GAM Series

Operation Manual

Instructions

- To ensure safe and proper use of the balance, please read this manual carefully.
- After reading this manual, store it in a safe place near the balance, so you can review it as needed.

Preface

Thank you for purchasing a Precision Balance GAM series. This product is a dust-/water-proof type electronic balance for light and heavy industry, R&D and laboratory purpose.

The GAM series also provides enhanced functions, including a counting mode for stock control of parts, a percentage mode for comparative measurements given in percentages, and a comparator function.

About This Document

This document describes how to operate the product.

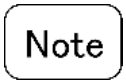
If the product is equipped with options/accessories, refer manuals of the respective option/accessory manuals in addition to this manual.

■ Notations used in this document

This product/ The product/ The balance	Refers to the product.
[KEY NAME] key	The name of an operation key located on the indicator unit is represented in square brackets “[ ]”.
<MESSAGE>	A message on the display is represented in angle brackets “< >”.
Press the key	Signifies pressing shortly an operation key once.
Press and hold the key	Signifies keeping pressing an operation key until the designated indication/operation occurs.

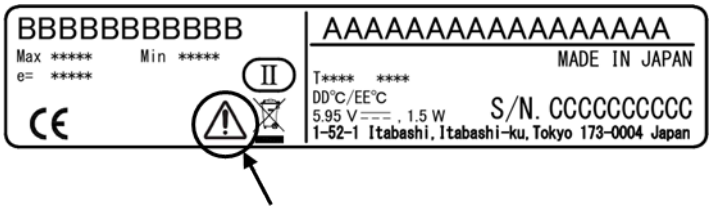
■ Symbols used in this document

Understand the meaning of the following symbols and observe the instructions of this document.

Symbols	Meaning
	Used for the situation that invites an imminent risk of death or severe injury if proper precautions are not taken.
	Used for the situation that invites a risk of death or serious injury if proper precautions are not taken.
	Used for caution concerning operations that may lead to a light physical injury to persons if proper precautions are not taken.
	Used for notation concerning operations that may lead to damage of the products/facilities/data if proper precautions are not taken. Used for accurate weighing and appropriate usage of the equipment.
	Used for reference information on operation.
	Used for “Prohibition” items.
	Used for “Mandatory” items requiring positive action.
	Used for prohibition items to avoid “Electrical shock”.
	This symbol indicates the operation/specification related to verified balance for legal metrology purpose.

Precautions and Disclaimers

- Potential dangers are increasing in the industrial equipment industries due to the advent of new materials and processing methods, and speeding up of machines. It is impossible to foresee all situations related to these dangers. In addition, there are so many “impossible” and “don’ts” and so writing all of them in the operation manual is impossible. Therefore, it is safe to think that what is not written in the operation manual “cannot be performed” unless the operation manual positively writes “it is possible.” When performing installation, operation, maintenance or inspection of this product, not only observe what is written or indicated in this document or on the product surface but also pay adequate consideration to safety measures.
- It should be known that this product contains potential danger. And so please be sure to observe this document when installing, operating or servicing this product.
- If the product is used in a manner not specified by the manuals or other accompanying documents, the protection provided by the product may be impaired.
- Dini Argeo will not take any responsibility for any injury or damage caused by the non-observance of this document or misuse or unauthorised modification
  of this product.
- Trouble related to the product or system will be dealt with in accordance with the individual maintenance contract. Please note, however, that we will not take responsibility for consequential trouble such as discontinuation of operation caused by the product trouble.
- For any questions or further information concerning this product, please contact the store where you purchased the product.
- The following symbol on the product's name label indicates that the user must carefully read and follow the safety instructions provided in this operation manual.



■ Safety precautions

DANGER

	■Do not wet the AC adaptor. That may cause an electric shock, short-circuiting or failure.
	■Do not expose the AC adaptor to dust. That may cause an electric shock, short-circuiting or failure.
	■Do not handle the AC adaptor with wet hands. That may cause an electric shock, short-circuiting or failure.
	■Do not use the scale in explosive atmosphere. That would cause explosion or fire. Please order our explosion-proof scales to weigh in such a hazardous area.
	■Obey the SDS of the object to be weighed. Measuring dangerous materials such as flammable liquid could cause an explosion or fire.

WARNING

	■Do not disassemble or modify the product. Doing so could result in injury, electric shock, fire and other accidents or failures. For inspection, adjustment, and repair, contact the dealer where you purchased the product.
	■Do not move the product with objects to be weighed set on the balance. That may cause the objects to fall from the weighing pan, leading to a bodily injury or destruction of the objects.
	■Do not route the cables across passages. The cables could be tripped on by a passerby and the balance could fall down and break or injure someone.
	■Do not use the product on an unstable table or a place that is subject to vibration. That may cause the object to fall from the weighing pan, leading to a bodily injury or destruction of the object.
	■Do not place unstable objects on the weighing pan. That may cause the objects to fall or topple over, leading to a bodily injury or destruction of the objects. Put unstable objects in a container (tare) before measuring it.
	■Do not use the product in an abnormal condition. If it should happen that an abnormal event such as smoking or unusual odour occurs, ask the store where you purchased the product or our sales department for repair. Keeping using the product may result in an electric shock or fire. In addition, do not ever try to repair it for yourself, or very dangerous situation is likely to occur.
	■Only use the dedicated AC adaptor. Use of other types of power or adaptors may result in electric shock, heat generation, or malfunction of the balance.

CAUTION

	■Do not mix old and new batteries, or batteries of different types or manufacturers.
	■Do not use the batteries that leak.
	■Observe the precautions printed on the batteries used.
	■Make sure insert batteries with the positive and negative poles correctly inserted and be careful of short circuits. If not, batteries may be damaged, leading to harmful liquid leakage or rupture.

Note

	■Do not apply excessive force to or impact the balance. Doing so could damage or result in failure of the balance. Carefully place samples on the balance.
	■Do not use volatile solvents to clean the resin part of the balance. The resin parts of the balance could deform.
	■Do not scratch or make a hole in the panel surface (display, operation keys). Water and dust may enter and result in failure of the balance.
	■Do not connect to the AC adaptor cord or communication cable with its connector or jack being wet. That may cause short-circuiting or failure.
	■ If the balance is not going to be used for a long time, store it with the batteries removed.
	■Unplug the AC adaptor from the receptacle when the balance is not going to be used for a long period of time. Unplug the balance from the receptacle to save energy and prevent degradation.
	■Install and clean in accordance this manual to maintain IP65. To prevent ingress of water or dust into this product, installation / cleaning shall be done in accordance with conditions described in this manual.

Regulatory Information

■For legal metrology

When this product is used for legal metrology purpose, it is subject to the regulations of the metrology-related laws and regulations of your country and may be subject to initial and/or periodic verification. Please contact your local dealer for details.

■Electromagnetic compatibility

(1) This product is compliant with EN 61326-1:2013 and IEC 61326-1:2020 (EN IEC 61326- 2021).

・Emission: Class B Group 1 equipment.

- "Group 1 equipment" contains all equipment in the scope of CISPR 11 which is NOT classified as ISM RF equipment in which radio-frequency energy in the frequency range 9 kHz to 400 GHz is intentionally generated and used.
- Class B equipment is suitable for use in locations in residential environments and in establishments directly connected to a low voltage power supply network which supplies buildings used for domestic purposes.

・Immunity: Intended to be used in "Industrial electromagnetic environment".

Industrial electromagnetic environment: environment existing at locations characterised by a separate power network, in most cases supplied from a high- or medium-voltage transformer, dedicated for the supply of installations feeding manufacturing or similar plants with one or more of the following conditions:

- frequent switching of heavy inductive or capacitive loads;
- high currents and associated magnetic fields;
- presence of Industrial, Scientific and Medical (ISM) equipment (for example, welding machines)

Please refer to "Appendix 2-2 Functional specifications" for the Performance Level and the Permissible Loss of Performance.

This product may subject to LOSS OF FUNCTION due to some of electromagnetic interference. Please refer to "Appendix 1 Specifications" for information on the nature of the LOSS OF FUNCTION, the electromagnetic interference that may cause it and the recovery process.

・Follow the respective instructions in this document for the connection and other conditions for EMC compliance.

(2) FCC Note

(2-1) This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(i) This device may not cause harmful interference, and

(ii) this device must accept any interference received, including interference that may cause undesired operation.

(2-2) This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radiocommunications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

(2-3) Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

■ Ingress Protection

This product, except the dedicated AC adaptor, complied with the following degrees of protection provided by enclosures (IP code) under proper assembly, installation, and operation as described in this document.

IP 6 5 (Indicator unit, Weighing unit with weighting pan)

Second characteristic numeral

・Degrees of protection against ingress of water:
Protected against water jets (Water projected in jets against the enclosure from any direction shall have no harmful effects)

First characteristic numeral

・Degrees of protection against access to hazardous parts and against solid foreign objects:

- Dust-tight (No ingress of dust)
- Protected against access to hazardous parts with a wire

Code letters

■For proper disposal

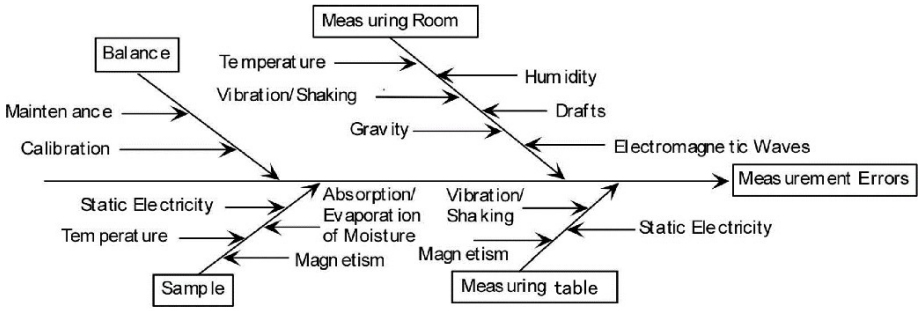
This product including accessories may not be disposed of in domestic waste in conformance with the specific requirements in your country, such as the European Directive 2012/19/EU on waste electrical and electronic equipment (WEEE). When you dispose of this product, please contact your local authorities or dealer and ask for the correct method of disposal.

■Packaging waste

Dispose of all the product packaging in accordance with your local regulations, if any.

For More Accurate Measurement

To make more accurate measurement, it is necessary to lessen error-causing factors in measurement to the extent possible. Error-causing factors include not only an instrument error and performance of the balance itself but also the nature and condition of a specimen, measuring environment (vibration, temperature, humidity, etc.) and the like. These factors will directly affect measurement result in the case of a balance with high resolution capability.



Meas urement Errors

Precautions related to measuring environment:

Temperature/ humidity/ atmospheric pressure	→	Try to keep the room temperature constant to the extent possible in order to avoid condensation and indication drift due to change in temperature.
	→	Low humidity is likely to cause generation of static electricity, resulting in inaccurate measurement.
	→	Change of atmospheric pressure is likely to cause change of buoyancy of the air on the specimen, tare and mechanism of the balance, resulting in inaccurate measurement.
Vibration/shaking	→	It is preferable to locate a measuring room on the ground floor or the basement. The higher the room is, the larger the vibration and shaking become. Therefore, a highly located room is not suitable for measurement. Rooms near the railway or roadside should also be avoided.
Air draught	→	Places directly exposed to air current from an air-conditioner or to direct sun generate abrupt temperature change and resultantly cause unstable weight indication, and therefore, should be avoided.
Gravity	→	The latitude and altitude of a measuring location differentiate the gravity that affects a specimen, giving a different weight indication to the same specimen.
Electromagnetic wave	→	At a location where a strong electromagnetic wave generating object is in the proximity of a balance, the balance is affected by the electromagnetic wave, making the balance unable to indicate accurate weight, and therefore, such a location should be avoided.
Magnetic field	→	Avoid placing the device near sources of strong magnetic fields such as motors, generators, magnetic stirrers, or electromagnetic feeders, as these can interfere with accurate weight measurements.

Precautions related to measuring table:

Vibration/shaking	→	Vibrations during measurement destabilises the indication of measurement value, leading to inability to make accurate measurement. And so use of a measurement table that is robust and hardly affected by vibration is required (a vibration-proof structured table or concrete or stone-made table is suitable). In addition, placing a sheet of soft cloth or paper under the balance causes shaking or makes keeping horizontal attitude difficult, and therefore should be avoided. → The measurement table should be installed in a position free from vibration to the extent possible. A corner rather than the centre of a room is less affected by vibration and therefore more suitable for installation of the balance.
Magnetism/Static electricity	→	Use of the balance on the table that is subject to magnetism or static electricity should be avoided.

Precautions related to a specimen:

Static electricity	→	In general, synthetic resin- and glass-made specimens are high in electric insulation, and so easily charged electrically. Weighing an electrically charged specimen makes the indication value unstable, reducing the reproducibility of the test result. Therefore, neutralise an electrically charged specimen before measurement.
Magnetism	→	Specimens affected by magnetism show different weight in a different position of the weighing pan, reducing the reproducibility. When weighing a magnetised specimen, either eliminate the magnetism from the specimen or place a setting plate on the weighing pan to distance the specimen from the weighing mechanism of the balance so that the mechanism may not be affected by the magnetism.
Moisture absorption/ Evaporation	→	Measuring a moist or evaporating (vaporising) specimen increases or decreases the indication value of the balance continuously. When this is the case, put the specimen in a container equipped with a small mouth and closely seal the mouth before measurement.
Specimen temperature	→	If the temperature of the sample is extremely high or low, allow it to acclimatise to room temperature before measurement. - If the temperature of the sample differs from that of the surrounding air, air convection around the sample may occur, resulting in measurement errors.

Precautions related to the balance:

Operating precautions	→ A dust cover, if equipped, for the balance may possibly make the weight indication unstable due to static electricity charged on the cover at a low humidity. When this is the case, wipe the cover with wet cloth or use antistatic agent or use the balance with the cover removed. → For more stable measurement, it is recommended to energise the balance for longer than 30 minutes and load the balance a few times with a weight equivalent to the maximum capacity (Max) before measurement.
Calibration	→ Calibrate the balance periodically with an external calibration weight. For the sake of precise calibration, use an external calibration weight weighing nearly equal to the maximum capacity (Max) of the balance. → Energise the balance for longer than 30 minutes and load the balance a few times with a weight equivalent to the maximum capacity (Max) before calibration. → Calibration is also needed in the following cases: When using the balance for the first time, When using the balance after a long period of non-use, When changing a place of installation, and When there was a large change in temperature, humidity or atmospheric pressure.
Maintenance	→ Attachment of dirt such as powder or liquid to the weighing pan or pan base will cause measurement error or unstable weight indication. For that reason, frequent cleaning of the balance is required. In cleaning the balance, take care for the dust or liquid not to enter into the balance.

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Chapter 1

How to Begin

This chapter describes the operations required before using the balance, starting from assembling the balance to turning the power switch on and off.
Before your first use of the balance, be sure to read this chapter.

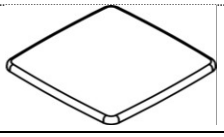
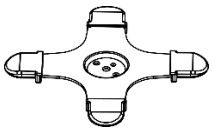
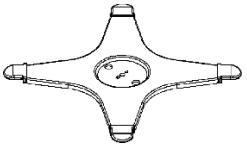
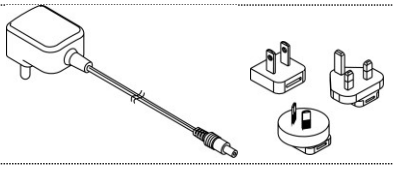
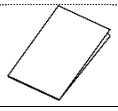
This chapter includes:

Checking Supplied Items
Names and Functions of Component Parts
Workings of Operation Keys
How to Read Displayed Signs
Assembling and Installing the Product

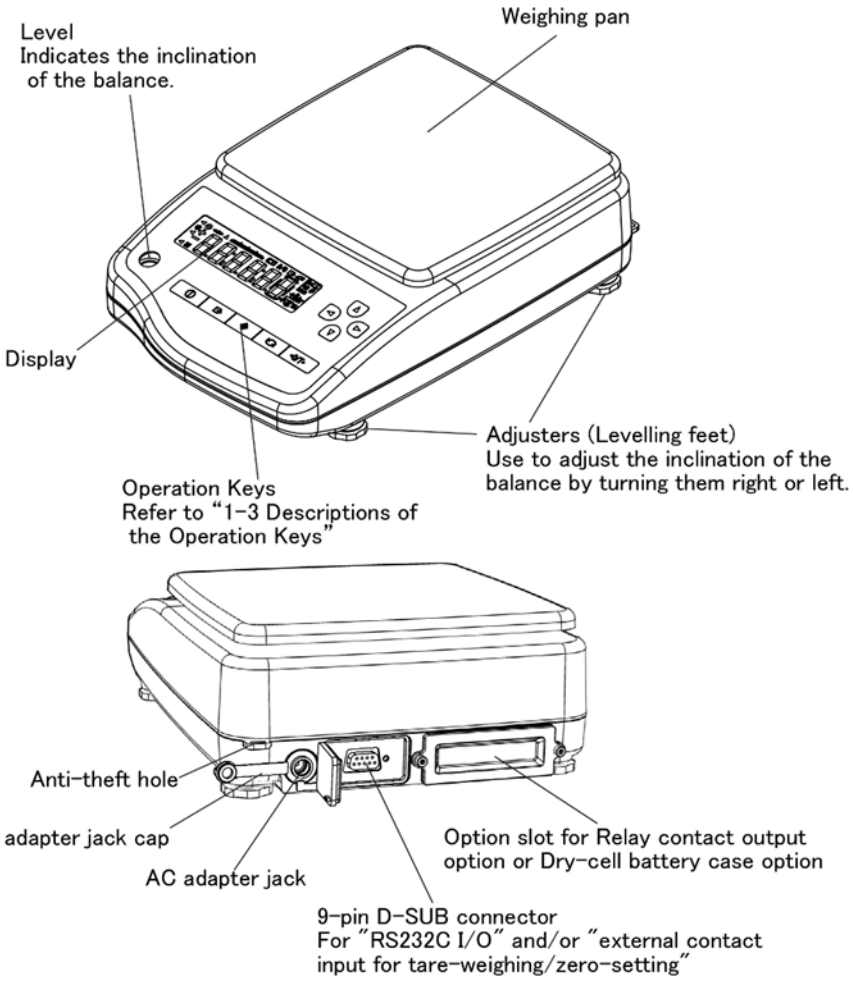
1-1 Checking Supplied Items

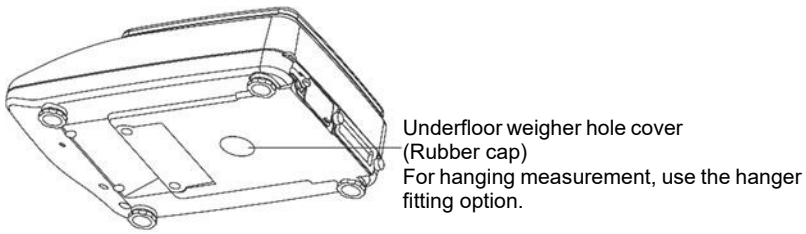
The following items are contained in the box.

