9. OPTIONS

The following options are available for the EJ series:

- ❑ EJ-02   USB interface
- ❑ EJ-03   RS-232C serial interface
- ❑ EJ-07   Underhook for EJ-3000 / EJ-4100 / EJ-6100
- ❑ EJ-08   Underhook for EJ-1500 / EJ-2000
- ❑ EJ-11   Breeze break
- ❑ EJ-12   Carrying case
- ❑ EJ-13   Density Determination Kit for EJ-120 / EJ-200 / EJ-300 / EJ-410 / EJ-610

9-1. EJ-02 USB Interface

- ❑ ***EJ-02 cannot be used together with EJ-03.***

- ❑ The EJ-02 is installed to the same slot as EJ-03 and see "9-2. EJ-03 RS-232C serial interface".

- ❑ The EJ-02 will be used to transmit the weight data (numerical value only) uni-directionally to a personal computer via USB.

- ❑ The EJ-02 can transmit the weight data (numerical value only) directly to other application software such as Microsoft Excel, Word, memo pad, and so on.
- ❑ The driver is not necessary to install.
- ❑ The EJ-02 cannot be used for bidirectional communication.

9-2. EJ-03 RS-232C serial interface

This interface allows the EJ series to be connected with a multifunction printer or a personal computer.

- ❑ ***EJ-03 cannot be used together with EJ-02.***

- ❑ The RS-232C interface has the following four modes.
  - Stream mode   Outputs data continuously.
  - Key mode   Outputs data by pressing the PRINT key.
  - Auto-print mode   Outputs data which meets the conditions of auto-print.
  - Command mode   Controls the balance using commands from a computer.
- ❑ Set the parameters of the data format (bPS and $btPr$) and data output mode (Prt), as necessary.
- ❑ Use a D-sub 9 pin cable (straight type) to connect with a computer.
  Optional cable: AX-KO2466-200   D-Sub 9 pin / 9 pin cable with 2 m long.

EJ-03 Installation

1. Turn off the balance and disconnect the AC adapter if used.
2. Remove the cover of the option slot on the rear by pressing and lowering it down.
3. Connect the connector in the slot to the EJ-03 unit and insert it into the slot.
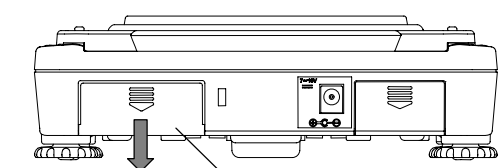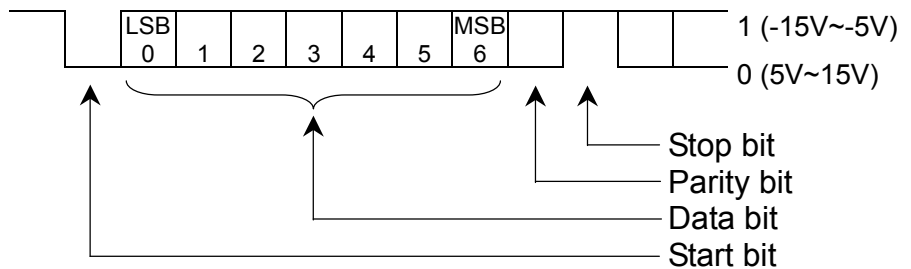
Press and lower down the cover.

