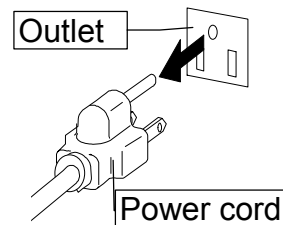
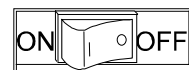
1. Press and hold the **SELECT** key to enter the function table.
2. Press the **SELECT** key to display *dP*.
3. Press the **ENTER** key to enter the item.
4. Press the **↓** or **↑** key to display *dP 1*.
5. Press the **ENTER** key to store the new parameter.
6. Press the **RESET** key to return to the weighing mode.





14. Maintenance

- ❑ Turn off the power switch and remove power cord during maintenance.
- ❑ Cool down all parts of the analyzer before maintenance.
- ❑ Pan support, sample pan and breeze break ring can be removed.
- ❑ Clean the analyzer with a lint free cloth that is moistened with warm water and a mild detergent.
- ❑ Do not use organic solvents to clean the analyzer.
- ❑ Dry the parts and reassemble them. Refer to "2. Precautions" and "5.1. Installing the Analyzer"
- ❑ Use the original packing material and box for transportation.

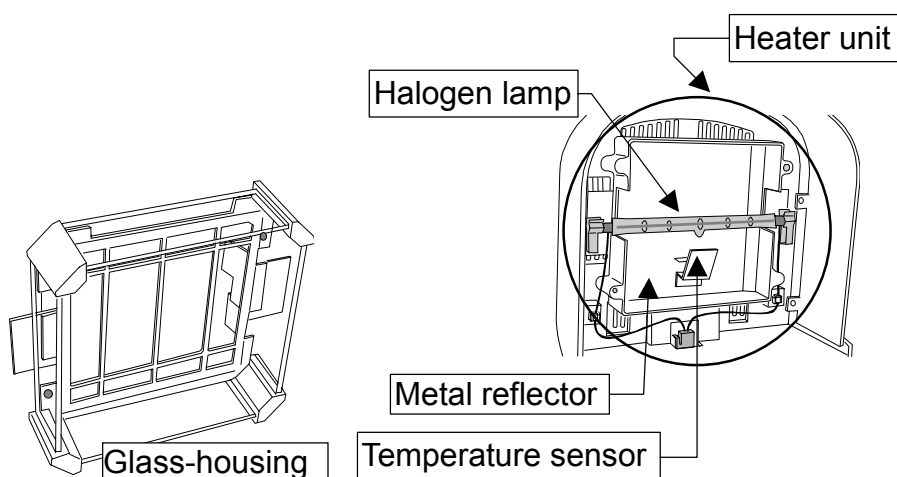
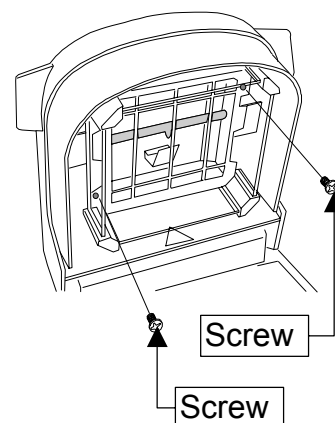


Example



14.1. Cleaning the Heater Unit

- ❑ Clean the glass-housing when it is stained (not clear) to maintain the drying performance.
- ❑ The glass-housing can be removed by removing two screws.
- ❑ Remove fingerprints from the halogen lamp to keep its life.
- ❑ Do not touch to reflective surface of the metal reflector. If the surface is touched, it may be the cause of a drying temperature error.
- ❑ Do not touch the temperature sensor that is at the side of halogen lamp. If the surface is touched, it may be the cause of a drying temperature error.





14.2. Replacement of the Halogen Lamp

- ❑ Replace the halogen lamp, when the drying time is excessive or the lamp is defective. Use the halogen lamp of accessory FM34-120V or FM34-240V that is adapted to your local voltage. The life of the halogen lamp is approximately 5000 hours.