In the unlikely event of problems such as missing or broken items, please contact the dealer where you purchased the balance.

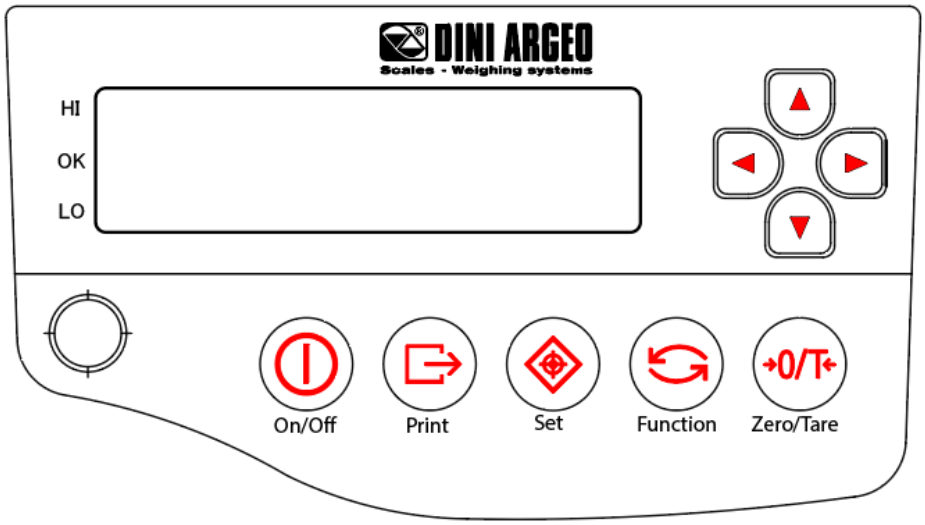
Models with a capacity of up to 820 g	Models with a capacity of 2200 g and over
(1) Main unit	
	
(2) Weighing pan	
	
(3) Pan base	
	
(4) Pan base screw	
	
(5) AC adaptor and AC plug set (optional)	
	
(6) Operation manual	
	

1-2 Names and Functions of Component Parts





1-2-1 Descriptions of operation keys



Operation key		Examples of functions
⏻	[On/Off] key	Press (shortly): power on Press and hold down: power off
⎆	[Output] key	- Initiates output. - Used to cancel the various settings.
◈	[Set] key	Press (shortly): Used to confirm the function setting at basic function setting mode and advanced function setting mode. Press (shortly): Used to perform addition when addition function is activated. Press and hold down: Starts the setting of thresholds when the comparator function is enabled. Press and hold down: Starts the setting of interval time when nterval output is enabled.
⟲	[Function] key	Press (shortly): Switches the indication. Press (shortly): Used to enter numerical values. Press and hold down: Invokes basic function setting mode. Press and hold down: Invokes calibration sequence.
→0/T←	[Tare] key	Press (shortly): Used for tare weighing. Press (shortly): Used to change the function setting value at basic function setting mode and advanced function setting mode. Press and hold down: Used for zero-setting. Note: Unlike the pictogram →0/T←, the [Tare] key does not operate as combined semi-automatic zero-setting and semi-automatic tare-balancing, but as tare weighing by short press and zero setting by long press.
▲◄►▼	Direction keys	The arrow keys function in the same way as the [Function] key or the [Tare] key when you set functions or enter numerical values. Press the down arrow key :Invokes calibration sequence.

1-3 How to Interpret the Display

■ Description of segment

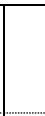
Displayed sign	Description
◎	Stable state indicator (Indicates that readout is stable.)
◁	- Indicates the judgement result of the comparator function. - Lights up together with other symbols in some modes/functions.
▷	- Indicates the response speed when the balance is in animal mode. - Lights up together with other symbols in some modes/functions.
✻	Indicates addition available status when the adding function is used.
▭	Minus sign
M	Indicates that the balance is in processing.
⇨0⇦	Zero-point indicator.
	Bar graph. - Shows the rate of gross weight to the maximum capacity (Max). - Shows judgement result of comparator function.
	Displayed when the balance is powered by batteries. Remaining battery time is indicated in three levels. When this indicator blinks, the batteries are dead.
B/G	Indicates that gross weight is being displayed.
	Indicates that data is being output.
	Indicates that the balance is in animal mode.
Net	Indicates that the tare weight is being subtracted and net weight is displayed.

Σ	Lights up when sum totals are displayed (shared use together with other readout units) when the addition function is used.
Pcs	Indicates that the balance is in counting mode.
#	Indicates that the balance is in coefficient mode.
%	Indicates that the balance is in percentage mode.
◁(Upper) and △	Lights up when device ID is being displayed or entered.
g	gram
kg	kilogram
	- Lights up to indicate each weighing unit. (Refer to “Appendix 4-3 Display, readability and capacity by each unit of weighing” for indication of each unit.) - Lights up in some modes/functions

Legal Metrology

The animal symbol is not displayed on certified models on verified scale.

■ 7-segment LCD character font

										
A	b	C	c	d	E	F	G	H	I	J
										
L	M	n	o	P	r	S	t	u	W	y

1-5 Assembling and Installing the Product

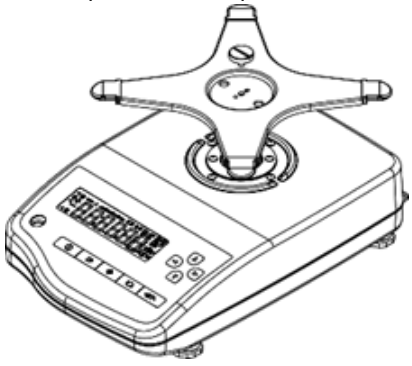
⚠ DANGER	**Risk of electric shock and fire.** The dedicated AC adaptor is not waterproof nor dust-proof. Do not install it where it will be exposed to water or dust.

Note	(1) This product meets IP65 only when: - The pan base and weighing pan are installed; and - AC adaptor jack cap is closed; and - Underfloor weigher hole cover is closed; and - The connector cover is closed, or specified water/dust-proof cable is connected; and - The balance is placed upright on the flat surface and water jet is not hit the bottom surface directly; and - The cover of the option slot is closed, or Dry-cell battery case option is adequately installed; and - Relay contact output option is not installed. (2) It is not possible to prevent water ingress into the balance by direct water jet when: - The pan base and weighing pan are not installed; or - The balance is not placed upright on the flat surface and the bottom surface can be suffered to water jet directly.

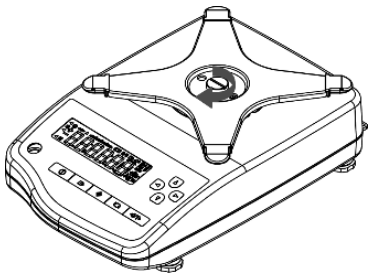
Reference	When connecting to an external device via the D-SUB9P connector, use an optional water-/dust-proof-type serial cable in order to maintain IP65. Please contact your local dealer for the optional cable.

(The same assembly procedure applies to round dish type.)

1 Attach the pan base and pan base screw.



Place the pan base by aligning it to the bosses provided on the main unit.
There is no specific up or down orientation when attaching the pan base.
Then attach the pan base screw and tighten it using a tool such as a coin to fix the pan base.



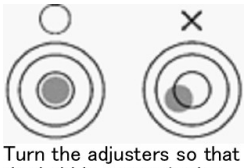
2 Attach the weighing pan.

Place the weighing pan on the pan base.

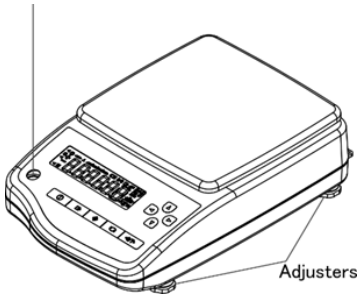
3 Put the AC plug to the AC adaptor, then connect the AC adaptor.

Open the AC adaptor jack cap and firmly insert the DC plug of the AC adaptor.

4 Level the balance



Turn the adjusters so that the bubble enters in the centre circle



By using the level indicator provided on the front of the main unit and the adjuster provided on the bottom, the inclination of the main unit can be corrected and checked.

- Start with the adjuster at the shortest position and make adjustments little by little.
- Making adjustments using the other adjuster located on the other side as a pair while observing the level helps to level the balance.
- After the air bubble in the level is within the circle, push the four corners of the balance to check that there is no play.

1-6 Calibration protection

1) Turn the balance.
2) Remove the white label. (the cover is in the red square of the photo.)
3) Use a screwdriver to move the switch in the hole shown in the picture and you hear a click.

- Inside there is this switch, locate it with a screwdriver, then take it with a slight lateral shift in the opposite position.

Chapter 2

Basic Operation

This chapter describes how to operate basic measuring functions.

This chapter includes:

Powering On/Off the Balance and Checking

Operation Zero-point Adjustment

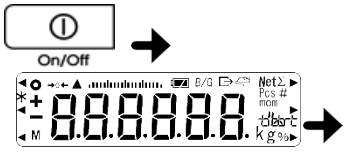
Weighing by Placing a Sample in a Container

(Tare) Weighing an Added Sample

Displaying the Sum of the Container and the Sample (Gross)

2-1 Power On/Off the Balance and Checking Operation

1 Turn the power on.



Make sure that nothing is placed on the weighing pan.

Press the [On/Off] key.

Check for a full display and ensure no segments are missing.

After the self-check, initial zero adjustment is performed, and the device starts up in measurement mode.

Zero is shown in the display after all indicators light up.

Reference

If there is an external disturbance such that the scale cannot initialise or if there is something on the weighing pan when the power is turned on, “on 0” will blink continuously. Remove the object from the weighing pan and when the scale stabilises the scale will switch to weight display.

2 (Recommended) Warm-up the scale.

For more accurate and stable measurements, a warm-up period of at least 30 minutes with the scale switched on is recommended.

Note

Ensure that <1C AUTO OFF > (Auto power-off) is set to “0” (Disabled) before warming-up. (cf. “7-2 Auto power-off”)

3 Preload the scale.

For accurate and stable measurements/calibration, perform several preloads with the load near the maximum capacity.

At this time, also check whether the displayed value changes.

4 Perform measurement operations.

5 Turn the power off.

Press and hold down the [On/Off] key.
The display lights out.

Reference - The status of the balance obtained when the power is turned on is the measuring mode that was used before the power was turned off. For example, if the power is turned off in counting mode, the balance is started up in counting mode when the power is turned on.

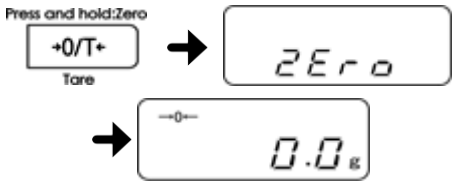
Zero Setting

Adjusting the indication to zero is called "Zero setting".

1 Unload the balance.

Make sure that nothing is placed on the weighing pan.

2 Execute zero-point adjustment.



Press and hold down The [Tare] key.
The readout becomes zero, and < ⇨0⇦ > is displayed (zero-point adjustment).

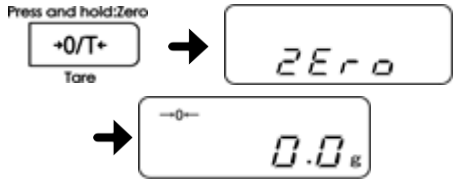
2-2 Tare device

When measuring weight with the sample in a container (tare), only the sample is weighed by subtracting the weight of the container. This is called “tare” or “tare subtraction”.

1 Unload the balance.

Make sure that nothing is placed on the weighing pan.

2 Execute zero-point adjustment.

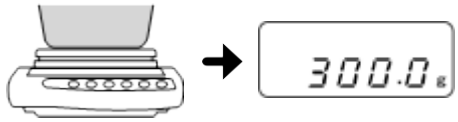


Press the [Tare] key.
The readout becomes zero, and < ⇨0⇦ > is displayed (zero-point adjustment).

Note

This operation is important for accurate tare weighing afterwards.

3 Place the container on the weighing pan.

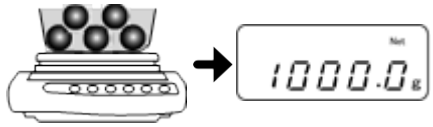


The weight of the container is displayed.

4 Execute tare subtraction.

Press the [Tare] key.
The readout becomes zero, and < ⇨0⇦ > and <Net> are displayed (tare subtraction).

5 Place the sample in the container.



The weight of only the sample is displayed.

Reference

(1) The tare range is from over 0 g of the weighing capacity up to the full capacity. Values exceeding the weighing capacity cannot be tared.
When the tare (container) weight is light, zero-point adjustment works instead of tare subtraction.
(2) When tare subtraction is performed, the weighable range is reduced by the weight of the tare.
Weighable range = Maximum capacity (Max) – tare weight
(3) In weight measurement mode, pressing the [Function] key several times allows you to switch to the gross weight display (sum of tare weight and net weight). During gross weight display, the <Net> indicator turns off and the <B/G> indicator lights up instead.
A gross weight can only be displayed when the measuring mode is “Weighing mode”.
(Refer to “4-1 Display Switching and Additional Functions of Each Measuring Mode”)
(4) Tare operations cannot be performed while in gross weight display mode.
(5) While the <Net> indicator is lit and net weight is displayed, if you replace the container and press the [Tare] key, the display will reset to zero with the <Net> indicator remaining lit. The tare value will be overwritten and replaced with the weight of the new container.

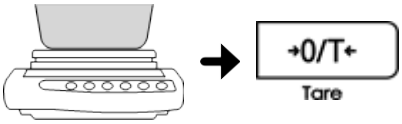
2-3 Displaying the Sum of the Container and the Sample

The sum weight of the sample and the container is displayed (gross readout).

Reference

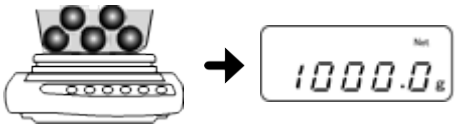
- A gross weight can only be displayed when the measuring mode is “Weighing mode”. (Refer to “4-1 Display Switching and Additional Functions of Each Measuring Mode”)
- When the tare (container) weight is light, zero-point adjustment may be made instead of tare subtraction, in which case the sum of the tare weight and the sample weight cannot be indicated.

1 Place the container and then execute tare subtraction.



Place the container and press the [Tare] key.
The tare is subtracted, and the readout becomes zero.

2 Place the sample.



The weight of only the sample is displayed (net readout).

3 Display the sum (gross readout).

Press the [Function] key.
The sum weight of the container and the sample is displayed (gross readout). When a gross weight is displayed, <B/G> lights up instead of <Net>.
Pressing the [Function] key toggles the display between gross and net.

[Function] key

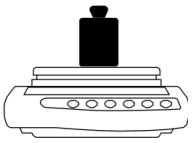
2-4 Weigh the Sample (Weighing Mode)

Weighing mode is the basic mode for weighing.
For other measuring modes, please refer to “Chapter 3 Measuring Modes and Additional Functions”.

1 Ensure that the balance is in weighing mode in the intended weighing unit.

Ensure that the balance is in weighing mode in the intended weighing unit.
If not, switch the measuring mode by referring “4-2” and switch the weighing unit by referring “4-5”.

2 Preload the balance.



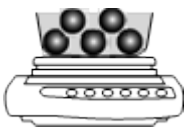
Pre-load the balance several times with a load near the maximum capacity of the balance.

3 Execute zero-point adjustment and/or tare subtraction as appropriate.

If necessary, place the tare item on the scale and press the [Tare] key to perform tare subtraction. (The display will show Net zero)

If you are not using a tare, ensure that nothing is on the weighing pan. If the <→0←> symbol is not displayed, press the [Tare] key to perform a zero adjustment.

4 Load the sample to be weighed.



The balance will indicate the weight of the sample loaded.

5 Read the indication.

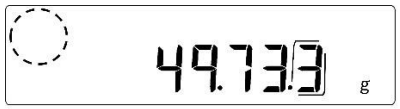
Read the indication when the balance reaches stable and the stable state indicator <◎ > appears.

Reference

1. The bar graph shows the current gross load status with respect to the maximum capacity of the balance.
   * Even when the display currently indicates zero with the tare subtracted, the weight corresponding to the subtracted tare is indicated on the bar.

- When the balance remains stable, the stable state indicator <◎> remains on. If the balance becomes unstable, the stable state indicator <◎> will disappear.

When a displayed value flickers or the stable state indicator flashes on and off, it is likely that the balance is being affected by wind, vibrations or other environmental factors. Use the windshield or vibration dampers to mitigate such adverse effects. Otherwise, refer to “7-4 Settings According to the Measurement Environment” to adjust the balance settings.



Unstable

Stable

- When the zero-point adjustment is executed or the tare is subtracted, the balance indicates zero and <⇨0⇦ > indicator appears. (When the tare is subtracted, the <Net> indicator also appears.)

When the measurement value deviates from the true zero point by 1/4 of the actual scale interval or more, <→0←> disappears.

When the zero-point adjustment is executed or the tare is subtracted, the balance indicates zero and <→ 0 ←> indicator appears.

- When the tare is subtracted, the measurable range is reduced. Measurable Range = Maximum Capacity - Tare Weight
- If <o-Err> appears when a sample is loaded, the gross weight exceeds the capacity of the balance.
- If <u-Err> appears
- Pressing the [Function] key switches the display to gross weight etc. (Refer to “4-1 Display Switching and Additional Functions of Each Measuring Mode”)

Chapter 3

Function Settings

This chapter includes:

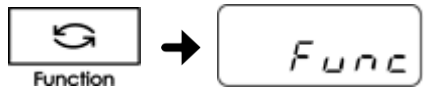
Setting of Functions
Function setting list

3-1 Setting of Functions

This product has two types of function setting modes: “basic function setting mode” and “advanced function setting mode”.
This section describes the basic key operations of function setting.

■ Basic function setting mode

1 Launch the basic function setting mode.



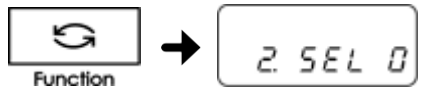
(Press and hold)

Press and hold the [Function] key until the display changed to <Func>.
The first function item is displayed.

Reference

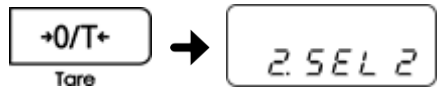
(1) Depending on measuring mode, the display may switch to another indication before it reaches <Func>. In such a case, it can still be reached to <Func> by keeping pressing [Function] key.
(2) Keeping the [Function] key held down after <Func> appears will switch the balance to another mode. If this happened, press the [Output] key to cancel the setting and redo this procedure from the beginning.

2 Select a function item.



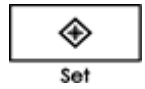
Press the [Function] key to select a function item to be set.
Example: By pressing the [Function] key once, select <2.SEL> (additional functions for measurement). The first setting <2.SEL 0> is displayed.