Option slot for EJ-02 / EJ-03

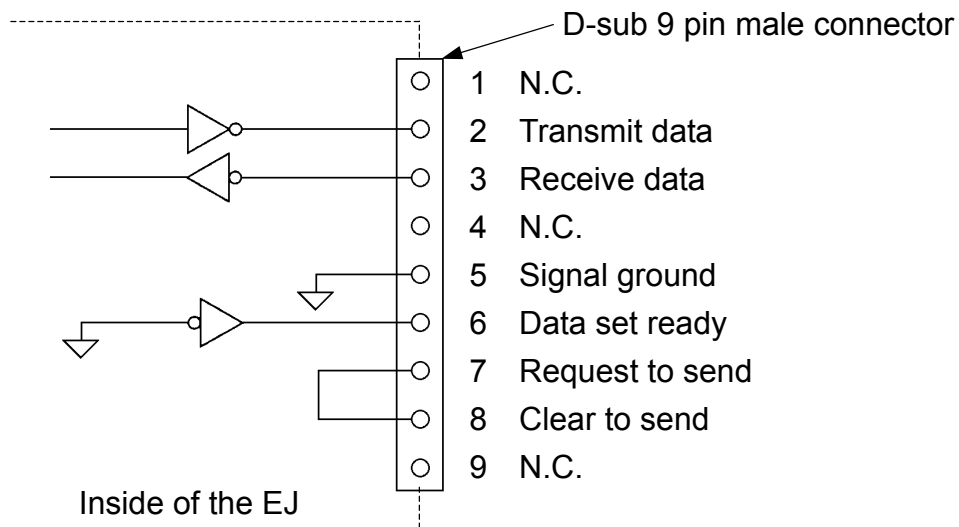4. Secure the EJ-02 with the screws supplied
   with the EJ-03.

Connector inside the option slot.

EJ-03
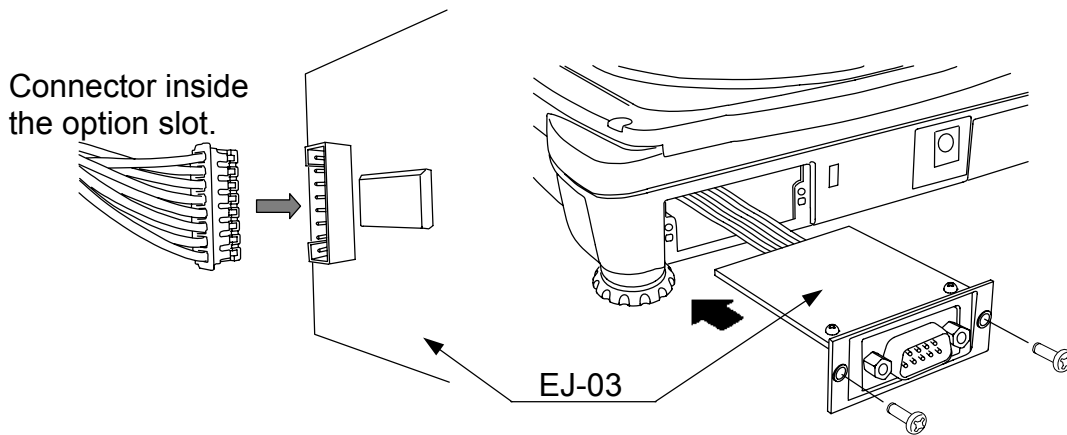
Interface specifications

Transmission system   EIA RS-232C
Transmission form   Asynchronous, bi-directional, half-duplex
Data format   Baud rate: 1200, 2400, 4800, 9600 bps
    Data: 7 bits + parity 1bit (even or odd)
        or 8 bits (non-parity)
    Start bit: 1 bit
    Stop bit: 1 bit
    Code: ACII
   Terminator: $C_R L_F$ (C_R: 0Dh, L_F: 0Ah)

1 (-15V~-5V)
0 (5V~15V)

Stop bit
Parity bit
Data bit
Start bit

Pin connections

D-sub 9 pin male connector

1 N.C.
2 Transmit data
3 Receive data
4 N.C.
5 Signal ground
6 Data set ready
7 Request to send
8 Clear to send
9 N.C.

Inside of the EJ

The interface is designated as DCE (Data Communication Equipment).

Data format

S	T	,	+	0	0	0	0	0	.	0	0	␣	␣	g	C$_R$	L$_F$

Header   Data   Unit   Terminator

Separator   ("␣" shows a space.)
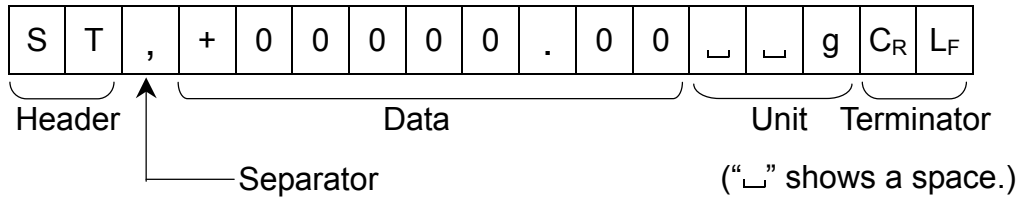
❑ There are four types of headers:
  ST : Stable weighing data (including % data)
  QT : Stable counting data
  US : Unstable weighing data (including count and %)
  OL : Out of weighing range (Over)

❑ The data is normally 9 digits including a decimal point and a sign.