Caution

- ❑ **Remove power cord before replacement. If the power cord is not removed during lamp replacement, it may cause receiving an electric shock.**
- ❑ **Read the power supply voltage label on the back of the heater cover and confirm that the rated voltage of the halogen lamp is correct for your power supply voltage.**

Voltage Label	The Rated Voltage of the Halogen Lamp	Accessory number
100 - 120 V	AC 120 V	FM34-120V
200 - 240 V	AC 240 V	FM34-240V

- ❑ **Do not drop, throw or crack the halogen lamp. Broken glass may cause an injury.**
- ❑ **Clean the surface of the halogen lamp. If there is a stain or fingerprint, it may shorten life of the halogen lamp. Do not touch the lamp directly.**
- ❑ **Dispose of a used halogen lamp that keeps its shape. If it is broken, glass may spread and cause injury.**
- ❑ **We recommend that you replace the halogen lamp, when it exceeds the rated life.**
- ❑ **Affix the lamp wire to the hook so that the lamp wire does not touch the glass-housing and heater cover.**

1. Turn off the power switch and remove power cord.

2. Check rated voltage of the halogen lamp that is printed around the holder.

3. Check that the lamp is cool.

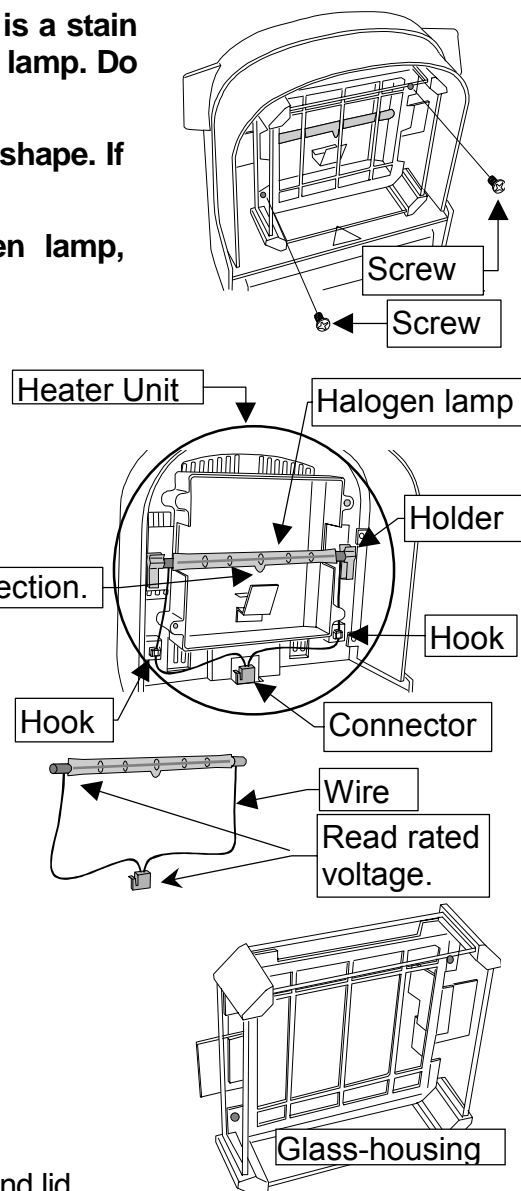
4. Remove the two screws holding the glass-housing.

5. Remove halogen lamp.

6. Install the new halogen lamp so that there is downward projection of the heat and light.

7. Affix the lamp wire to the hook.

8. Affix the glass-housing with the two screws.
Do not pinch the wire between the glass housing and lid.





14.3. Factory Settings

This function can set the following parameters to factory settings.

- ❑ All measurement programs
- ❑ All results stored in memory function.
- ❑ All parameters of the function table
- ❑ ID number is reset to 0000000.
- ❑ Order of calendar and date.