3 Select a setting.



Press the [Tare] key to select a setting.
Pressing the key toggles the settings in turn. After the last setting is displayed, the next setting displayed is the first one.
Example: By pressing the [Tare] key twice, select <2.SEL 2>.

4 Save the setting.



Press the [Set] key to complete the setting.
The balance returns to measuring mode.
To cancel, press the [Output] key.

Reference

- Pressing the [Output] key during function setting cancels the setting and returns to measuring mode.
- To initialise the function setting, refer to “Section 7-5 Initialising”.
- Function setting is also possible with the direction keys.
After switching to the basic function setting mode with step 1, use the direction (arrow) keys to change setting items and settings.
To complete the setting, press the [Set] key.

Previous menu

3-2 Function Setting List

■ **Basic function setting mode**

☆: default factory settings

Item		Set value		Description
Measuring mode		1. SEt.	☆1	Weighing mode
			2	Countin mode
			3	Percentage mode
			5	Specific gravity mode
			6	Animal mode
Displayed when <1. SEt.> (Measuring Mode) is set to “5” (Specific gravity mode).	Media	11. MEd.	☆0	Water
			1	Any liquid other than water
	Output data	12. d.o.d.	☆0	Only specific gravity of the sample is output
			1	Specific gravity, weight, and water temperature or specific gravity of the medium liquid
	Auto output	13. A.o.	☆0	Disabled (Manual output by [Output] key)
			1	Enabled (Automatic output each time a specific gravity measurement is completed)
Displayed when <1. SEt.> (Measuring Mode) is set to “6” (Animal mode).	Auto Tare	14. At.	0	Disabled
			☆1	Enabled
	Output hold value	15. H o.	☆0	Disabled
			1	Enabled
	Threshold for animal mode	16. W d .	1	20d
			☆2	50d
			3	100d
	Response speed for animal mode	13. SP	1	Fast
			☆2	Middle
			3	Slow

☆: default factory settings

Item		Set value		Description
Addition function and Comparator function		2. SEL	☆0	Disabled
			1	Addition function enabled
			2	Comparator function enabled
			3	Addition function and comparator function enabled
Displayed when the comparator function is enabled by setting <2. SEL.> to “2” or “3”.	Judgement condition	21. Co.	☆1	Always judge (even when the balance is unstable).
			2	Judge only when the balance is stable.
	Judgement range	22. Li.	0	Over +5 divisions
			☆1	Entire area
	Number of thresholds	23. Pi.	1	1 (Classifies into 2 ranks “OK” and “LO”)
			☆2	2 (Classifies into 3 ranks “HI”, “OK” and “LO”)
	Judgement method	24. tYP.	☆1	Judge by absolute values.
			2	Judge by deviation values.
	Buzzer for rank 1	25. bu.1	☆0	Disabled
			1	Enabled
	Buzzer for rank 2	26. bu.2	☆0	Disabled
			1	Enabled
	Buzzer for rank 3	27. bu.3	☆0	Disabled
			1	Enabled
	How to indicate results	2A. LG.	☆1	Pointer form.
			2	Bar graph form (Enabled only when <23. Pi.> is set to “2”)
Displayed when the addition function is enabled by setting <2. SEL.> to “1” or “3”.	Addition method	2C. Ad.M.	☆1	Cumulate
			2	Net addition
Zero tracking		3. A.0	0	Disabled
			☆1	Enabled (Automatically adjust slight deviation of the zero-point.)
Stability judgment		4. S.d.	☆2	Wide (Mild)
			3	↓
			4	Narrow (Strict)
Response speed		5. rE.	0	Sensitive mode
			1	Fast
			2	↓
			☆3	Slow

☆: default factory settings

Item		Set value		Description
Interface		6. I.F.	0	Stop input/output
			1	6-digit numeric format
			2	7-digit numeric format
			3	Extended 7-digit numeric format
			☆4	CBM format
Displayed when <6. I.F.> is set to “1”, “2”, “3”, “4” .	Output control	61. o.c.	0	Stop output.
			1	Output continuously at all times.
			2	Output continuously if stable (Stop output if unstable).
			3	Output once by pressing [Output] key (Irrespective of whether the balance is stable or not).
			4	Output once when the balance is loaded and stabilised. The next output for another sample loading is executed once the indication becomes stabilised at less than or equal to zero by unloading and zero-point adjustment.
			5	Output once every time when the balance reaches stable (Stop output at unstable times).
			6	Output continuously at unstable times and output once every time when the balance reaches stable.
			☆7	Output once after [Output] key is pressed and the balance reaches stable.
	Baud rate	62. b.L.	☆1	1200 bps
			2	2400 bps
			3	4800 bps
			4	9600 bps
			5	19200 bps
Displayed when <6. I.F.> is set to “2”, “3”, “4”,	Parity	63. PA.	☆0	None
			1	Odd
			2	Even
Displayed when <6. I.F.> is set to “3”, “4”, .	Data length *2	64. d.L.	7	7 bits
			☆8	8 bits
	Stop bits	65. St.	1	1 bit
			☆2	2 bits
Displayed when <6. I.F.> is set to “1”, “2”, “3”, “4”.	Unused high order digits *3	66. n.u.	☆0	Embed 0 (30H) (Leading zero padding)
			1	Embed space (20H) (Leading zero suppress)
	Response format	67. r.ES.	☆1	A00/Exx format
			2	ACK/NAK format
	Combined Gross-Net-Tare output	68. G n t .	☆0	Disabled
			1	Enabled (Gross, net and tare weight values are output simultaneously.)

☆: default factory settings

☆i: default factory settings for models with internal calibration weight
☆ii: default factory settings for models without internal calibration weight

Item		Set value		Description
Span adjustment/test mode evoked by the down arrow key or long press of the [Function] key *1		7. CA.	0	Disable the calibration
			☆i 1	Semi-automatic span adjustment with internal calibration weight
			2	Span test with internal calibration weight
			3	Span adjustment with external weight
			☆ii 4	Span test with external weight
Bar graph		8. b.G.	0	No display
			☆1	Displays the bar graph
Auto power off		9. A.P.	☆0	Disabled
			1	Enabled. turn off after 5 minutes. Works only when the balance is powered by batteries.
Auto backlight off		A. A.b.	☆0	Disabled
			1	Enabled. The balance goes into backlight off 3 minutes later when the balance is in measuring mode, there is no load on the balance and the indication is stable.
Weighing unit assigned to "Unit A"		b1. u.A	☆1	gram
			2	kilogram
			4	carat
Weighing unit assigned to "Unit B"		b3. u.b	☆0	None
			1	gram
			2	kilogram
			4	carat
ISO/GLP/GMP settings		E. GLP	☆0	Disabled
			1	Enabled
Displayed and activated when <E. GLP> is set to "1".	Output of span adjustment / test results	E1. out	0	Disabled
			☆1	Enabled
	ISO/GLP/GMP form output	E2. od.	☆0	Disabled
			1	Enabled
	Output language *2	E3. P.F.	☆1	English
			2	Japanese (Katakana)
Buzzer control		M. bZ.	0	Disabled
			1	Enabled (Beeps when a value is confirmed, wrong operation is made, etc.)
			☆2	Enabled (Beeps when the operation key is pressed in addition to the beeping situations in "1".)
Displayed and activated when <M. bz> is set to "1 or 2".	Buzzer tone	M1. tn.	1	Low
			☆2	Middle
			3	High
Backlight control		O. b.L.	0	Off
			1	On
			☆2	"On" when powered by the AC adaptor. "Off" when powered by batteries.
External contact input settings		P. E.tA.	0	Disabled
			☆1	tare-subtraction
			2	zero-point-adjustment

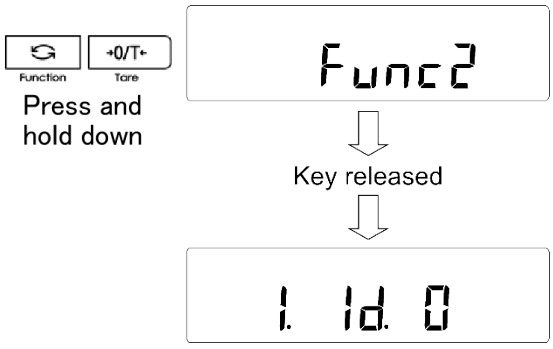
Legal Metrology	(1) Gray-shaded items are not available on verified balance. (2) Set values “1”, “3”, “6”, and “A” of <61. o.c.> (Output control) SHALL NOT be selected on verified balance when the output data is used for legal for trade purpose. Unstable weighing data shall not be used for printing, price calculation, invoicing nor data storage for legal transactions.

Reference

*1 “1” and “2” of <7. CA.> are not available for models without internal calibration weight.

*2 When <E3. P.F.> (Output language) is set to “2” (Japanese), <64. d.L.> (data length) is fixed to “8” (8 bits).

■ Advanced function setting mode

1 Invoke the advanced function setting mode. 	Press the [F] key while holding down the [Zero/Tare] key. When <Func2> is displayed, release the key. The advanced function setting mode is activated, and the first item, <1. Id> (Setup of ID No.) appears.
Legal Metrology	Gray-shaded items are not available on verified balance.

Reference

- <1. Id>, <2. i.n.i.> and <3. r.CA.> are reset to “0” each time they are invoked.
- <3. r.CA.> is available only on models with internal calibration weight.

☆: default factory settings

Item	Set Value		Description
Setup of ID No.	1. Id	☆0	Not execute
		1	Execute
Initialisation	2. ini.	☆0	Not execute
		1	Execute
Calibration of Built-in Weight	3. r.CA.	☆0	Not execute
		1	Execute

Chapter 4

Measuring Modes and Additional Functions

This balance has the following measuring modes: weighing mode, counting mode, percentage mode, coefficient mode, specific gravity mode, and animal mode.
Additional functions for measurement are also available: addition function and comparator function.

This chapter includes:

Appendix 1 Display Switching and Additional Functions of Each Measuring Mode
Weighing (Weighing mode)
Counting Pieces (Counting mode)
Measuring Percentage (Percentage mode)
Obtaining Weight Multiplied by Coefficient (Coefficient mode)
Measuring Specific Gravity (Specific gravity mode)
Weighing an Animal (Animal mode)
Adding Multiple Measurements (Addition function)
Judging appropriate quantity or not (Comparator Function)
How to Perform Span Adjustment and Testing
How to Adjust the Internal Weight

4-1 Display Switching and Additional Functions of Each Measuring Mode

In each measuring mode, pressing the [Function] key can toggle the display. The display switching depends on the measuring mode and/or the additional function activated. The additional functions usable in each display or measuring mode also differ.

Measuring mode	Display switching by [Function] key				Additional functions usable in each display		Remarks
	Switching order	Displayed value	Unit	Displayed sign	Addition	Comparator	
Weighing	1	Net weight by unit A	Unit A	Net (When tare is subtracted)	x	x	
	2	Gross weight by unit A	Unit A	B/G	-	-	
	3	Net weight by unit B	Unit B	Net (When tare is subtracted)	-	-	Displayed only when unit B is assigned.
	4	Total of weight	Unit A	Σ	Total value indication	-	Displayed only when addition function is activated.
Counting	1	Counting	Pcs	Net (When tare is subtracted)	x	x	
	2	Total of counting	Pcs	Σ	Total value indication	-	Displayed only when addition function is activated.
	3	Unit weight	Unit A	Pcs	-	-	
	4	Net weight by unit A	Unit A	Net (When tare is subtracted)	-	-	
Percentage	1	Percentage	%	Net (When tare is subtracted)	x	x	
	2	Total of percentage	%	Σ	Total value indication	-	Displayed only when addition function is activated.
	3	Net weight by unit A	Unit A	Net (When tare is subtracted)	-	-	
Coefficient	1	Multiplied value	(Unitless)	# and Net (When tare is subtracted)	x	x	
	2	Total of multiplied value	(Unitless)	# and Σ	Total value indication	-	Displayed only when addition function is activated.
	3	Net weight by unit A	Unit A	Net (When tare is subtracted)	-	-	
Specific gravity	1	Specific gravity	(Unitless)	and ▷ of upper right	-	-	Unit for weight fixed to g
Animal	1	Net weight	g	and Net (When tare is subtracted) and (When the indication is held)	-	-	Unit for weight fixed to g

Reference For more information on unit A and unit B, refer to “7-1 Using Two Expression Units by Switching Them”.

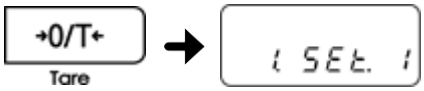
4-2 Weighing (Weighing Mode)

By default, the balance is set to weighing mode. To return to weighing mode from other measuring modes, use the following operation:

1 Launch the basic function setting mode.
(Refer to “Section 3-1 Setting of Functions”.)

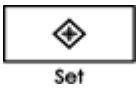
Press and hold the [Function] key. After < FUNC > is displayed, release the finger.
Function item < ISET > is displayed.

2 Select “Weighing mode”.



Press the [Tare] key several times to select “1”.

3 Complete the function setting.



Press the [Set] key.
The “Weighing mode” is activated and the display shows the sample’s weight.

4-3 Counting Pieces (Counting Mode)

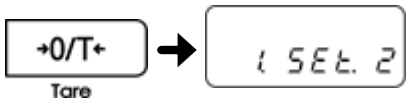
Counting mode can count the number of items by placing the items for which sampling has been completed on the balance and dividing the total weight of those items by the recorded unit weight. In the sampling carried out prior to counting, a specified number of samples are first placed on the balance and the weight is captured. The balance then automatically calculates and stores the unit weight.
The balance calculates the sample's unit weight using the automatic memory update method: First, place a set number of samples. Next, place an appropriate number of additional samples, up to three times the set number. Then, the balance will automatically update the sample unit weight. Repeating this step allows accurate counting.

Legal Metrology — This mode is not legal for trade.

1 Launch the basic function setting mode.
(Refer to "Section 3-1 Setting of Functions".)

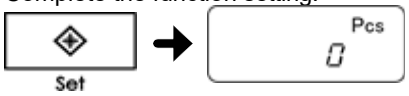
Press and hold the [Function] key. After <FUNC> is displayed, release the finger.
Function item < ISET> is displayed.

2 Select "Counting mode".



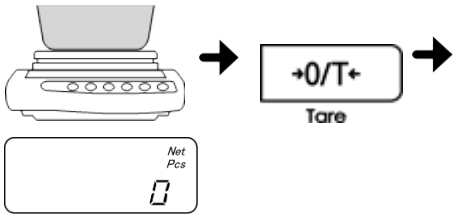
Press the [Tare] key several times to select "2".

3 Complete the function setting.



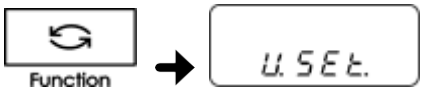
Press the [Set] key.
The "Counting mode" is activated, displaying <Pcs>.

4 Place a container and execute tare subtraction as appropriate.



Place a container and press the [Tare] key to execute tare subtraction.

5 Launch the sampling sequence.



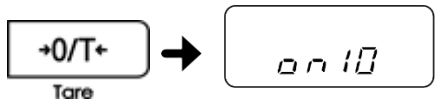
(Press and hold)

Press and hold the [Function] key. After < U. SEt> is displayed, release the finger.
The <on 10> display indicates using ten samples.

Reference

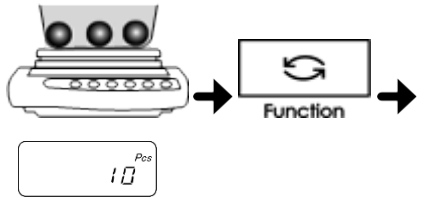
Pressing the [Output] key can cancel the sampling sequence midway through.

6 Select the number of samples.



Each press of the [Tare] key can select the sample count between 5, 10, 30, and 100.
If the samples vary considerably in size or are light weight, set a greater number of samples.

7 Put the specified number of samples.



Place the specified number of samples on the weighing pan and then press the [Function] key.
Then the display starts blinking.
Add10' is displayed.

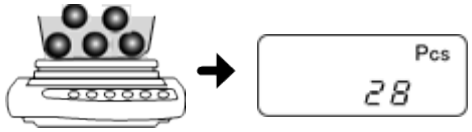
8 Put additional samples.

Put additional samples. The number of additional samples is up to three times the set number of samples.
For example, if <10 Pcs> is set, add 30 or less samples.
A short beep sounds each time additional sample weight is acquired and the unit weight is updated.
Repeating this sample addition step can improve the resolution of parts counting.

9 Finish sampling.

Press the [Function] key.
The average sample weight is saved as unit weight and the balance returns to counting indication.
A buzzer sounds and 'end' is displayed.

10 Place samples to count them.



The number of samples is indicated.

Reference

- The <Sub> display indicates that more than three times as many samples as the set number is added. Decrease the number of additional samples. Starting from a small number of samples, gradually increase the number of samples to increase counting accuracy.
- The <Add> display indicates that the number of added samples is too small. Increase the number of additional samples.
- Even when < Sub> or < Add> is displayed, sampling is possible. In this case, however, counting accuracy is low.
- <L -Err> is displayed to indicate that the unit weight is smaller than the minimum unit weight (Refer to “Appendix 2 Specifications”).
- Pressing the [Function] key switches the display to number of samples, unit weight, net weight, etc. (Refer to “Appendix 2 Display Switching and Additional Functions of Each Measuring Mode”.)

4-4 Measuring Percentage (Percentage Mode)

With respect to the reference weight, the weight of a sample is shown in percentage. A reference sample weight can be set by weighing an actual sample or entering a numeric value.

Legal Metrology

Percentage mode shall not be used for legal for metrology purpose.

Reference

The readability is automatically set based on the saved reference weight.

Readability	Range of Reference Weight
1%	MRW ≤ Reference weight <MRW x 10
0,1%	MRW x 10 ≤ Reference weight < MRW x 100
0,01%	MRW x 100 ≤ Reference weight

* MRW: Minimum Reference Weight

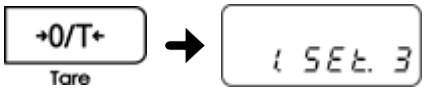
- The <L-Err> display indicates that the reference weight is too light. For the minimum reference weight (MRW) that can be saved, please refer to “Appendix 2 Specifications”.
- Pressing the [Function] key switches the display to percentage, net weight, etc.. (Refer to “Appendix 2 Display Switching and Additional Functions of Each Measuring Mode”.)

4-4-1 Setting a Reference Weight by Weighing an Actual Sample

1 Launch the basic function setting mode.
(Refer to “Section 3-1 Setting of Functions”.)

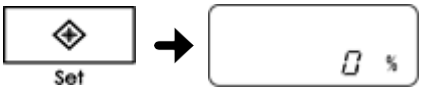
Press and hold the [Function] key. After < Func> is displayed, release the finger.
Function item < ISEt> is displayed.

2 Select “Percentage mode”.



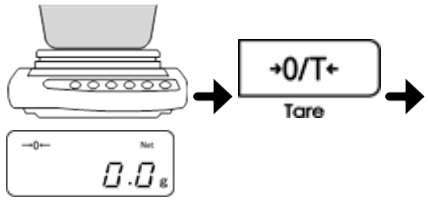
Press the [Tare] key several times to select “3”.