❑ There are 14 types of units:
  ␣␣ g : Weighing data "gram"
  ␣ P C : Counting data "pcs"
  ␣␣ % : Percentage data "%"
  ␣ o z : Weighing data "decimal ounce"
  ␣ l b : Weighing data "decimal pound"
  o z t : Weighing data "troy ounce"
  ␣ c t : Weighing data "carat"
  mom : Weighing data "momme"
  d w t : Weighing data "penny weight"
  ␣GN : Weighing data "grain"
  ␣␣ N : Force data "Newton"
  ␣ t l : Weighing data "tael"
  ␣␣ t : Weighing data "tola"
  ␣DS : Calculated density (specific gravity) value

❑ The terminator is always C$_R$L$_F$.

❑ Example of output data:

Weighing data "gram"

S	T	,	+	0	0	1	2	3	4	.	5	␣	␣	g	C$_R$	L$_F$

Counting data

Q	T	,	+	0	0	0	1	2	3	4	5	␣	P	C	C$_R$	L$_F$

Percentage data

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

Out of range "gram" (+)

O	L	,	+	9	9	9	9	9	9	.	9	␣	␣	g	C$_R$	L$_F$

Out of range "pcs" (-)

O	L	,	-	9	9	9	9	9	9	9	9	␣	P	C	C$_R$	L$_F$

Data output mode

❑ Stream mode

Set the function "Prt 0".
The balance outputs the current display data. The data-update rate is approximately 10 times per second. This rate is the same as the display-update.
The balance does not output data while it is in the setting mode.

❑ Key mode

Set the function "Prt 1, 2 or 3".
When the   PRINT   key is pressed while the weighing data is stable (the STABLE indicator is on), the balance transmits the data. When the data is transmitted, the display will blink one time.

❑ Auto-print mode A

Set the function "Prt 2".
The balance transmits the weighing data when the display is stable (the STABLE indicator is on) and the data is greater than +4d.
The next output can be obtained after the display returns below +4d.

❑ Auto-print mode B

Set the function "Prt 3".
The balance transmits the weighing data when the display is stable (the STABLE indicator is on) and the data is greater than +4d or less than -4d.
The next output can be obtained after the display returns between -4d and +4d.

Command mode

In the command mode, the balance is controlled by commands that come from the personal computer and so on.

Command list

❑ Command to request the current weighing data.

| Command | Q | C_R | L_F |

| Reply | S | T | , | + | 0 | 0 | 1 | 2 | 3 | 4 | . | 5 | ␣ | ␣ | g | C_R | L_F |

❑ Command to zero or tare the balance (same as the   RE-ZERO   key).

| Command | Z | C_R | L_F |

| Reply | Z | C_R | L_F |

❑ Command to change the weighing units (same as the   MODE   key).

| Command | U | C_R | L_F |

| Reply | U | C_R | L_F |

9-3. EJ-07 / EJ-08 Underhook

By attaching the underhook to the bottom of the balance, large objects that are difficult to load on the weighing pan can be weighed, and the density (specific gravity) of objects may be measured. Refer to the "9-6. EJ-13 Density Determination Kit" for the information about the density measurement.

❑ *EJ-07 is for use with the EJ-3000 / EJ-4100 / EJ-6100.*

❑ *EJ-08 is for use with the EJ-1500 / EJ-2000.*

❑ *The calibration with a weight being hung on the hook is required for an accurate weighing.*

EJ-07 / EJ-08 Installation

Open the cap on the bottom of the balance, and screw the underhook into the mounting hole.

Remove the cap.