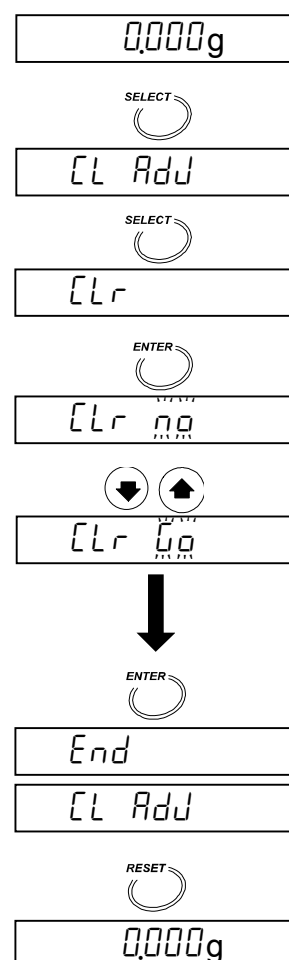
14.3.1. Operation

1. Turn on the analyzer. The gram unit (of the weighing mode) is displayed.
2. Press and hold the **SELECT** key to enter the function table.
3. Press the **SELECT** key several times to display **CLr**.
4. Press the **ENTER** key to enter the item.
5. Press the **↓** or **↑** key to display **CLr 00**.

Caution

If pressing the **ENTER** key with **CLr 00** and pressing the **RESET** key, operation is canceled.

6. Press the **ENTER** key to reset.
And **End** is displayed.
7. Press the **RESET** key to return to the weighing mode.

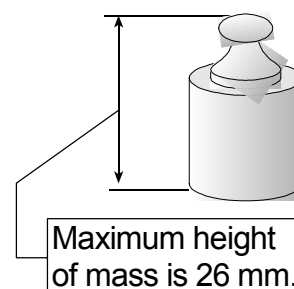




14.4. Troubleshooting

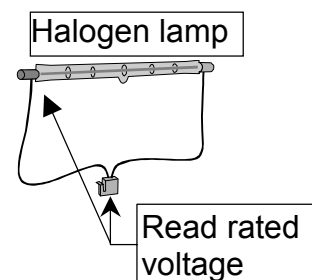
1. In the Case that Proper Results are not be Obtained.

- ❑ Use the self-check function. Refer to 8.1.Self-Check Function (Motion Check).
- ❑ Check repeatability. (Weigh the same mass several times in the weighing mode.) A taller mass may touch the glass-housing. Use a short mass if possible. If a tall 50g mass is used, open the heater cover and avoid external influence.
- ❑ The height from sample pan to glass-housing is 26 mm.
- ❑ Check whether the test sample can be measured correctly.
- ❑ Avoid the breeze from an air conditioner and vibration.
- ❑ Check sample condition. Refer to 5.3.Proper Operation for Precision Measurement
- ❑ Check measurement procedure and pre-heating process. Refer to 5.3.Proper Operation for Precision Measurement



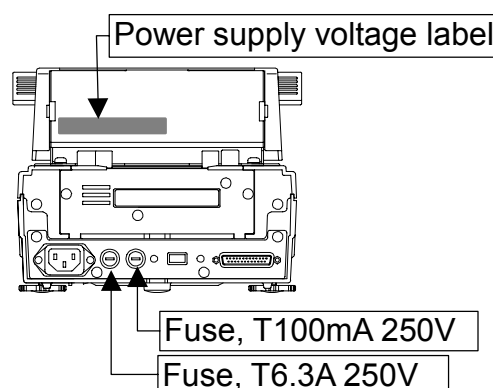
2. In Case that the Lamp does not Light or it takes Too Long to Reach the Drying Temperature.

- ❑ It requires six seconds to light the halogen lamp using the **START** key.
- ❑ When the heater cover is opened, power is not supplied to the halogen lamp.
- ❑ When an overheat has occurred, power is not supplied to the halogen lamp until the halogen lamp becomes cool.
- ❑ Check the rated voltage of the halogen lamp that is printed around the holder.
- ❑ Read the power supply voltage label on the back of the heater cover and confirm that the rated voltage of the halogen lamp is correct for your power supply voltage.



Voltage Label	Power Supply Voltage	The Rated Voltage of the Halogen Lamp	Accessory number
100 - 120 V	AC 100 V to AC 120 V	AC 120 V	FM-34-120V
200V - 240 V	AC 200V to AC 240 V	AC 240 V	FM-34-240V

- ❑ Is a fuse blown? Check the fuses after removing the power cord. Check the rated value and put new fuses into the correct holders.
- ❑ Do you measure a lower drying temperature after a high drying temperature? If the lamp is hotter than the drying temperature, the measurement can not be started.
- ❑ Check that the sample pan is cool.
- ❑ Other cases, the halogen lamp may be defective. Replace with a new halogen lamp. Refer to "14.2. Replacement of the Halogen Lamp".