3 Complete the function setting.



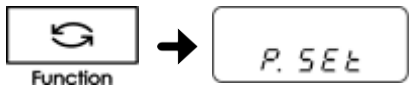
Press the [Set] key.
The “Percentage mode” is activated, displaying <%>.

4 Place a container and execute tare subtraction as appropriate.



Place a container and press the [Tare] key to execute tare subtraction.

5 Launch the reference weight setting sequence.



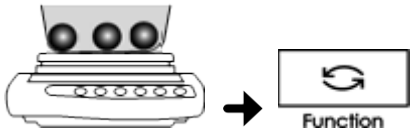
(Press and hold)

Press and hold the [Function] key. After <P. SEt> is displayed, release the finger.
The previously-saved reference sample weight blinks.

Reference

Pressing the [Output] key can cancel the reference weight setting sequence midway through.

6 Load a sample for reference and save the reference weight.



Put the reference sample on the balance and then press the [Function] key.
The reference weight is saved, and the display reverts to percentage indication.

A buzzer sounds and 'end' is displayed.

7 Place a sample to be measured.

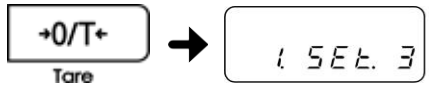
The display indicates the percentage of the sample with respect to the reference weight.

4-4-2 Setting a Reference Weight by Numeric Value Input

1 Launch the basic function setting mode.
(Refer to “Section 3-1 Setting of Functions”.)

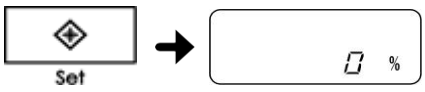
Press and hold the [Function] key. After <Func> is displayed, release the finger.
Function item < 1SEt> is displayed.

2 Select “Percentage mode”.



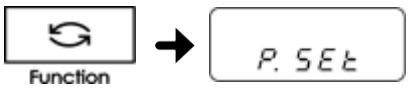
Press the [Tare] key several times to select “3”.

3 Complete the function setting.



Press the [Set] key.
The “Percentage mode” is activated, displaying <%>.

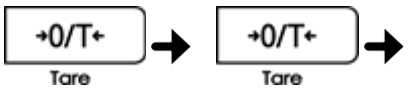
4 Launch the reference weight setting sequence.

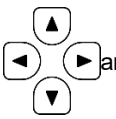


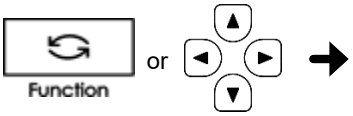
(Press and hold)

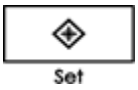
Press and hold the [Function] key. After <P SEt> is displayed, release the finger.
The previously-saved reference sample weight blinks.

5 Set the reference weight.



Numeric value input by  and



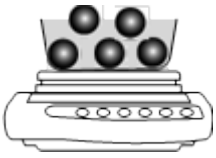


Input the reference weight value with the following steps:

1. Press the [Tare] key.
   The display switches to the numerical input screen and the rightmost digit blinks.
2. Select a number by pressing the [Tare] key, [▲] key, or [▼] key.
   Pressing the key switches between digits 0-9, minus sign, and decimal point.
3. Pressing the [Function] key or [▶] key confirms the entry, and shift to the next lower-order digit entry.
   Pressing the [◀] key cancels the last digit input and returns to the previous digit entry.
4. Set the reference weight by repeating steps 2 and 3.
   Pressing the [Output] key can cancel the setting.
5. Press the [Set] key to save the reference weight.

Input the water temperature or specific gravity of the liquid starting from a higher order digit with the following steps:

6 Load a sample to be measured.



The display indicates the percentage of the sample with respect to the reference sample weight.

4-5 Measuring Specific Gravity (Specific Gravity Mode)

The specific gravity of a sample — the ratio of the density of the sample to the density of water at its densest (4°C) for liquids — is measured by underwater displacement method.

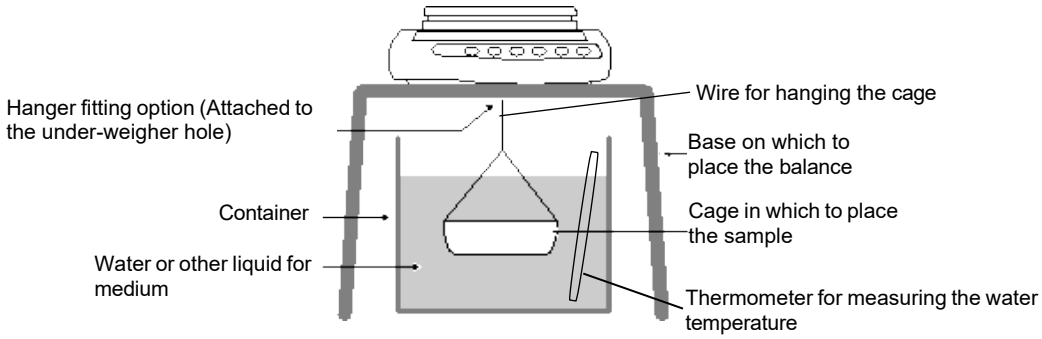
Reference	The “hanger fitting option” is required. Please purchase the option and refer to the option’s manual.

Note	The balance doesn’t meet IP65 when using hanging measurement.

Legal Metrology	This mode is not legal for trade.

4-5-1 Preparing and Setup of Measurement Equipment

Prepare equipment and set it up as follows:



* Except for the balance itself, all other equipment must be prepared by the customer.

Note	(1) The diameter of the wire to hang the cage may affects the measurement result especially when volume or specific gravity of the solid sample is small. Use as thin wire as possible. (2) Ensure that the cage is completely submerged in the liquid and that it does not touch the container. (3) Foam or bubbles produced on the specimen causes an error of the measuring result. When water is used as the medium, add one or two drops of surface-active agent (liquid detergent for kitchen use) to prevent air bubbles from adhering to the specimen. When the specimen is water-repellent, use a medium other than water. (4) The specific gravity of the medium liquid varies with temperature. This can affect the specific gravity measurement results. When water is used as the medium, the water temperature should be measured each time. When liquid other than water is used, measure the temperature and determine the specific gravity at that temperature using a conversion table, or directly measure the specific gravity of the liquid.

4-5-2 Measurement of the Specific Gravity

Note	- Specimen that is pneumatic, foamable or solubility cannot be measured accurately by underwater displacement method. - Specimens affected by strong magnetism repel diamagnetic liquids (e.g. water) and attract magnetic liquids, and that lead to an error of the measuring result. - Difference in temperature between the specimen and the medium liquid generates convection flow within the water tank, causing a measurement error. - Ensure that no air bubbles attached to the specimen when it is submerged.

1 Launch the basic function setting mode.
(Refer to “Section 3-1 Setting of Functions”.)

Press and hold the [Function] key. After <FUNC> is displayed, release the finger.
Function item < ISET > is displayed.

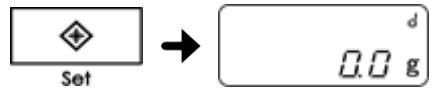
2 Select “Specific gravity mode”.

Press the [Tare] key several times to select “5”.
Navigate to '11.md.' within the Function mode.

3 Select the media liquid.

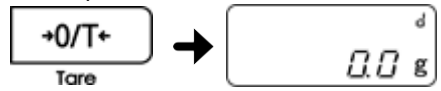
Press the [Function] key to go to < I 11d. >.
Press the [Tare] key to select "0" (water) or "1" (Liquid other than water) for the media liquid.

4 Complete the function setting.



Press the [Set] key.
The “Specific gravity mode” is activated, displaying <d>.

5 Launch the setting mode of the temperature of the water or the specific gravity of the media liquid.

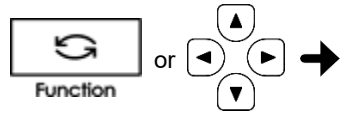


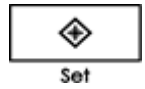
(Press and hold)

Press and hold the [Tare] key to launch the setting mode.
When the media liquid is set to water, <dt> is displayed on the right side of the display.
Otherwise, <d> will be indicated instead.

6 Set the water temperature in degree Celsius or specific gravity of the media liquid.

Numeric value input by ▲ ◄ ► ▼ and





Input the water temperature or specific gravity of the liquid starting from a higher order digit with the following steps:

1. Press the [Tare] key.
   The display switches to the numerical input screen and the rightmost digit blinks.
2. Select a number by pressing the [Tare] key, [▲] key, or [▼] key.
   Pressing the key switches between digits 0-9, minus sign, and decimal point.
3. Pressing the [Function] key or [►] key confirms the entry, and shift to the next lower-order digit entry.
   Pressing the [◄] key cancels the last digit input and returns to the previous digit entry.
4. Set the value by repeating steps 2 and 3.
   Pressing the [Output] key can cancel the setting.

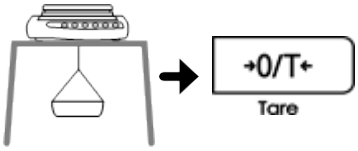
5. Press the [Set] key to save the value.

Reference

- The value set is held even after the power is turned off.
- The acceptable range of numeric entry is specified as follows:

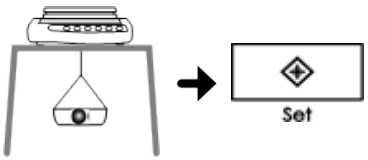
Input data	Range
Water temperature	0,0 to 99,9 °C
Specific gravity of the liquid	0,0001 to 9,999

7 Start specific gravity measurement sequence.
Execute tare subtraction.



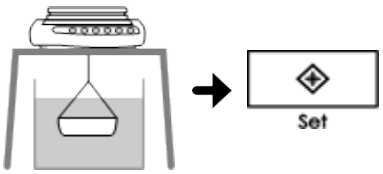
Press the [Tare] key to execute tare subtraction. This is to remove any residual error due to the cage.
The readout becomes zero and <Net> indicator appears.

8 Capture the weight of the sample in air.



Place the sample on the weighing pan.
After the weight display is stable, press the [Set] key to capture the weight of the sample in the air.
After the weight is captured, <◀ > is displayed in the lower left of the display.

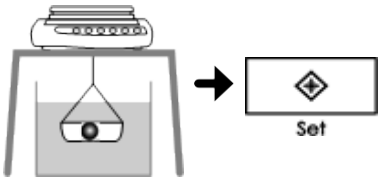
9 Capture the weight of the sample in the media liquid.



Place the sample on the cage and submerge the entire volume.
After the weight display is stable, press the [Set] key to capture the weight of the sample in the media liquid.

Then the specific gravity of the sample is calculated and displayed with < ▶ > symbol.

10 Terminate the specific gravity measurement sequence.



Press the [Set] key to terminate the current sequence and move to the next sequence.

4-5-3 Specific Gravity Measurement Data Output

- Before measurement
  Irrespective of the setting made in the function item <oUt> (output control), pressing the [Output] key outputs data (irrespective of whether data is stable or unstable).

(1) To output when specific gravity is displayed:
Press [Output] key to output the specific gravity measurement result.
Auto output can also be selected by setting the function item < 13. Ao> to “1”.

(2) Output format of the specific gravity measurement result:
The followings show the output example when the function item < 12. do> is set to “1”.
When < 12. do> is set to “0”, only the sample specific gravity is output.
Language selection between English and Japanese for output is made by the function item <EJPF> (Output language. “1”: English / “2”: Japanese).

Specific gravity measurement data output samples

Reference
- The unit notation “ °C ” (degree Celsius) is replaced by the letter “c”.
- The character code of Japanese is JIS X 0201.
- In the output, please interpret 'DENSITY' as 'Specific Gravity' and 'TEMPERATURE NOW' as 'Water temperature'.

4-6 Weighing an Animal (Animal Mode)

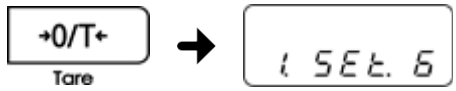
Legal Metrology	Animal mode are not available on verified balance.

This function allows you to weigh animals or other subjects that move during measurement. When the weight fluctuation of the animal or object being weighed stays within a preset range, the displayed weight value will be held (fixed) even if the subject moves during weighing.

1 Enter the Function Setting Mode.
(Refer to Section 2-4 'Basic Function Settings')

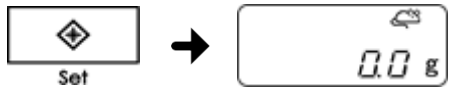
Press and hold the [Function] key for approximately 2 seconds until 'Func' is displayed, then release the key.

2 Select "Animal Scale".



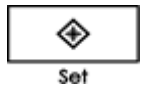
Press the [Tare] key several times and select "1.SEt. 6"

3 Memorise the scale mode

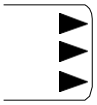


Press the [Set] key.
The scale will enter animal scale mode and "🐁" will be displayed.

4 Set the response speed according to the animal's movement



Set the response speed using the [Set] key.
The response speed is indicated by the "▶"position on the right side of the display.



Slow (wild)
Middle (in-between)
Fast (quiet)

5 Place the animal to be weighed

The value will be held when the weight fluctuation falls within the set range. When the display is held, "✋" will be displayed on the display.
When automatic taring is ON, taring will be performed automatically when the animal is removed and the weight fluctuation is within the set range. When automatic tare subtraction is OFF, the hold value will be displayed until you press the [Tare] key.

Reference

The weight fluctuation range for holding can be set with "16.Wd.".
In addition, by changing the minimum display, you can also change the stability detection width in combination with "16.Wd." (see "5-2 Setting the minimum display").

Note

- If the movement is rapid, it may not hold.
- The unit of animal scales is "g" only.
- Animal scales have a wide stability detection range, so there may be errors compared to the actual weight.
- Depending on the response speed and the movement of the animal, the weight may not return to zero even if the automatic tare function is turned on. Please use the tare key as appropriate.

4-7 Adding Multiple Measurements (Addition function)

Multiple samples are measured consecutively and the sum is displayed.
The addition function can be operated by either of the following two methods:
- Replacement method: Method of sequentially replacing the samples to be added;
- Net accumulation method: Method in which the samples to be added are additionally loaded without unloading, with the net measured volume of each sample displayed.

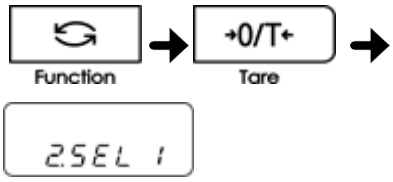
Reference The addition function can be used in the following measuring modes: weighing, counting, percentage, and coefficient.
(Refer to "4-1 Display Switching and Additional Functions of Each Measuring Mode".)

4-7-1 Addition Function Setting

1 Launch the basic function setting mode.
(Refer to "Section 3-1 Setting of Functions".)

Press and hold the [Function] key. After <FUNC> is displayed, release the finger.
Function item <ISET> is displayed.

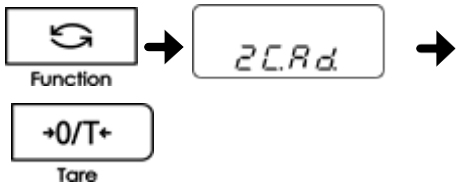
2 Select "Addition Function".



Press the [Function] key several times to go to <2.SEL> (Additional functions).
Press the [Tare] key to select "1" or "3".
1: Addition function enabled
3: Addition function and Comparator function enabled

Reference
For more information on the comparator function, refer to "Section 4-8 Judging appropriate quantity or not".

3 Select "Replacement method" or "Net accumulation method".



Press the [Function] key to go to <2CRd.>.
Press the [Tare] key to select the method.
1: Replacement method
2: Net accumulation method

4 Complete the function setting.

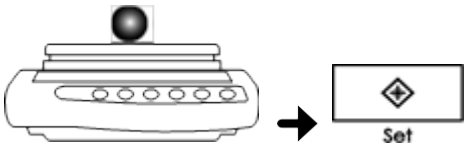
Press the [Set] key.
The addition function is activated.

4-7-2 Replacement Method Operation

1 Execute zero-point adjustment or tare subtraction as appropriate.

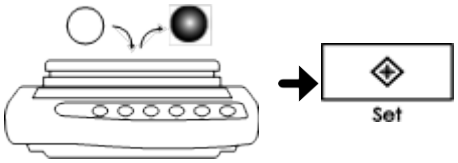
Place the tare and press the [Tare] key to execute zero-point adjustment or tare subtraction.

2 Place the first sample.



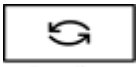
Place the first sample.
After <*> and < ◎ > are displayed, press the [Set] key.
The measured value of the first sample is captured and the total value (= measured value of the first sample) is displayed for several seconds with a <Σ> symbol.
Then the indication reverts to the measured value of the sample, with <*> symbol disappeared.

3 Reset the indication to zero and place another sample to be added.



Unload the first sample (and press the [Tare] key as appropriate) to reset the indication to zero.
Then place another sample to be added.
After <*> and < ◎ > are displayed, press the [Set] key.
The measured value of the additional sample is captured, and the total value is displayed for several seconds with a <Σ> symbol.
Then the indication reverts to the measured value of the sample, with <*> symbol disappeared.
Repeat this operation to capture all the samples to be summed.

4 Display the total value.



(Press twice)

Press the [Function] key several times until <Σ> symbol appears.
The total value is displayed with a <Σ> symbol.

Reference

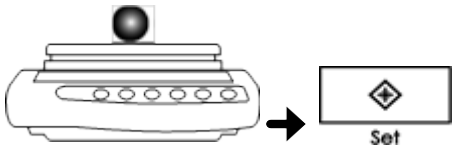
- Pressing the [Tare] key when the total value is displayed clears the total value.
- Additional samples can be loaded when an asterisk <*> is displayed.
- When <ㄴ-Er-r> is displayed by pressing the [Set] key, it indicates that additional samples are put on twice or that some samples are unloaded.

4-7-3 Net Accumulation Method Operation

1 Execute zero-point adjustment or tare subtraction as appropriate.

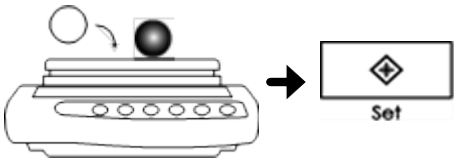
Place the tare and press the [Tare] key to execute zero-point adjustment or tare subtraction.

2 Place the first sample.



Place the first sample.
After <*> and < ◎ > are displayed, press the [Set] key.
The measured value of the first sample is captured and the total value (= measured value of the first sample) is displayed for several seconds with a <Σ> symbol.
Then tare subtraction is performed automatically.

3 Place another sample to be added.



Place another sample to be added.
After <*> and <◎ > are displayed, press the [Set] key.
The measured value of the additional sample is captured, and the total value is displayed for several seconds with a <Σ> symbol.
Then tare subtraction is performed automatically.
Repeat this operation to capture all the samples to be summed.