EJ-07   EJ-08
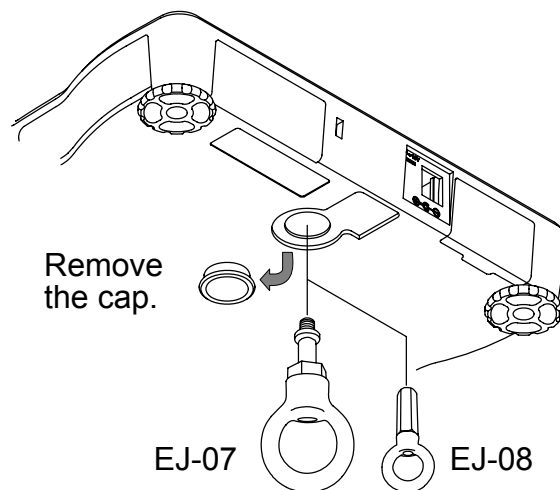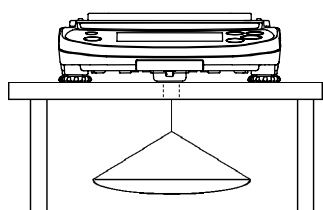
Caution
❑ *Do not apply excessive force to the underhook.*

❑ *When not in use, remove the underhook and attach the cap to prevent dust from getting into the balance.*

9-4. EJ-11 Breeze break

EJ-11 will be used mainly for min. display 0.01 g models. But all of EJ series can use this option unit.

❑ Remove the fixing frame out.
❑ Attach the breeze break frame instead of the fixing frame.
❑ Attach the breeze break to the balance.

Fixing frame

Breeze break

Breeze break frame
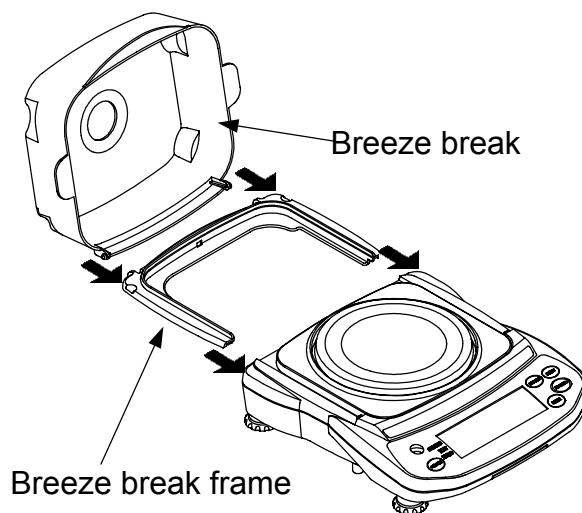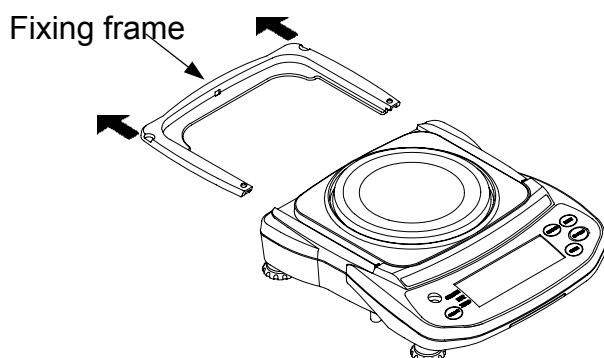
9-5. EJ-12 Carrying case

EJ-12 is available for the convenience of carrying the balance by hand. However, note that because these balances are precision equipment, they will not be able to withstand excessive shock, such as being dropped.

9-6. EJ-13 Density Determination Kit

Using this option and calculation program, the balance can determine the density (specific gravity) of a sample.

EJ-13 Installation

❑ Push the fixing frame out, and remove the weighing pan.