14.5. Error Message

[H no]

Internal Error

An internal error indicated by the result of the self-check function. If repair is needed, contact the local dealer.

[L PF]

Clock Battery Error

Press any key and input the date and time. Refer to "5.2. Setting the Clock and Calendar".

[L Err]

Clock Error

Contact the local dealer to repair the analyzer.

[LoSE]

Heater Cover Error

The heater cover is opened when starting self-check function. If it is closed, the self-check function is started.

Error0

Internal Error

Turn the power switch off and then on .
Check the frequency of the power supply.
Contact the local dealer to repair the analyzer, if the error is not cleared.

Error3

IC Error

Error8

Contact the local dealer to repair the analyzer.

Error9

Ht Err

Temperature Control Error

Contact the local dealer to repair the analyzer, if an error is not cleared when turning the power switch off for more than a half hour and rechecking it.

t-UP

Time Error at Temperature Calibration

There is no key operation for five minutes during temperature calibration.
If pressing any key, the weighing mode is displayed.

E

Positive Overload, Overweight

The sample has exceeded the weighing capacity.
If the weighing sample pan is empty and this error is displayed, contact the local dealer to repair the analyzer.

-E

Negative Overload, Sample Pan Error

The weight value is too light.
Check the pan, pan support and press the **[RESET]** key.
Calibrate the weighing sensor.
If an error can be not cleared, contact the local dealer to repair the analyzer.

**MEM
FUL**

Full Memory

The number of results stored in memory has reached the upper limit.
Clear the data to store the new results. Refer to "11. Data Memory Function".