4 Display the total weight.

(Press twice)

Press the [Function] key several times until <Σ> symbol appears.
The total value is displayed with a <Σ> symbol.

Reference

- Pressing the [Tare] key when the total value is displayed clears the total value.
- When <t-Err> is displayed by pressing the [Set] key, it indicates that additional samples are put on twice or that some samples are unloaded.

4-8 Judging Appropriate Quantity or Not (Comparator Function)

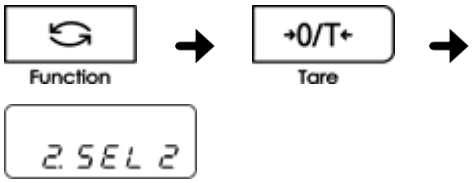
The comparator function judges measured values based on pre-registered thresholds. This function can be used in weighing mode, counting mode, percentage mode, and coefficient mode.

4-8-1 Comparator Function Setting

1 Launch the basic function setting mode.
(Refer to "Section 3-1 Setting of Functions".)

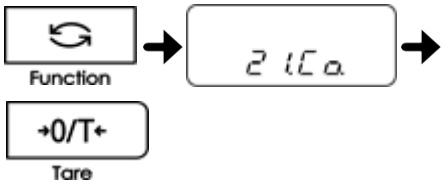
Press and hold the [Function] key. After < FUNC > is displayed, release the finger.
Function item < ISET > is displayed.

2 Select "Comparator Function".



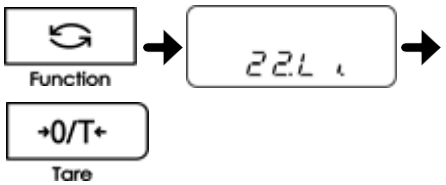
Press the [Function] key several times to go to <2SEL > (Additional functions).
Press the [Tare] key to select "2" or "3".
2: Comparator function enabled
3: Addition function and Comparator function enabled

3 Set the discriminant condition.



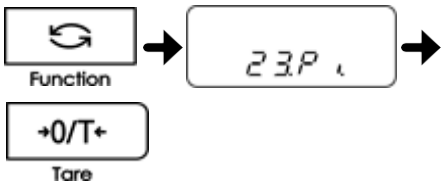
Press the [Function] key to go to <2 1Ca>.
Press the [Tare] key to select the discriminant condition.
1: Always judges (even when the balance is unstable).
2: Judges only when the balance is stable.

4 Set the discriminant range.



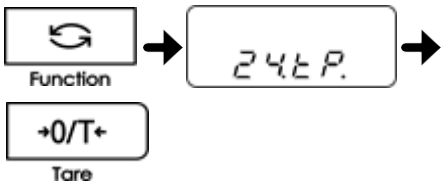
Press the [Function] key to go to <22L 1>.
Press the [Tare] key to select the discriminant range.
0: Over +5 d above net zero
1: Entire range

5 Set the number of the thresholds to be set.



Press the [Function] key to go to <23P 1>.
Press the [Tare] key to select the number of the thresholds to be set.
1: One threshold corresponding to the lower limit is set. Judged as "OK" or "LO".)
2: Two thresholds corresponding to the upper and lower limits respectively are set. Judged as "HI", "OK" or "LO".)

6 Set the threshold setting method.



Press the [Function] key to go to <24tP>.
Press the [Tare] key to select the threshold setting method.
1: Absolute values setting
2: Deviation values setting

7	Configure the buzzer settings	Press the [F] key to select from <25b. 1> to <27b.3> <25b. 1>: Buzzer for rank “Lo” <26b.2>: Buzzer for rank “ok” <27b.3>: Buzzer for rank “Hi”
8	Set the result indication form.	Press the [Function] key to go to <2AL.G>. Press the [Tare] key to select the result indication form. 1: Pointer form 2: Bar graph form (Available only when <23P 1> is set to “2”.)
9	Complete the function setting.  	Press the [Set] key. Comparator function is activated.

4-8-2 Configuration of the Thresholds

The following two threshold setting methods (set in <24LP>) are available:
(1) Absolute values setting: Specify the threshold values directly;
(2) Deviation values setting: First, specify the target value, then specify deviations from the target.

For example:
To set a lower limit of 970,0 g and an upper limit of 1050,0 g with respect to a target of 1000,0 g, enter the thresholds as shown below:

	Target	Lower limit	Upper limit
Absolute value	1000,0 g	970,0 g	1050,0 g
Absolute values setting	-	970,0 g	1050,0 g
Deviation values setting	1000,0 g	-30,0 g	50,0 g

Thresholds can be set in the following two ways:
(1) Place actual samples on the balance;
(2) Enter the values by key stroke.

Reference

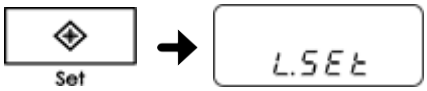
- Once registered, the thresholds are retained even after the balance is turned off.
- Thresholds can be saved for each measuring mode. However, thresholds of both absolute and deviation setting cannot be saved in the same measuring mode.
- Thresholds and reference setting sequence can only be evoked in:
  - At weighing mode: Display of net weight in unit A;
  - At counting mode: Display of counting;
  - At percentage mode: Display of percentage;
  - At coefficient mode: Display of multiplied value.
- If the upper and lower limit value entries are not lined up in the order of magnitude, three <◀ > will be lit and the discrimination cannot be performed. Enter the appropriate values.

■ **Absolute values setting by placing actual samples on the balance**

1 Execute zero-point adjustment or tare subtraction as appropriate.

Place a container and press the [Tare] key to execute tare subtraction.

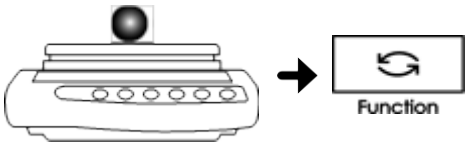
2 Launch the thresholds setting sequence.



(Press and hold)

Press and hold the [Set] key. After <L.SEt> is displayed, release the finger.

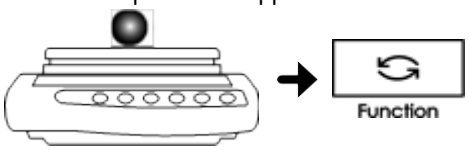
3 Place a sample for the lower limit.



Place the sample for the lower limit on the balance and press the [Function] key to capture the value.

When the number of thresholds is “1”, this operation completes the threshold setting and then the balance goes back to measuring mode. When the number of thresholds is “2”, < H.SEt> is displayed and the display shift to the upper limit setting.

4 Place a sample for the upper limit.



Place the sample for the upper limit on the balance and press the [Function] key to capture the value.

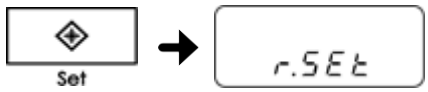
Threshold setting is completed and then the balance goes back to measuring mode.

■ **Deviation values setting by placing actual samples on the balance**

1 Execute zero-point adjustment or tare subtraction as appropriate.

Place a container and press the [Tare] key to execute tare subtraction.

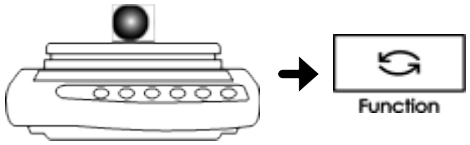
2 Launch the thresholds setting sequence.



(Press and hold)

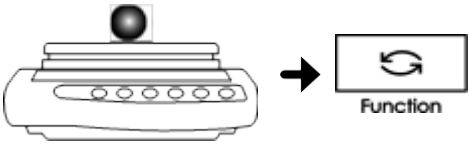
Press and hold the [Set] key. After <L SEt> is displayed, release the finger.

3 Place a sample for the target value.



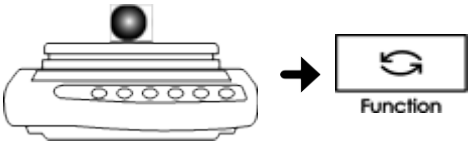
Place the sample for the target value on the balance and press the [Function] key to capture the value.
Then <H SEt> is displayed and the display shift to the lower limit setting.

4 Place a sample for the lower limit calculation.



Place the sample with a value corresponding to the value that is less than the target value by the lower limit, and then press the [Function] key.
The lower limit is calculated and set automatically.
When the number of thresholds is “1”, this operation completes the threshold setting and then the balance goes back to measuring mode.
When the number of thresholds is “2”, <H SEt> is displayed and the display shift to the upper limit setting.

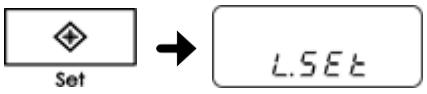
5 Place a sample for the upper limit calculation.



Place the sample with a value corresponding to the value that is greater than the target by the upper limit, and then press the [Function] key.
The upper limit is calculated and set automatically.
Threshold setting is completed and then the balance goes back to measuring mode.

■ **Absolute values setting by numeric value input**

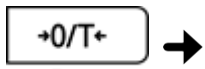
1 Launch the thresholds setting sequence.

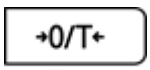


(Press and hold)

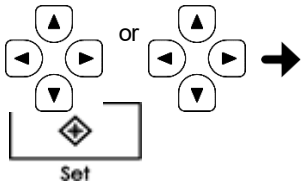
Press and hold the [Set] key. After <L.SEt> is displayed, release the finger.

2 Set the lower limit value.



Numeric value input by 

and

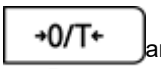


Input the lower limit value with the following steps:

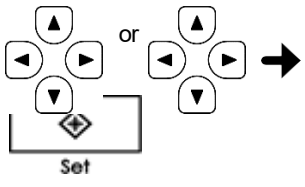
1. Press the [Tare] key.
   The display switches to the numerical input screen and the rightmost digit blinks.
2. Select a number by pressing the [Tare] key, [▲] key, or [▼] key.
   Pressing the key switches between digits 0-9, minus sign, and decimal point.
3. Pressing the [Function] key or [▶] key confirms the entry, and shift to the next lower-order digit entry.
   Pressing the [◀] key cancels the last digit input and returns to the previous digit entry.
4. Set the reference weight by repeating steps 2 and 3.
   Pressing the [Output] key can cancel the setting.
5. Press the [Set] key to save the value.

When the number of thresholds is “1”, this operation completes the threshold setting and then the balance goes back to measuring mode.
When the number of thresholds is “2”, <H.SEt> is displayed and the display shift to the upper limit setting.

3 Set the upper limit value.

Numeric value input by 

and



Input the upper limit value by using the same operation as with step 2.
Threshold setting is completed and then the balance goes back to measuring mode.

■ **Deviation values setting by numeric value input**

1

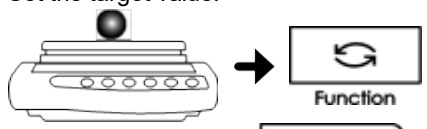
Launch the thresholds setting sequence.

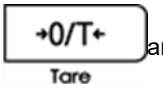
(Press and hold)

Press and hold the [Set] key. After <r-SEt> is displayed, release the finger.

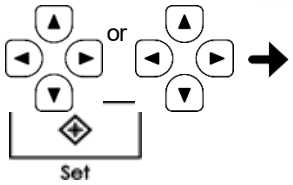
2

Set the target value.



Numeric value input by 

and



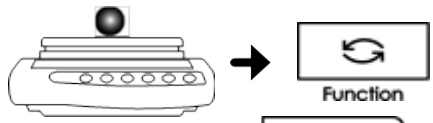
Input the target value with the following steps:

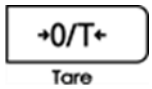
1. Press the [Tare] key.
   The display switches to the numerical input screen and the rightmost digit blinks.
2. Select a number by pressing the [Tare] key, [▲] key, or [▼] key.
   Pressing the key switches between digits 0-9, minus sign, and decimal point.
3. Pressing the [Function] key or [▶] key confirms the entry, and shift to the next lower-order digit entry.
   Pressing the [◀] key cancels the last digit input and returns to the previous digit entry.
4. Set the reference weight by repeating steps 2 and 3.
   Pressing the [Output] key can cancel the setting.
5. Press the [Set] key to save the value.

Then <H.SEt> is displayed and the display shift to the lower limit setting.

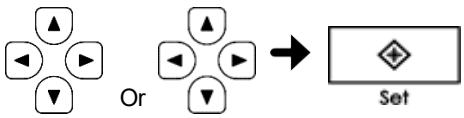
3

Set the lower limit value.



Numeric value input by 

and



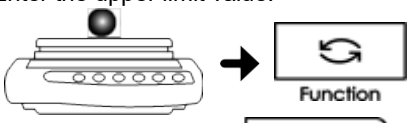
Input the lower limit value by using the same operation as with step 2.

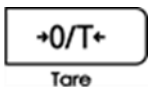
When the number of thresholds is “1”, this operation completes the threshold setting and then the balance goes back to measuring mode.

When the number of thresholds is “2”, <H.SEt> is displayed.

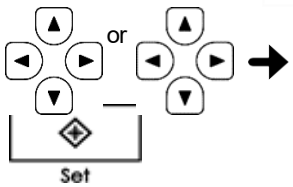
4

Enter the upper limit value.



Numeric value input by 

and



Input the upper limit value by using the same operation as with step 2.

Threshold setting is completed and then the balance goes back to measuring mode.

4-8-3 Indication of Judgement Result

Reference Refer to “4-1 Display Switching and Additional Functions of Each Measuring Mode” for the choice of display for showing the judgement result in each measuring mode.

(1) When <NP i> (number of the threshold) is set to “1”:
Judgement result is indicated in the pointer form as shown below.

- Pointer form:

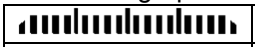
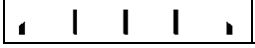
Hi
Ok ◂---------- Rank OK: Lower limit ≤ Measured value
Lo ◂---------- Rank LO: Measured value < Lower limit

(2) When <NP i> (number of the threshold) is set to “2”:
Judgement result is indicated in either pointer form or bar-graph form according to the setting in <RLD> (Result indication form).

- Pointer form:

Hi ◂---------- Rank HI: Upper limit < Measured value
Ok ◂---------- Rank OK: Lower limit ≤ Measured value ≤ Upper limit
Lo ◂---------- Rank LO: Measured value < Lower limit

- Bar graph form:

	Rank Hi:	Upper limit < Measured value
	Rank Ok:	Lower limit ≤ Measured value ≤ Upper limit The ratio of the measured value to the two threshold values is displayed.
	Rank Lo:	Measured value < Lower limit

Reference
- Bar-graph form does not work when <NP i> (number of thresholds) is set to “1”.
- The centre of the bar graph corresponds to the midpoint between the upper and lower limits, not the target value.

Chapter 5

Input/Output to/from External Devices

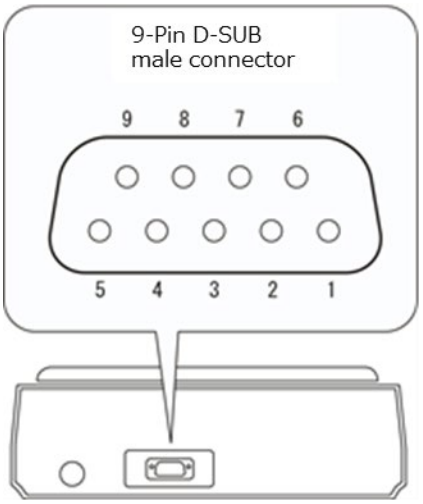
Balance can connect with external devices via the 9-pin D-SUB connector.

This chapter includes:

Connecting to External Devices via 9-Pin D-SUB Connector
RS 232C I/O Communication Data and Commands
Tare-Subtraction/Zero-Point-Adjustment by External Contact Input

4-6 Connecting to External Devices via 9-Pin D-SUB Connector

5-1-1 Connector Pin Assignment



Pin	Signal	Input/Output	Description
1	-	-	-
2	RXD	Input	Receiving data
3	TXD	Output	Transmitting data
4	DTR	Output	This signal is fixed to "HIGH" while the balance is powered on.
5	GND	-	Signal ground
6	-	-	-
7	-	-	-
8	-	-	-
9	External Contact	Input	External contact input for tare-weighing / zero-setting

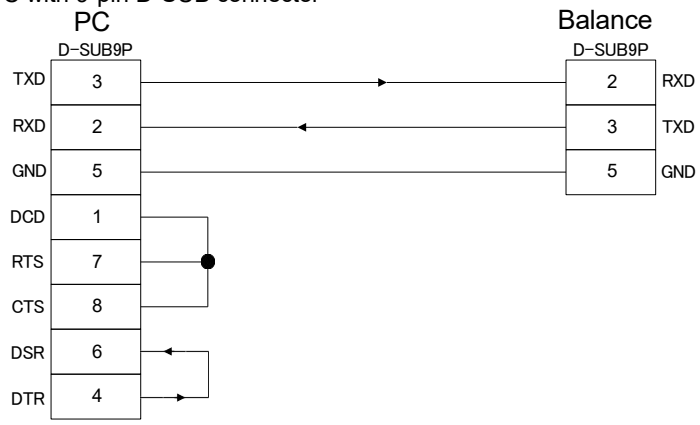
Note	- Take care not to short-cut the pin 4 (DTR) to the ground.

Note	- Disconnect the AC adaptor from the mains before connecting external devices. - Use shielded cable up to 15 m length to prevent the product from being affected by electromagnetic interference. For RS 232C I/O, use a serial crossover cable. - Take care not to short-cut the pin 4 (DTR) to the ground. - To maintain IP65, use optional water-/dust-proof-type cable. Please contact your local dealer for the optional cable. - To maintain IP65, connector cover must be fitted when not connected.

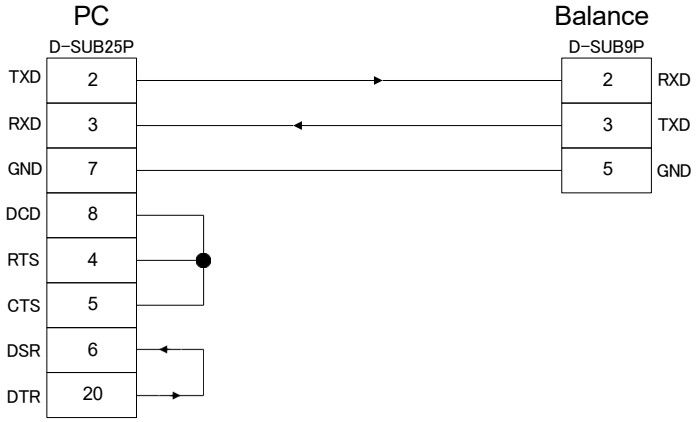
1 Disconnect the AC adaptor from the mains.