❑ Attach the beaker stand to the balance and fit the pan stand to the pan support of the balance.
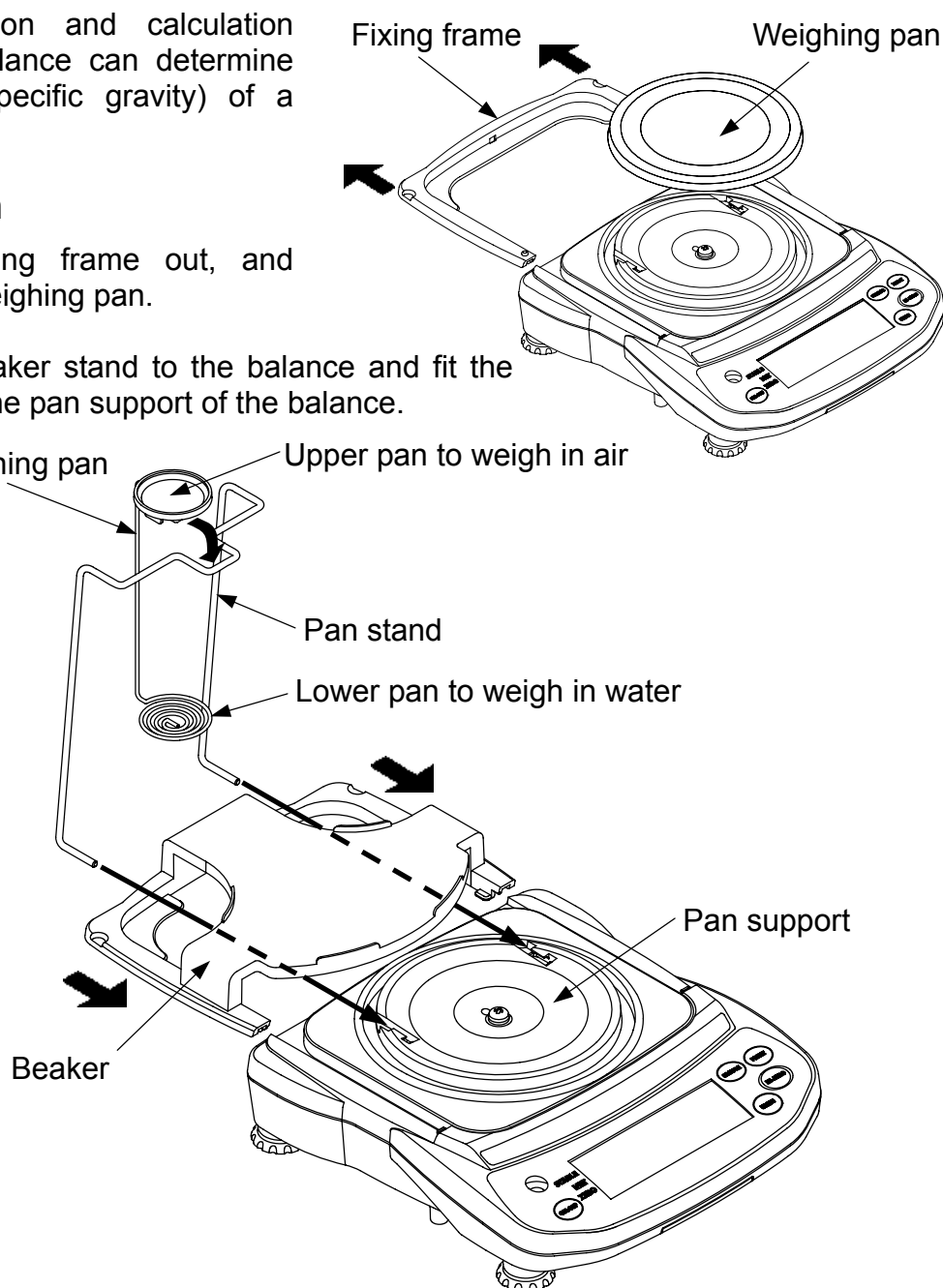
❑ Place a beaker filled with water on the beaker stand and place the sample weighing pan on top of the pan stand.

Density (specific gravity) measurement

❑ The density of a liquid can be changed and there are two ways of setting. One is to set the water temperature and the other is to set density value directly.
❑ The factory setting for density of a liquid is 25 °C as water temperature (the density value $\rho = 0.99704$ (g/cm^3) is used to calculate).
❑ The density (specific gravity) is calculated by the following formula.

$$S = \frac{A}{A-B} \times \rho$$

S: Density (specific gravity) of a sample
A: Weight in air
B: Weight in liquid
ρ: Density of liquid (water)

❑ The result is shown with two decimal places.