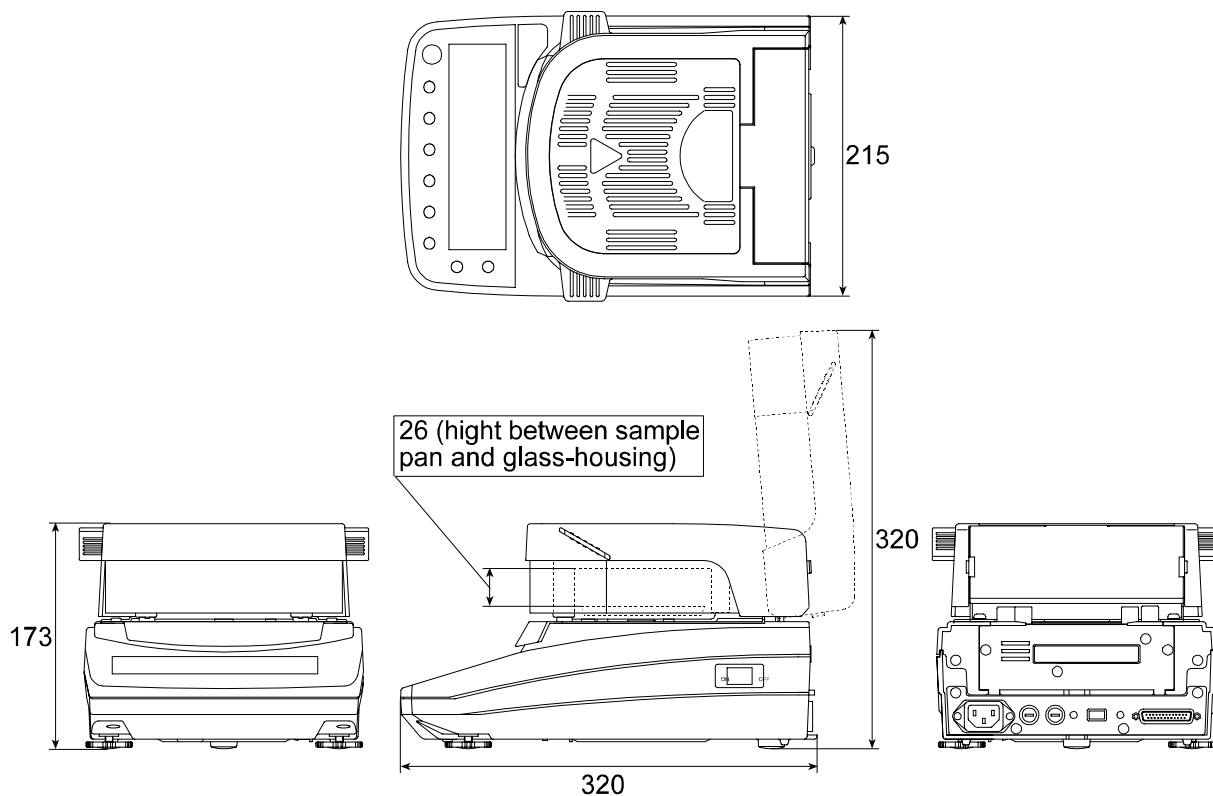
15. Specifications

		FM503	FM50
Measurement method		400 W halogen lamp, thermogravimetric analysis	
Drying temperature range at sample pan		50°C to 200°C (1°C increments)	
Drying temperature profile		Standard drying, Ramp drying, Step drying, Quick drying	
Temperature calibration		By Accessory FM-43	---
Sample weight range		0.1 g to 51 g	
Accuracy: Repeatability of measurement, (Standard deviation)			
Moisture content *1	over 5 g sample	0.02%	0.05%
	over 1 g sample	0.1%	0.2%
Weighing mode		0.001g	0.002g
Minimum reading			
Moisture content		0.01%, 0.1%	0.05%, 0.1%, 1%
Weighing mode		0.001g	0.002g
Measurement programs			
Analyzing mode	Standard mode	Sample weight and termination value is automatically set with ACCURACY and % display. When drying rate reaches the termination value, measurement is automatically completed. (*2)	
	Quick mode (Quick drying)	Sample weight and termination value is automatically set with ACCURACY and % display. When drying rate reaches the termination value, measurement is automatically completed. (*2)	
	Automatic mode	When drying rate is less than preset termination value, measurement is automatically completed. (*2)	
	Timer mode	After heating for the preset drying time, measurement is automatically stopped. (1min. to 480 min.)	
	Manual mode	When pressing the key at any time, measurement is stopped and the result is decided.	
Measurement unit		Moisture content (Wet-base)	
		Moisture content (Dry-base, Atro)	
		Dry content	
		Ratio	
		Weight (g)	
Number of memory		20 sets	10 sets
Data memory function		Storage of 100 results	Storage of 50 results
Communication function		RS-232C serial interface	
Operation environment		5°C to 40°C (41°F to 104°F), 85%RH or less (no condensation)	
Sample pan		φ85 mm	
Power source, Maximum current (r.m.s), Maximum consumption		AC100V to 120V, 3A or AC200V to 240V, 1.5A 50Hz or 60Hz, Approximately 400W Please confirm that this analyzer is correct for your local voltage and receptacle type.	
External dimensions		215(W) x 320(D) x 173(H)mm, 8.46(W) x 12.60(D) x 6.81(H)in.	
Mass (Net weight)		Approximately 6kg (without accessories)	

- *1: After preheating the analyzer, the data can be obtained with approximately 5 g test sample (Sodium tartrate dihydrate) in standard mode (MID.), standard drying, 160 °C
- *2: When change of moisture content per one minute reaches the preset termination value, the measurement is completed.



15.1. Dimensions





15.2. Accessories and Peripheral Equipment

Accessories

Name	Order number
Sample pan (ϕ 85 mm, 100 pcs)	FM31
Glass fiber sheet (ϕ 70 mm, 100 sheets)	FM32
Test sample (Sodium tartrate dihydrate, 30gx12 pcs)	FM33
Halogen lamp for AC 100V to 120 V	FM34-120V
Halogen lamp for AC 200V to 240 V	FM34-240V
Pan handle (2 pcs)	FM35
Tweezers (2 pcs)	FM36
Spoon (2 pcs)	FM37
Display cover (5 pcs)	FM38
Dust cover	FM39
RS-232C cable (2m, 25 pins - 9 pins)	F M40
Calibration mass (20g, equivalent to OIML class F1)	AFM1
Certified Temperature calibrator (only for FM503	FM43

Peripheral equipment

AD-8121 Dot matrix compact printer

Function: Statistical function, interval printing, chart printing,

Character: 5x7 dot, height 2.5mm/01.in., 16 characters/line

Power source: AC adapter or alkaline batteries