Reference Connection diagram for RS232C communication with PC

- PC with 9-pin D-SUB connector

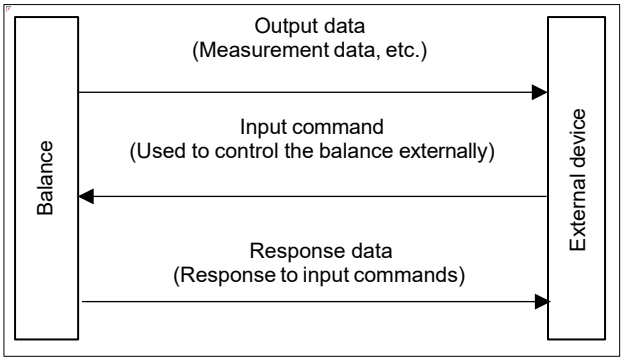


- PC with 25-pin D-SUB connector



5-2 RS232C I/O

This product exchanges data with external devices via RS-232C interface as follows:



5-2-1 Function Settings

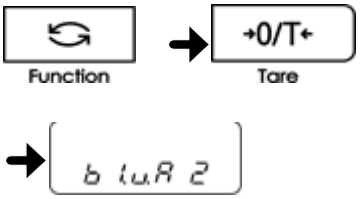
The four formats of “6-digit numeric”, “7-digit numeric”, “extended 7-digit numeric”, and “CBM” formats are available. Select a format and interface specifications with the following operation:

Legal Metrology “6-digit numeric format”, “7-digit numeric format”, and “extended 7-digit numeric format” are not available on verified balance.

1 Launch the basic function setting mode.
(Refer to “Section 3-1 Setting of Functions”.)

Press and hold the [Function] key. After <Func> is displayed, release the finger.

2 Select enable/disable of the RS232C and select the data format for RS232C output.



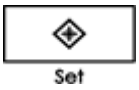
Press the [Function] key several times to go to <5. IF.>.
Press the [Tare] key to select a format.
0: Stop input/output
1: 6-digit numeric format
2: 7-digit numeric format
3: Extended 7-digit numeric format
4: CBM format

Reference
Refer to “5-2-2 Interface Specifications” and “5-2-3 Output Data Format” for the details of each format.

Legal Metrology
“6-digit numeric format”, “7-digit numeric format”, and “extended 7-digit numeric format” are not available on verified balance.

Press the [Function] key and select the interface specifications and output data settings via the menu items <61.o.c> to <68.Gnt.>.
Please refer to 5-2-2 and 3-2 Function Setting List for selectable interface specifications and output data settings

3 Complete the function setting.



Press the [Set] key.
The balance goes back to measuring mode.

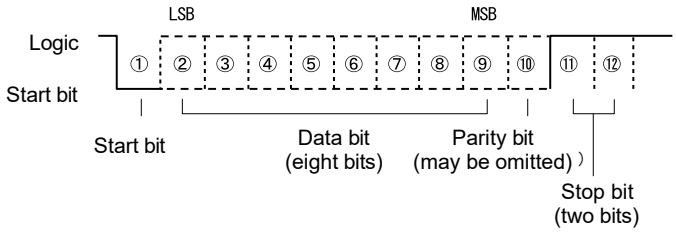
Reference - Gross, net and tare weight values are output simultaneously when <68. Gnt.> is set to <Enabled> .

5-2-2 Interface Specifications

Transmission system	Serial transmission, Start-stop synchronisation
Transmission rate	1200/2400/4800/9600/19200 bps
Transmission code	ASCII code
Signal level	Compliant with EIA RS-232C HIGH level (data logic 0): +5 to +15 V LOW level (data logic 1): -5 to -15 V

Format	Bit configuration				Parity
	Start bit	Data bit	Parity bit	Stop bit	
6-digit numeric format	1	8	0	2	-
7-digit numeric format	1	8	0 or 1	2	None/Odd/Even
Extended 7-digit numeric format	1	7 or 8*	0 or 1	1 or 2	None/Odd/Even
CBM format	1	7 or 8*	0 or 1	1 or 2	None/Odd/Even

* If <E.GLP> is set to "2" and Japanese is selected for output language, the data length is automatically set to eight bits at extended 7-digit numeric format.



■ For 6/7-digit numeric format and extended 7-digit numeric format

Legal Metrology These formats are not available on verified balance.

☐ Data composition

- 6-digit numeric format

  Consists of 14 characters including terminators (CR = 0DH, LF = 0AH).

1	2	3	4	5	6	7	8	9	10	11	12	13	14
P1	D1	D2	D3	D4	D5	D6	D7	U1	U2	S1	S2	CR	LF

- 7-digit numeric format and extended 7-digit numeric format

  Consists of 15 characters including terminators (CR = 0DH, LF = 0AH).

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
P1	D1	D2	D3	D4	D5	D6	D7	D8	U1	U2	S1	S2	CR	LF

(1) P1: Polarity

P1	Code	Description
+	2BH	Zero or positive data
-	2DH	Negative data

(2) D1 to D7/D8: Numeric data

D1 to D7/D8	Code	Description
0 to 9	30H to 39H	Digits 0 to 9 0 is also used to fill the leading portion of value. (Leading zero padding)
●	2EH	Decimal point (floating position) * When the data is an integer, decimal point is omitted and a space is inserted at the right of the least significant digit instead.
Space	20H	Space (Hereinafter abbreviated as (SP).) - Used to fill the leading portion of value. (Leading zero suppress) - Inserted at the right of the least significant digit instead when the data is an integer.

(3) U1, U2: Measuring unit or mode

U1	U2	Code		Description
(SP)	G	20H	47H	gram
K	G	4BH	47H	kilogram
C	T	43H	54H	carat
P	C	50H	43H	Pieces (Counting mode)
(SP)	%	20H	25H	% (Percentage mode)

(4) S1: Type of the measurement data or the judgment result (rank) of the comparator function.

S1	Code	Description	Remarks
L	4CH	Rank Lo	Judgement result of the comparator function
G	47H	Rank Ok	Judgement result of the comparator function
H	48H	Rank Hi	Judgement result of the comparator function
T	54H	Total value	Adding function
U	55H	Unit weight	Counting mode
d	64H	Gross weight	Weighing mode
(SP)	20H	Net value, and no judgment result specified	

(5) S2: Data status

S2	Code	Description	Remarks
S	53H	Data stable	This value is appended even when the data is not related to stability or instability (e.g., total value or unit weight), in which case it is meaningless.
U	55H	Data unstable	This value is appended even when the data is not related to stability or instability (e.g., total value or unit weight), in which case it is meaningless.
E	45H	Data error	Indicates that the data (except this status) is invalid due to <□-Err> or <⊔-Err> and should be ignored.
(SP)	20H	No status specified	

☐ **Sample of the data composition**

- 6-digit numeric format

3000.1 g/Net/Data stable

1	2	3	4	5	6	7	8	9	10	11	12	13	14
+	0	3	0	0	0	.	1	(SP)	G	(SP)	S	CR	LF

800.05 ct/Gross/Data unstable

1	2	3	4	5	6	7	8	9	10	11	12	13	14
+	0	8	0	0	.	0	5	C	T	d	U	CR	LF

250 pcs/Net, Rank HiData stable

1	2	3	4	5	6	7	8	9	10	11	12	13	14
+	0	0	0	2	5	0	(SP)	P	C	H	S	CR	LF

- 7-digit numeric format

3000.1 g/Net/Data stable

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
+	0	0	3	0	0	0	.	1	(SP)	G	(SP)	S	CR	LF

800.05 ct/Gross/Data unstable

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
+	0	0	8	0	0	.	0	5	C	T	d	U	CR	LF

250 pcs/Net, Rank Hi/Data stable

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
+	0	0	0	0	2	5	0	(SP)	P	C	H	S	CR	LF

■ **For CBM format**

␣: Space (SPC)

☐ **Data composition**

- Measurement data other than Specific Gravity mode

Composed of 26 characters including terminators (CR=0DH/LF=0AH)

1	2	3	4	5	6	7	8	9	10	11	12	13
S1	C1	␣ (20H)	T1	T2	T3	T4	T5	T6	D1	D2	D3	D4
14	15	16	17	18	19	20	21	22	23	24	25	26
D5	D6	D7	D8	D9	D10	D11	D12	U1	U2	␣ (20H)	CR (0DH)	LF (0AH)

- ERROR

Composed of 26 characters including terminators (CR=0DH/LF=0AH)

1	2	3	4	5	6	7	8	9	10	11	12	13
* (2AH)	* (2AH)	␣ (20H)	E	R	R	O	R	␣ (20H)	* (2AH)	* (2AH)	* (2AH)	* (2AH)
14	15	16	17	18	19	20	21	22	23	24	25	26
* (2AH)	* (2AH)	* (2AH)	* (2AH)	* (2AH)	* (2AH)	* (2AH)	* (2AH)	* (2AH)	* (2AH)	␣ (20H)	CR (0DH)	LF (0AH)

-Others (Specific Gravity result, Span test result, Header, Footer, etc.)

Consist of lines of single or multiple messages, each of which is of indeterminate length, with terminators (CR=0DH/LF=0AH) are added to each line.

␣: Space (SPC)

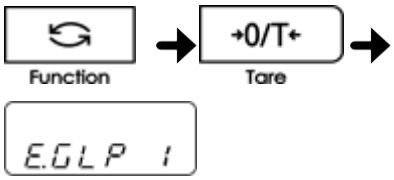
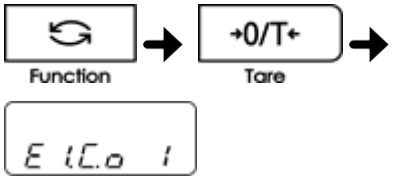
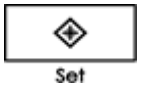
Symbol	Code	Description
"S1" (1 character): Represents the stable equilibrium status.		
␣	0x20	Data stable
*	0x2A	Data unstable
"C1" (1 character): Represents the judgement result of comparator function.		
␣	0x20	Comparator result: Proper (OK) or No result
H	0x48	Comparator result: Over (HIGH)
L	0x4C	Comparator result: Shortage (LOW)

"T1"-"T6" (6 characters): Represents the designation of the data.													
␣	␣	␣	␣	␣	␣	0x20	0x20	0x20	0x20	0x20	0x20	- Gross value when tare weighing is not in operation, <68. Gnt.> is set to "0", and <B/G> is not displayed. - Net value when <68. Gnt.> is set to "0" and net value alone is output.
N	␣	␣	␣	␣	␣	0x4E	0x20	0x20	0x20	0x20	0x20	- Net value (tare is subtracted). - Net value when <68. Gnt.> is set to "1".
T	␣	␣	␣	␣	␣	0x54	0x20	0x20	0x20	0x20	0x20	Tare weight
T	O	T	A	L	␣	0x54	0x4F	0x54	0x41	0x4C	0x20	Total value (Addition function)
G	␣	␣	␣	␣	␣	0x47	0x20	0x20	0x20	0x20	0x20	Gross weight
U	N	I	T	␣	␣	0x55	0x4E	0x49	0x54	0x20	0x20	Unit weight (Counting mode)

"D1"-"D12" (12 characters): Numeric value data.		
+	0x2B	Zero or positive data
-	0x2D	Negative data
0 – 9	0x30 – 0x39	0 to 9 (numeric) 0 is also used to fill the leading portion of value (leading zero padding).
.	0x2E	Decimal point (floating decimal point)
␣	0x20	- Output to the least significant digit in the absence of a decimal point. - Used to fill the leading portion of value (leading zero suppress).

"U1, U2" (2 characters): Represents the unit of numeric value data.				
␣	g	0x20	0x67	gram
k	g	0x6B	0x67	kilogram
c	t	0x63	0x74	carat
P	C	0x50	0x43	Piece(s) (Counting mode)
␣	%	0x20	0x25	Percentage (Percent mode)

5-2-4 ISO/GLP/GMP form output of measurement data

1	Launch the basic function setting mode. (Refer to “3-1 Setting of Functions”.)	Press and hold the [Function] key. After < FUnC > is displayed, release the finger.
2	Enable the “Outputting calibration results” function. 	Press the [Function] key several times to go to <E.GLP > (ISO/GLP/GMP settings), and press the [Tare] key to select “1” (enabled). Then press the [Function] key to go to <E2.od. > (ISO/GLP/GMP form output), and press the [Tare] key to select “1” (enabled).
3	Select the output language. 	Press the [Function] key several times to go to <E 3.P.F. > (Language for outputting). Press the [Tare] key to select the output language. 1: English 2: Japanese
4	Complete the function setting. 	Press the [Set] key. The balance goes back to measuring mode.
5	Header output.	Press and hold the [Output] key. The display indicates <HEAd> and a header is output.
6	Measurement data output	Measurement data is output in accordance with the setting of <5 Loc. > (Output control).
7	Footer output.	Press and hold down the [Output] key after the measurement is completed. The display indicates <Foot> and a footer is output.

■ Output Samples:

Note	Date, time, and signature must be entered separately manually.

Reference	- To set the device ID, refer to “7-3 Device ID Setting”. - The character code of Japanese is JIS X 0201.

● Header

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
1																
2			D	I	N	I		A	R	G	E	O				
3	T	Y	P	E	:											← Model
4							G	A	M	1	5	K	M			
5	S	/	N	:	2	5	2	5	5	4	0	0	1			← Serial number
6	I	D	:							1	2	3	4	5	6	← Device ID
7																
8	S	T	A	R	T											
9	D	A	T	E	:											← Start date
10	T	I	M	E	:											← Start time
11																

● Footer

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
1																
2	E	N	D													
3	D	A	T	E	:											← End date
4	T	I	M	E	:											← End time
5																
6	S	I	G	N	A	T	U	R	E							
7																
8																
9																
10	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
11																
12																
13																
14																

5-2-5 Input Commands

An input command is to control the balance from an external device. The following four types of input commands are supported:

(1) Tare-subtraction/zero-point-adjustment command
(2) Output control setting command
(3) Display setting command
(4) Span adjustment/test command

■ Procedure for transmission

(1) An input command is sent from an external device to the balance.
The full-duplex transmission system allows input commands to be sent to the balance regardless of the timing of data output from the balance.

(2) Once the balance has received the command:
- For “Tare-subtraction/zero-point-adjustment command”, “Display setting command”, and “Span adjustment/test command”, the balance performs the operation based on the command, and sends a normal end response command to the external device;
- For “Output control setting command”,
The device will send a normal completion response command to the external display and perform the operation specified by the command.
- For an erroneous command or the operation based on the command cannot be completed, it transmits an error response command.

If the balance receives a command while it is in function setting mode, in calibration mode or during processing for other reasons, the command will be executed after the mode has been switched or the processing has been completed.

Note	After sending an input command, do not send another command to the balance until the external device receives a response from the balance.

■ **Response**

Upon receiving an input command, the balance sends out a response.
Either of the “A00/Exx format” or the “ACK/NAK format” can be selected for the response command.

- A00/Exx format

Consists of five characters including terminators (CR = 0DH, LF = 0AH).

A1	A2	A3	CR	LF

A1	A2	A2	Code (A1)	Code (A2)	Code (A3)	Meaning
A	0	0	41H	30H	30H	Successful completion
E	0-9	0-9	45H	30H to 39H	30H to 39H	Abnormal completion, such as: - Command error (when an errant command is received) - Numeric format error - Processing interrupted - Processing terminated abnormally - Other errors

- ACK/NAK format

Consists of one character without a terminator.

A1

A1	Code (A1)	Meaning
ACK	06H	Successful completion
NAK	15H	Abnormal completion, such as: - Command error (when an errant command is received) - Numeric format error - Processing interrupted - Processing terminated abnormally - Other errors

Reference

To switch between A00/Exx format and ACK/NAK format, use the function item <bFn-5>.
1: A00/Exx format
2: ACK/NAK format

■ **Command form**

An input command consists of 4 characters including terminators (CR = 0DH, LF = 0AH).

C1	C2	CR	LF

(1) Tare-subtraction / zero-point-adjustment command

C1	C2	Code (C1)	Code (C2)	Description	Response	
					A00/Exx	ACK/NAK
T	(SP)	54H	20H	Tare subtraction	A00: Successful completion E01: Command error E04: Tare-subtraction cannot be executed (Range violation, weight error, etc.).	ACK: Successful completion NAK: error
Z	(SP)	5AH	20H	Zero-point adjustment	A00: Successful completion E01: Command error E04: Zero-point-adjustment cannot be executed (Range violation, weight error, etc.).	ACK: Successful completion NAK: error

(2) Set output control command

C1	C2	Code (C1)	Code (C2)	Description	Response	
					A00/Exx	ACK/NAK
O	0	4FH	30H	Stop output.	A00: Successful completion E01: Command error	ACK: Successful completion NAK: error
O	1	4FH	31H	Output continuously at all times.		
O	2	4FH	32H	Output continuously if stable (Stop output if unstable).		
O	3	4FH	33H	Output once when the [Output] key is pressed (whether the balance is stable or unstable).		
O	4	4FH	34H	One-time output when the balance is loaded and stabilised. The next output for another sample loading is executed once the indication becomes stabilised at less than or equal to zero by unloading and zero-point adjustment or tare subtraction.		
O	5	4FH	35H	One-time output every time when the balance reaches stable (Output stop at unstable times).		
O	6	4FH	36H	Continuous output at unstable times and one-time output every time when the balance reaches stable.		
O	7	4FH	37H	Output once when the [Output] key is pressed and the balance reaches stable.		
O	8	4FH	38H	Output once immediately.		
O	9	4FH	39H	Output once after the balance reaches stable.		

Legal Metrology

"Output commands "O1", "O3", "O6" SHALL NOT be used for legal for trade purpose. Unstable weighing data shall not be used for printing, price calculation, invoicing nor data storage for legal transactions.

Reference

- The output controls executed with commands "O0" to "O7" work the same as the function items in <5 toc.> of the basic function setting mode.
- The commands "O8" and "O9" are data request commands issued to the balance. After the "O8" or "O9" command has executed and balance has performed an output, the balance stops outputting until the next output command comes along.
- Once any command from "O0" to "O7" is executed, the balance runs that function until another command is entered. However, if the balance is switch ed off and on again, the output control is reset to the initial function setting.

(3) Set display command

C1	C2	Code (C1)	Code (C2)	Description	Response	
					A00/Exx	ACK/NAK
M	1	4DH	31H	Set to Display 1	A00: Successful completion E01: Command error E02: Error	ACK: Successful completion NAK: error
M	2	4DH	32H	Set to Display 2		
M	3	4DH	33H	Set to Display 3		
M	4	4DH	34H	Set to Display 4		

The display to be activated by the above settings 1 to 4 depends on the measuring mode currently in use.

- Relationship between measuring mode and display setting

Mode / Display setting	Weighing	Counting	Percentage	Coefficient	Specific gravity	Animal
Display 1	Net weight by unit A	Net weight by unit A	Net weight by unit A	Net weight by unit A	Unassigned	Unassigned
Display 2	Gross weight by unit A	Counting	Percentage	Multiplied value	Unassigned	Unassigned
Display 3 *1	Total of weight	Total of counting	Total of percentage	Total of multiplied value	Unassigned	Unassigned
Display 4	Net weight by unit B *2	Unit weight	Unassigned	Unassigned	Unassigned	Unassigned

Reference

*1: Display 3 can be specified only when the addition function is activated. If the addition function is not enabled, it results in an error.