Change the function table

Selecting a way to set the density of a liquid

Select the liquid density input method from the function table below. The function table is available only when the density measurement mode is selected.
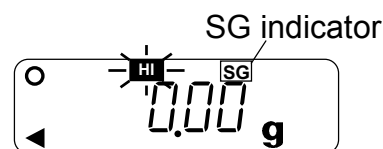
Class	Item	Param-eter	Description	
Func	*Ld in* Liquid density input	◆ *0*	Water temperature	The way to input liquid density.
		1	Liquid density	

◆ Factory setting

Setting the density of a liquid

SG indicator

1. Press the UNITS key to select SG .

2. Press and hold the UNITS key to display liquid density input mode.

   Ld in = 0: Water temperature
   This shows 25 °C.
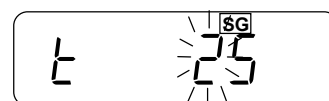
   Ld in = 1: Liquid density
   This shows ρ = 1.0000 (g/cm^3).
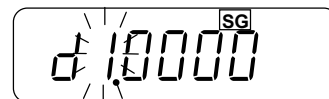
3. Using the RE-ZERO (to increment the value) and SAMPLE key (to shift the selected digit), set the value and press the PRINT key to store.

❑ To cancel the setting procedure and return to the density measuring mode, press the
   UNITS key. The input value is not stored.

❑ The relation between the water temperature and density is shown below.

°C	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9
0	0.99984	0.99990	0.99994	0.99996	0.99997	0.99996	0.99994	0.99990	0.99985	0.99978
10	0.99970	0.99961	0.99949	0.99938	0.99924	0.99910	0.99894	0.99877	0.99860	0.99841
20	0.99820	0.99799	0.99777	0.99754	0.99730	0.99704	0.99678	0.99651	0.99623	0.99594
30	0.99565	0.99534	0.99503	0.99470	0.99437	0.99403	0.99368	0.99333	0.99297	0.99259
40	0.99222	0.99183	0.99144	0.99104	0.99063	0.99021	0.98979	0.98936	0.98893	0.98849
50	0.98804	0.98758	0.98712	0.98665	0.98618	0.98570	0.98521	0.98471	0.98422	0.98371
60	0.98320	0.98268	0.98216	0.98163	0.98110	0.98055	0.98001	0.97946	0.97890	0.97834
70	0.97777	0.97720	0.97662	0.97603	0.97544	0.97485	0.97425	0.97364	0.97303	0.97242
80	0.97180	0.97117	0.97054	0.96991	0.96927	0.96862	0.96797	0.96731	0.96665	0.96600
90	0.96532	0.96465	0.96397	0.96328	0.96259	0.96190	0.96120	0.96050	0.95979	0.95906

Example of density measurement

Selecting the SG measurement mode

Measuring weight in air.   SG indicator

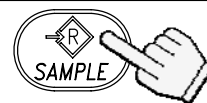1. Press the UNITS key to select SG .
   (The weight unit is "g".)
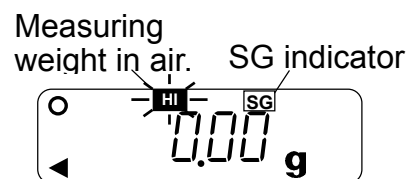
❑ The weighing unit is "g".
❑ The display shows that HI blinks and the balance is measuring weight in air.
❑ When the display does not show zero, press the RE-ZERO key to set the display to zero.

2. Place a sample on the upper pan.

3. Wait for the STABLE indicator to be displayed and press the | SAMPLE | key to store the weight in air.
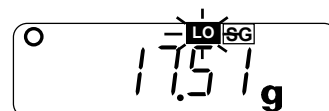
Measuring weight in water.

4. The display shows that **LO** blinks and the balance starts to measure weight in water.
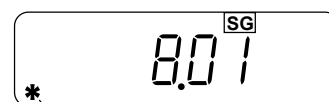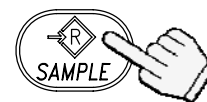
5. Place the sample on the lower pan in water.

❑ Adjust the amount of water so that the sample is about 10 mm below water surface.