*2: If the unit B is NOT specified, the display is set to the net weight by unit A.

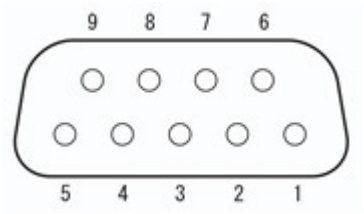
(4) Span adjustment/test command

C1	C2	Code (C1)	Code (C2)	Description	Response	
					A00/Exx	ACK/NAK
C	0	43H	30H	Disables the calibration operation by key stroke or command input.	A00: Successful completion E01: Command error E02: Operation is disabled. E03: Cancelled by operation E04: Abnormal completion	ACK: Successful completion NAK: error
C	1	43H	31H	Semi-Automatic Span Adjustment with Internal Calibration Weight		
C	2	43H	32H	Span Test with Internal Calibration Weight		
C	3	43H	33H	Span adjustment with external weight		
C	4	43H	34H	Span test with external weight		

Reference

- If the function item < CAL > is set to “0” (Calibration operation disabled), span adjustment/test command does not work.
- When the command “C0” is once input, calibration is disabled until the balance is turned on again or < CAL > is set to other than "0" by key stroke.

5-3 External Contact Input for Tare-Subtraction / Zero-Point Adjustment



Either tare-weighing or zero setting can be assigned to the function of the external contact input, which is switched on by ensuring continuity between pin 9 (External Contact) and pin 5 (GND) for at least 400 ms.

Ratings:
Open circuit voltage: 15 V
Sink current: 20 mA

Select the function assignment to the external contact input in function item <P. E.tA.> from the following.
Set value:
0 : Disabled
1 : tare-subtraction
2 : zero-point-adjustment

Refer to “2-2 Zero-Point Adjustment” and “2-3 Weighing by Placing a Sample in a Container (Tare)” for zero-point adjustment and tare subtraction.

Chapter 6

Calibration and adjustment of the Balance

A balance is influenced by the acceleration of gravity, temperature, air pressure, etc. Therefore, balance should be calibrated when it is relocated, used for a long period of time, or when it no longer indicate correct values for some reasons.

- Span adjustment: Determining the difference between an indicated value and the true value of the span, then rewriting the internal correction coefficients of the balance.
- Span test: Determining the difference between an indicated value and the true value (= calibration) of the span, and outputting the true value minus current value (the additive inverse of the "instrumental error").

Note	The span adjustment significantly affects the weighing accuracy. Please read this procedure carefully before getting to the adjustment.

This chapter includes:

Select the Span Adjustment/Test Mode

Semi-Automatic Span Adjustment with Internal Calibration Weight

Span Adjustment with External Weight

Span Test with Internal Calibration Weight

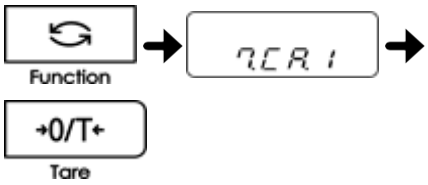
Span Test with External Weight

6-1 Select the Span Adjustment/Test Mode

1 Launch the basic function setting mode.
(Refer to “Section 3-1 Setting of Functions”.)

Press and hold the [Function] key. After <FUNC> is displayed, release the finger.

2 Select the adjustment/test mode to be launched by key stroke.



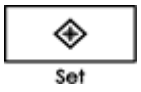
Press the [Function] key several times to go to <NCAL>.
Press the [Tare] key several times to select the span adjustment/test mode:

0: Adjustment/test operation disabled

1: Span adjustment with external weight

2: Span test with external weight

3 Complete the function setting.



Press the [Set] key.
The balance goes back to measuring mode.

Legal Metrology “Span adjustment with external weight” is not available on verified balance.

6-3 Span Adjustment with External Weight

Legal Metrology This function is not available on verified balance.

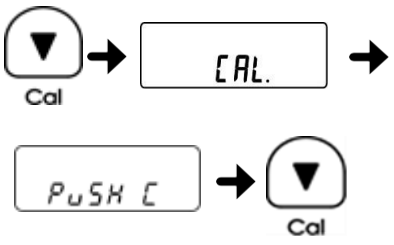
Note	(1) The span adjustment significantly affects the weighing accuracy. Please read this chapter carefully before executing the adjustment. (2) To ensure accurate calibration, the external weights used must be the one equivalent to OIML F1. (3) Use weights for calibration that weighs 50% of the maximum capacity (Max) or heavier. To calibrate more accurately, use a combination of weights whose weight is equivalent to the maximum capacity. (4) To ensure accurate calibration, please note the following before starting this function: - Ensure that the balance installed properly levelled; - Ensure that the equipment is not subject to environmental influences such as wind, vibration, temperature changes and changes in air pressure.

Reference Please contact us if you wish inquire about or place an order for calibration weights.

1 Energise the balance for longer than 15 minutes and load the balance a few times with a weight equivalent to the maximum capacity.

2 Check that no load is on the weighing pan.

3 Launch the span adjustment sequence.

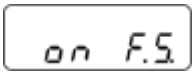


Press the [Cal] key.
The display will show “CAL” followed by “PuSH C”.
Press the [Cal] key again.
The span adjustment sequence is evoked and the display switches in the order:

4 Zero-point calibration.

The display indicates blinking of <on 0>, and the balance starts calibration of the zero point.

5 Capacity-point calibration.



The display changes to <on F.S.>.
Place the calibration weight on the weighing pan.
The display changes to blinking of <on F.S.>, and the balance starts calibration of the capacity point.

6 Completion of the span adjustment sequence.

When span adjustment is complete, <End> is displayed and the balance reverts to measuring mode.

Reference

(1) Pressing any other key than the [Function] key cancels adjustment in midway through.
(2) The < 1-Err> display indicates that the weight used for calibration is less than 50% of the maximum capacity (Max).
(3) The <2-Err> display indicates that an error over 1.0% was detected For more information, refer to “8-2 Troubleshooting”.
(4) The span adjustment sequence can also be invoked by pressing and holding the [Function] key until <CAL.> is displayed.

6-4 Span Test with External Weight

Note	(1) Please read this chapter carefully to ensure accurate calibration. (2) To ensure accurate calibration, the external weights used must be the one equivalent to OIML F1. (3) Use weights for calibration that weighs 50% of the maximum capacity (Max) or heavier. To calibrate more accurately, use a combination of weights whose weight is equivalent to the maximum capacity. (4) To ensure accurate calibration, please note the following before starting this function: - Ensure that the balance installed properly levelled; - Ensure that the equipment is not subject to environmental influences such as wind, vibration, temperature changes and changes in air pressure.

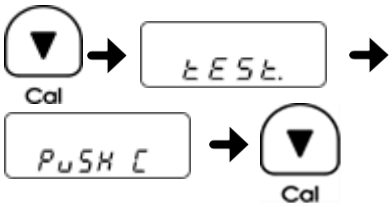
Reference

(1) Please contact us if you wish inquire about or place an order for calibration weights.
(2) The span adjustment sequence can also be invoked by pressing and holding the [Function] key until <t. int> is displayed.

1 Energise the balance for longer than 15 minutes and load the balance a few times with a weight equivalent to the maximum capacity.

2 Check that no load is on the weighing pan.

3 Launch the span adjustment sequence.

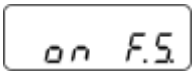


Press the [Cal] key.
The display will show “tESt.” followed by “PuSH C”.
Press the [Cal] key again.
The span adjustment sequence is evoked and the display switches in the order:

4 Zero-point calibration.

The display indicates blinking of <on 0>, and the balance starts calibration of the zero point.

5 Capacity-point calibration.



The display changes to <on F.S.>.
Place the calibration weight on the weighing pan.
Span test starts.

6 The result is displayed.

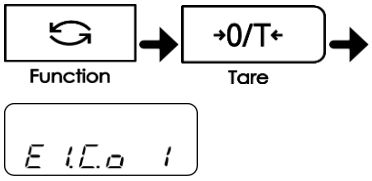
After <d IFF> is displayed, “the true value” minus “the current value of the device’s span (Maximum capacity point minus zero point)” is indicated.
Please note that this value is the additive inverse of the "instrument error".
Press any key to return to measuring mode.

6-5 Outputting Calibration Results

1 Launch the basic function setting mode.
(Refer to “3-1 Setting of Functions”.)

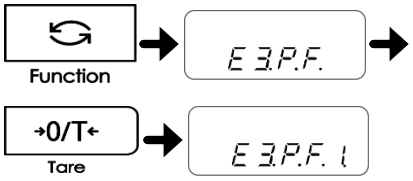
Press and hold the [Function] key. After <FUNC> is displayed, release the finger.

2 Enable the “Outputting calibration results” function.



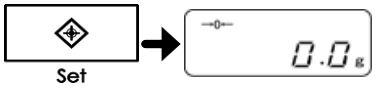
Press the [Function] key several times to go to <E.G.L P> (ISO/GLP/GMP settings), and press the [Tare] key to select “1” (enabled). Then press the [Function] key to go to <E 1. C.o> (Outputting calibration results), and press the [Tare] key to select “1” (enabled).

3 Select the output language.



Press the [Function] key several times to go to <E 3.P.F.> (Language for outputting). Press the [Tare] key to select the output language.
1: English
2: Japanese

4 Complete the function setting.



Press the [Set] key.
The balance goes back to measuring mode.

5 Perform calibration.

After span adjustment/test or calibration of the internal calibration weight is successfully completed, the result is automatically output. While the data is being output, the balance displays “busy” and the process is ongoing internally. Please wait for a while until the process is completed.
No output is made if calibration is not successfully completed.

■ Output Samples

Note	The start and end dates and times, and signature must be entered separately manually.

Reference
- To set the device ID, refer to “7-3 Device ID Setting”.
- The character code of Japanese is JIS X 0201.

● Span adjustment with external weight

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
1																
2	*	*	C	A	L	I	B	R	A	T	I	O	N	*	*	← Title
3																
4	D	A	T	E	:											← Start date
5	T	I	M	E	:											← Start time
6			D	I	N	I		A	R	G	E	O				
7	T	Y	P	E	:											← Model
8							G	A	M	1	5	K	N			
9	S	/	N	:	2	5	2	5	5	4	0	0	1			← Serial number
10	I	D	:							1	2	3	4	5	6	← Device ID
11																
12	C	A	L	.	E	X	T	E	R	N	A	L				
13	R	E	F	:												← Nominal weight used
14								3	2	0	0	.	0		g	
15																
16	C	O	M	P	L	E	T	E								
17	D	A	T	E	:											← End date
18	T	I	M	E	:											← End time
19																
20	S	I	G	N	A	T	U	R	E							
21																
22																
23																
24	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
25																
26																
27																
28																

- Span test with external weight

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
1																
2	*	*	C	A	L	.	T	E	S	T	*	*	*	*	*	← Title
3																
4	D	A	T	E	:											← Start date
5	T	I	M	E	:											← Start time
6			D	I	N	I		A	R	G	E	O				
7	T	Y	P	E	:											← Model
8							G	A	M	1	5	K	N			
9	S	/	N	:	2	5	2	5	5	4	0	0	1			← Serial number
10	I	D	:							1	2	3	4	5	6	← Device ID
11																
12	C	A	L	.	E	X	T	.	T	E	S	T				
13	R	E	F	:												← Nominal weight used
14								3	2	0	0	.	0		g	
15	D	I	F	F	:											← Additive inverse of the instrumental error
16								0	.	0	0	8	1		g	
17																
18	C	O	M	P	L	E	T	E								
19	D	A	T	E	:											← End date
20	T	I	M	E	:											← End time
21																
22	S	I	G	N	A	T	U	R	E							
23																
24																
25																
26	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
27																
28																
29																
30																

Chapter 7

Miscellaneous Functions and Settings

This balance has various functions and settings useful for managing of the balance, saving power, setting the measurement performance according to the measurement environment, etc.
This chapter describes those useful functions and settings.

This chapter includes:

Setting of Unit of Weighing
Power Save Settings
ID No. Setting
Settings According to the Measurement Environment
Initialising

7-1 Setting of Unit of Weighing

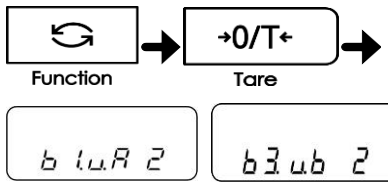
Two unit of weighing can be assigned as “Unit A” and “Unit B”, and they can be called up as weighing unit in accordance with the description in “4-1 Display Switching and Additional Functions of Each Measuring Mode”.

Reference Unit B can be used only in weighing mode. The Animal Weighing mode and Specific Gravity mode are fixed to grams. Changes to Unit A will not be reflected in these modes. For more information on selectable units, refer to “3-2 Function Setting List”.

1 Launch the basic function setting mode.
(Refer to “Section 3-1 Setting of Functions”.)

Press and hold the [Function] key. After <FUNC> is displayed, release the finger.

2 Set unit A.

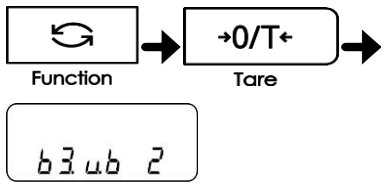


Press the [Function] key several times to go to <b1uA> (Unit A setting).
Press the [Tare] key to select the unit of weighing to be assigned to unit A.

1: gram
2: kilogram
4: carat

When setting only the unit A, press the [Set] key in this step to complete the function setting.

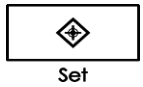
3 Set unit B.



Press the [Function] key several times to go to <b3ub> (Unit B setting).
Press the [Tare] key to select the unit of weighing to be assigned to unit B.

0: None
1: gram
2: kilogram
4: carat

4 Save the setting.



Press the [Set] key.
The balance goes back to measuring mode.

7-2 Power Save Settings

This product has three types of power saving features: auto power off, backlight control, and auto backlight off.

(1) Auto power off <APo>:
Turns off the balance automatically if left untouched for about five minutes.
This function is only available when the balance is operated by dry-cell batteries (optional).
The auto power off function does not work under the following conditions:
- During basic function setting mode and advanced function setting mode.
- An object is placed on the weighing pan, and display is not stable.
- The balance is powered by AC adaptor.

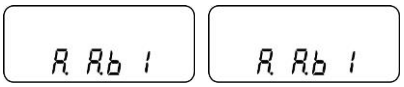
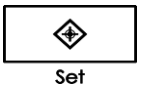
To use the balance again after it is powered off, start from turning the power on.

(2) Backlight Control <bL>:
In addition to on/off, the backlight can be turned off only when operated by dry-cell batteries (optional).

(3) Auto backlight off <ABb>:
Turns off the backlight automatically if the balance is left untouched in measuring mode for about three minutes.
This function does not work under the following conditions:
- During basic function setting mode and advanced function setting mode.
- An object is placed on the weighing pan, and display is not stable.

Placing an object on the weighing pan or pressing any key turns the backlight on again automatically.

Note	For accurately weighing, please set Backlight Control <bL> to continuously “ON” or “OFF”, do not select Auto backlight off<ABb> “ON”. When the balance is battery powered, it is recommended to set backlight settings to continuously “OFF” to save the power.

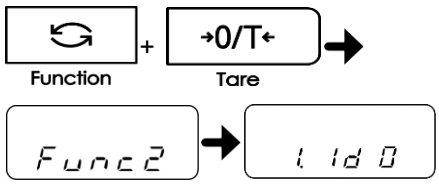
1	Launch the basic function setting mode. (Refer to “Section 3-1 Setting of Functions”.)	Press and hold the [Function] key. After < FUNC > is displayed, release the finger.
2	Select each function items. 	Press the [Function] key several times to select the function items (See the above table). <A.A.P. >: Auto power off <b. bL. >: Backlight Control <A.A.b. >: Auto backlight off
3	Select a setting. 	Press the [Tare] key to select the setting values of each function item (see the above table).
4	Complete the function setting. 	Press the [Set] key. The balance goes back to measuring mode.

7-3 Device ID Setting

Setting a Device ID allows it to be output simultaneously with Calibration results and ISO/GLP/GMP form outputs of measurement results, which aids in managing the output of calibration and measurement results.

Up to six characters can be set as the device ID. The characters that can be use are “Space”, “0” to “9”, “A” to “F”, and “-” (hyphen).

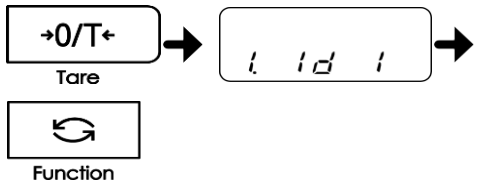
1 Launch the advanced function setting mode.



Press and hold the [Function] key while pressing the [Tare] key. Release the fingers when <Func2> is displayed.

Function item < 1. id> (Device ID setting) is displayed.

2 Launch the device ID setting mode.



Press the [Tare] key to select “1” and press the [Function] or [Set] key.

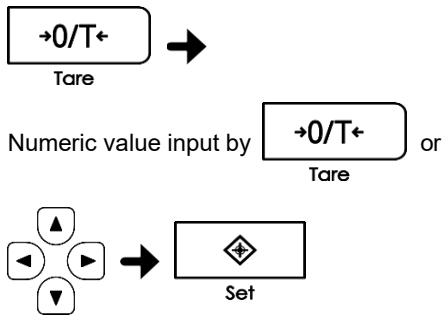
If the device ID is not set (initial setup), the process will proceed directly to Step 3.

If a device ID has been set, the configured ID will be displayed along with <◂> and <▴> symbols.

Press the [Set] key to return to measurement mode.

To reconfigure the Device ID, proceed to Step 3.

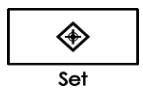
3 Set the device ID.



Input the device ID with the following steps:

1. Press the [Tare] key.
   The display switches to the numerical input screen and the leftmost digit blinks.
2. Select a character by pressing the [Tare] key, [▴] key, or [▾] key.
   Pressing the key switches between space, digits 0-9, A to F, and hyphen.
3. Pressing the [Function] key or [▶] key confirms the entry, and shifts to the next lower-order digit entry.
   Pressing the [◂] key cancels the last digit input and returns to the previous digit entry.
4. Set the device ID by repeating steps 2 and 3.
   Pressing the [Output] key can cancel the setting.
5. Press the [Set] key to save the device ID,
   and the balance goes back to measuring mode.

4



7-4 Settings According to the Measurement Environment

When the balance is stable, the stable indicator <○> is lit in the upper left of the display. When displayed value flickers and stable indicator disappears, it indicates that the balance is influenced by wind or vibration.

As larger values are set in the function items of <StAb> (stability judgment) and <SP-E> (response speed), stability improves, however, accuracy and response time decrease respectively.