6. Wait for the STABLE indicator to be displayed and press the | SAMPLE | key. Then the balance reads the weight in water and shows the density (specific gravity) of the sample.
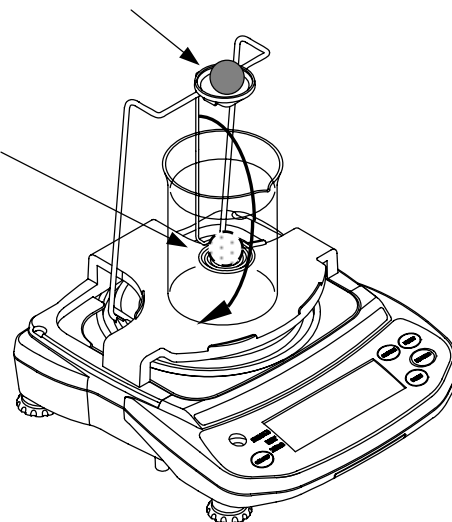
The display shows the density.

7. To continue the specific gravity measurement, press the | SAMPLE | key again. To exit this measurement, press the | UNITS | key.

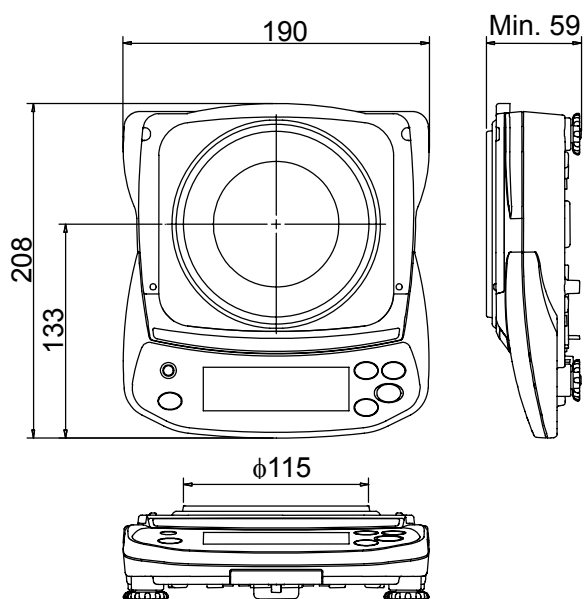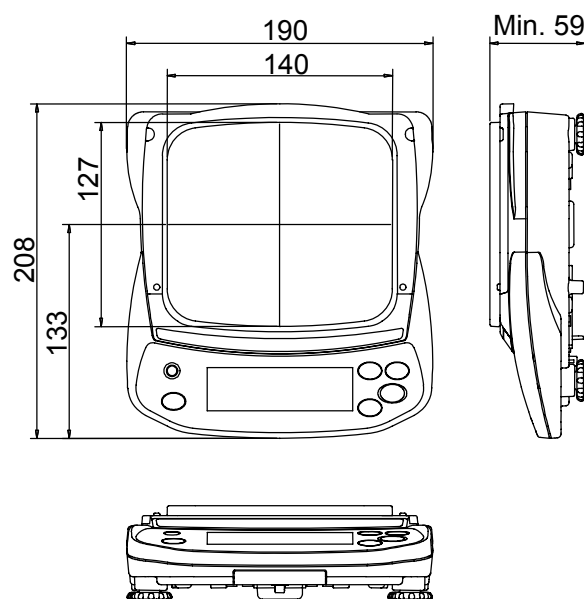To weigh in air.

To weigh in water.

12-3. Options

EJ-02   USB interface
EJ-03   RS-232C interface
EJ-07   Underhook for EJ-3000 / EJ-4100 / EJ-6100
EJ-08   Underhook for EJ-1500 / EJ-2000
EJ-11   Breeze break
EJ-12   Carrying case
EJ-13   Density Determination Kit for EJ-120 / EJ-200 / EJ-300 / EJ-410 / EJ-610

12-4. Dimensions

EJ-120 / EJ-200 / EJ-300
EJ-410 / EJ-610

EJ-1500 / EJ-2000 / EJ-3000
EJ-4100 / EJ-6100

Unit: mm