Relationship between each function setting and wind/vibration influences

Wind/vibration influences	Stability judgment <StAb>	Response speed <SP-E>
Small | Big	2 (Strict) 3 4 (Mild)	0 (Sensitive mode) 1 (Fast) 2 3 (Slow)

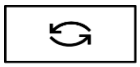
Reference

In each of the functions, if wind and vibration influences are small, select 1 or 2.
If those influences are big, select 3 to 4.
When the response speed is set to 0 (Sensitive mode), the balance becomes very sensitive, and follows and detects even the smallest load fluctuations.

1 Launch the basic function setting mode.
(Refer to “Section 3-1 Setting of Functions”.)

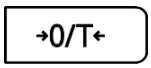
Press and hold the [Function] key. After <FUNC> is displayed, release the finger.

2 Select each function items.



Press the [Function] key several times to select the function items (See the above table).
<StAb>: Stability judgment
<SP-E>: Response speed

3 Select a setting.



Press the [Tare] key to select the setting values of each function item (see the above table).

4 Complete the function setting.

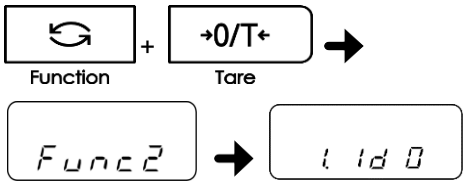
Press the [Set] key.
The balance goes back to measuring mode.

7-5 Initialising

The settings of the balance can be initialised.

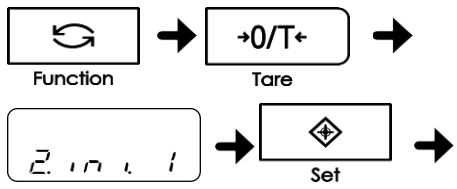
Note	All function settings will be initialised In addition, all data saved after the factory will be discarded, including device ID, limit values, data of counting, percentage, coefficient, and specific gravity. It is not possible to restore the current setting values. Before initialising the balance, make a note of the setting values if necessary.

1 Launch the advanced function setting mode.



Press and hold the [Function] key while pressing the [Tare] key. Release the fingers when <Func2> is displayed.
Function item < i id> is displayed.

2 Execute initialisation.



Press the [Function] key several times to go to <2. in i.>.
Press the [Tare] key to select "1" (Execute) and press the [Set] key.
Initialisation is executed, and the balance goes back to measuring mode.

Chapter 8

Cleaning the product

This chapter describes how to clean the product.

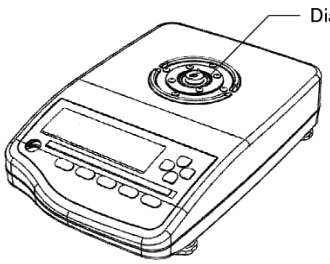
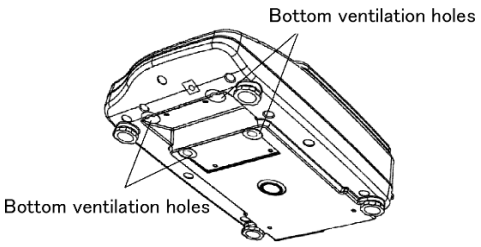
This chapter includes:

Cleaning the product

8-2 Cleaning the product

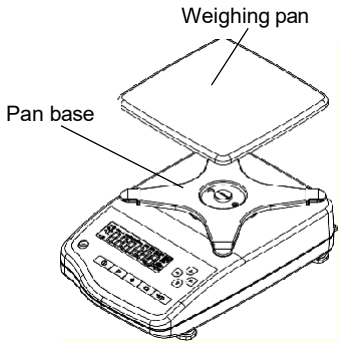
When taking care of the product, follow the instruction below:

DANGER	- Do not wet the AC adaptor. - Be sure to disconnect the AC adaptor from AC mains before cleaning the balance.

Note	(1) This product meets IP65 only when: - The pan base and weighing pan are installed; and - Underfloor weigher hole cover is closed; and - The connector cover is closed, or specified water/dust-proof cable is connected; and - The balance is placed upright on the flat surface and water jet is not hit the bottom surface directly; and - The cover of the option slot is closed, or Dry-cell battery case option is adequately installed; and - Relay contact output option is not installed. (2) It is not possible to prevent water ingress into the balance by direct water jet when: - The pan base and weighing pan are not installed; or - The balance is not placed upright on the flat surface and the bottom surface can be suffered to water jet directly. (3) Do not scratch the diaphragm and the bottom ventilation hole using a sharp object, hard brush, or other such hazardous tools.   (4) Do not remove any parts other than those described in this chapter. (5) Do not use volatile solvents to resin parts of the balance. If volatile solvents are used to clean the metal parts, care should be taken to ensure that they never contact the resin parts. (6) Do not submerge the balance in wat Bottom ventilation holes

1-2-1 How to remove light dirt of the main unit

1



Remove the weighing pan, pan base screw and pan base, then wipe dirt from the balance with dry and soft cloth.

1-2-2 How to wash the balance with water

Note	- This cleaning procedure cannot be used when the relay contact output option is installed. - When the diaphragm, operation key and display panel, bottom ventilation holes, AC adaptor cap and connector cover, or any parts of the enclosure are damaged, do not wash them with water to prevent water from entering the unit.

Reference	In case of heavy soiling, neutral detergents can also be used for cleaning. If this is the case, the detergent should be wiped off with a damp cloth.

1 Disconnect the AC adaptor from AC mains.

2 Disconnect the AC adaptor, output cables and optional hanger fitting from the balance, and then close the AC adaptor cap, connector cover and underfloor weigher hole cover.
If the area around the connector is contaminated with dust, remove the dust first and then disconnect it, taking care not to let the dust get inside the connector.

3 With the pan base, pan base screw and weighing pan still attached to the balance, rinse off the dirt under a stream of water.

4 Remove the weighing pan, pan base screw and pan base, then wipe off any areas that have not been washed away with a soft cloth dampened with water.

5 Wipe the main unit, weighing pan, pan base screw and pan base with a soft, dry cloth and dry them thoroughly.

Chapter 9

Troubleshooting

This chapter describes troubleshooting including error messages and remedies.

This chapter includes:

Error Messages
Troubleshooting

9-1 Error Messages

Message	Cause	Remedy
o-Err	- The gross weight of the load is over the maximum capacity (Max). - The number of digits in the addition result or calculation result went over the number that can be displayed.	- Unload the sample to weigh it in some portioned-out measurements. - Replace the tare with a lighter one. - If the error message does not disappear even when nothing is placed on the weighing pan, mechanical parts may have failed. Contact our dealer. - First, clear the addition result. Then execute addition again. - The coefficient used in unit converting is too small. Set a greater coefficient.
u-Err	The gross weight of the load is below the negative lower limit.	- The weighing pan or the pan base may not be properly set. Check them, paying attention to whether they are in contact with an external object. - If the error message does not disappear even if the weighing pan and the pan base are properly set, mechanical parts may have failed. Contact our dealer.
1-Err	The reference weight used during span adjustment with an external weight is far less than 50% of the maximum capacity (Max).	For span adjustment with an external weight, use a weight that weighs as close to the maximum capacity as possible.
2-Err	An error over 1.0% was detected in span adjustment（ and Calibration of the Internal Calibration Weight） with an external weight.	For span adjustment with an external weight, check that a correct weight is placed and that no objects other than the weight are placed. Then, execute span adjustment again.

b-Err	The balance is influenced by static electricity or noise.	- Unplug the AC adaptor from the receptacle and then turn the power on again. - If this error occurs again, electric components may have failed. Contact our dealer.
d-Err	The balance is influenced by static electricity or noise.	- Unplug the AC adaptor from the receptacle and then turn the power on again. - If this error occurs again, electric components may have failed. Contact our dealer.
L-Err	The weight of a sample is too light at a sampling during parts counting, or reference weight saving during percentage weighing.	Use a heavier sample by referring to the “Appendix 4 Specifications” to check the minimum unit weight and the percentage weighing weight limit.
t-Err	- At addition operation, you placed additional samples on twice. - At addition operation, you unloaded some samples, or you pressed the key without adding samples.	- After setting the display to “0” (by unloading the previous sample), place the next sample to continue addition operation. - Addition operation is impossible when 0 or a negative value is displayed. Place a sample to continue addition operation.
E1-Err	No inputs are sent from the weight sensor.	- Unplug the AC adaptor from the receptacle and then turn the power on again. - If this error occurs again, the sensor may have failed. Contact our dealer.
E2-Err	Because the balance is unstable, initial zero-point adjustment at power on cannot be completed.	The balance may be affected by an external influence such as wind and vibration. Relocate the balance by referring to the section “For more accurate measurement”.
E3-Err	Cannot complete initial zero-point adjustment because the power was turned on with an object on the weighing pan.	Please remove the object from the weighing pan.

9-2 Troubleshooting

Problem	Cause	Remedy
Nothing is displayed even when the balance is powered on.	The AC adaptor is not connected.	- Check that the AC adaptor is connected. - If nothing is displayed even if the AC adaptor is properly connected, the electric components of the balance, or the AC adaptor may have failed. Replace the AC adaptor to test the root cause of the problem, if you have a same-model AC adaptor that operates properly at hand. - Contact our dealer.
	The batteries are exhausted.	Replace the batteries.
Display flickers.	The balance may be affected by an external influence such as wind and vibration.	Increase the setting values of relevant functions by referring to “Section 5-6: Settings According to the Measurement Environment”.
Weight indication contains an error.	The display error is caused because the balance has not been used for a long period of time or has been relocated to another location.	Perform span adjustment.
	The adjusters are not settled, and the balance is not kept horizontal.	Check that the balance is kept horizontal.
Weight indication contains an error even after calibrated.	The balance may have been affected by an external influence such as wind and vibration during calibration.	The balance may be affected by an external influence such as wind and vibration. Take remedial actions or relocate the balance by referring to the section “For more accurate measurement”. Then calibrate again.

Problem	Cause	Remedy
	The weight used for calibration is slightly different in mass from the weight used for checking.	Use the same weight during calibration and checking.
The display does not move with the M sign flashing. (When the [Tare] key is pressed, during a sampling in parts counting mode, etc.)	The balance may be affected by an external influence such as wind and vibration.	The balance may be affected by an external influence such as wind and vibration. Take remedial actions or relocate the balance by referring to the section “For more accurate measurement”.
The icon blinks when the balance is operated on batteries.	The batteries are exhausted.	Replace the batteries.
The display is turned off when the balance is operated on batteries.	The display was turned off by the auto power off function.	The auto power off function is activated if the balance is left unused with no measurement taken for approximately five minutes. Disable the auto power off function if it interferes with your use of the balance.

Problem	Cause	Remedy
No outputs	Intended output function settings are not established.	Make the balance compatible in communication conditions with the external device by referring to their operation manuals. Check outputs with the following methods: Initialise the function settings by referring to “Section 7-3: Initialising”. Then, set to a communication condition of 1200 bps, 8-bit data, 2-bit stop bit, and no parity by referring to the operation manual of the external device. Now, output is done once after stabilisation, after the [Output] key is pressed. Check output by pressing the [Output] key.
	Communication conditions disagree with the external device.	
	Wrong cable connection	To connect the balance to a general-use PC, a cross cable is required (Refer to “Section 6-2: Connecting to External Devices via RS-232C Interface”). Arrange it yourself or contact our dealer.
	The cable is disconnected or not properly connected.	Check for proper cable connection.
The current settings of the balance are unknown.		You can initialise the balance (“Section 5-7: Initialising”).

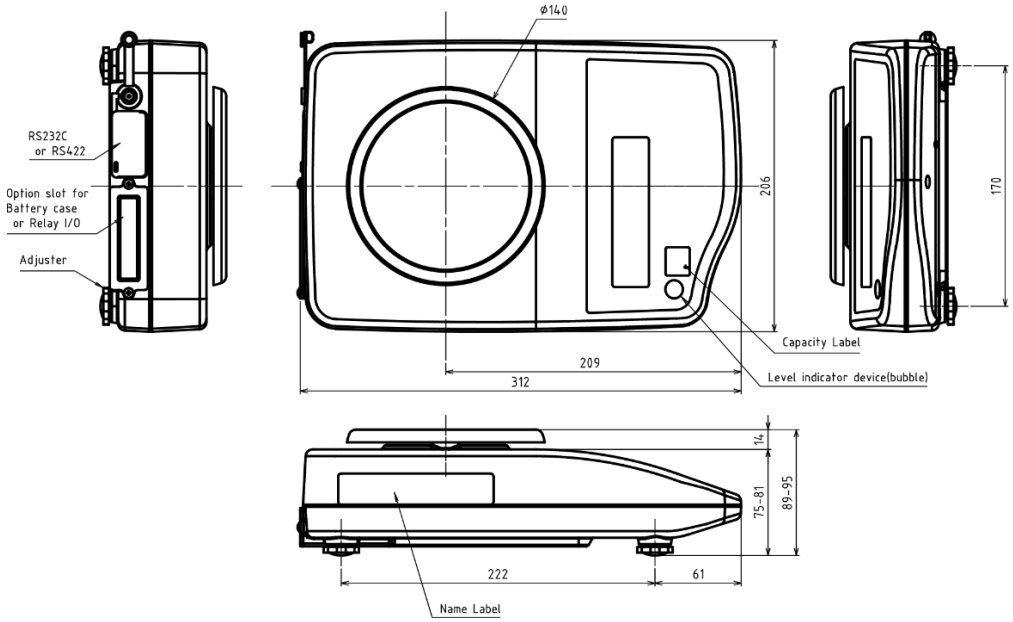
Appendixes

This chapter includes:

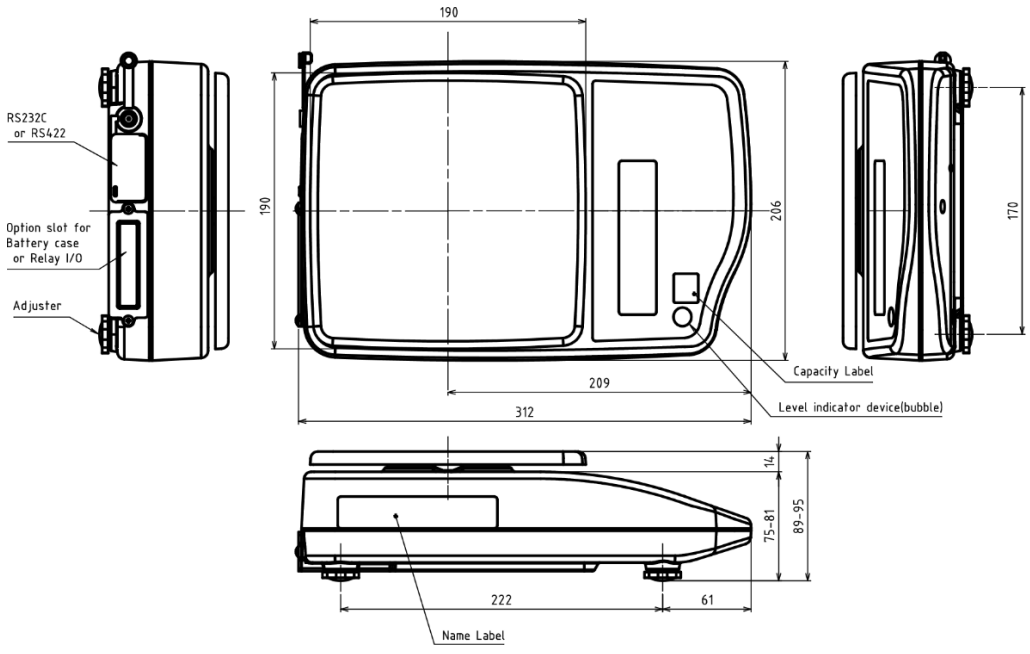
Dimensional Outline Drawings
Specifications

Appendix 1 Dimensional Outline Drawings

■ GAM820N



■ GAM2200N, GAM3200N, GAM6200N, GAM8200N, GAM15KN



Appendix 2 Specifications

Appendix 2-1 Metrological specifications

Model	Max	Legal Metrology Min	Legal Metrology e	d	Legal Metrology Accuracy class	Minimum unit weight in counting mode	Minimum reference weight in percentage mode	Calibration method	Pan size
GAM820N	820 g 4100 ct	0.2 g 1 ct	0.01 g 0.05 ct	0.01 g 0.05 ct		0.01 g	1 g	- Span adjustment with external weight (Not available for verified balance)	140 X 140
GAM2200N	2200 g 11000 ct	5 g 25 ct	0.1 g 0.5 ct	0.1 g 0.5 ct		0.1 g	10 g		190 X 190
GAM3200N	3200 g 16000 ct	5 g 25 ct	0.1 g 0.5 ct	0.1 g 0.5 ct		0.1 g	10 g		
GAM6200N	6200 g 31000 ct	5 g 25 ct	0.1 g 0.5 ct	0.1 g 0.5 ct		0.1 g	10 g		
GAM8200N	8200 g 41000 ct	5 g 25 ct	0.1 g 0.5 ct	0.1 g 0.5 ct		0.1 g	10 g		
GAM15KN	15000 g 75000 ct	50 g 250 ct	1 g 5 ct	1 g 5 ct		1 g	100 g		

Legal Metrology	Span adjustment with external calibration weight is not available on the verified Class II balance.

Weighing system	Tuning-fork vibration system
Zero	■ Initial zero setting Range: -5% to +5% ■ Semi-automatic zero-point adjustment with [Tare] key, external contact input, or external command input. Range: -1.5% to +1.5% ■ Zero tracking Range: -1.5% to +1.5% Rating: 0.5 d/second Can be disabled by setting.
Tare subtraction	■ Semi-automatic tare weighing with [Tare] key, external contact input or external command input. - Type: Subtractive tare (Tare reduces the weighing range for net loads) - Range: greater than 1.5%,and up to the maximum capacity of the scale (Max)
Limits of Indication	<o-Err> is displayed when the maximum capacity (Max) is exceeded by 9 e. Legal Metrology < U–Err > is displayed when negative gross weight is less than -20 d.
Guaranteed temperature range for metrological performance	5 to 35 °C

Appendix 2-2 Functional specifications

Product name	Precision Balance
Type	GAM series
Model	GAM820N, GAM2200N, GAM3200N, GAM6200N, GAM8200N, GAM15KN
Manufacturer	Dini Argeo Via della Fisica, 20 41042 Fiorano Modenese (MO), Italy
Power	Dedicated AC Adaptor: 100-240 V〜±10% / 50-60 Hz / 0.3 A Dry-cell battery drive (optional): 4 AA batteries
Ratings	AC adaptor jack: 5.95 V⎓, 1,5 W Dry-cell battery powered: 6 V⎓ 0,54 W
Weight of the balance	GAM820N: Approximately 2 kg GAM2200N, GAM3200N, GAM6200N, GAM8200N, GAM15KN: Approximately 2,5 kg
Operating condition	Temperature: 5 to 35 °C Humidity: 80%rh or less (No condensation allowed) Pollution degree: 2 Altitude: 2000 m or less above sea level Location of use: Indoor use only Can be used in wet location (except when equipped with relay output option)
Electromagnetic compatibility	Immunity: Industrial electromagnetic environment - Performance Level: The balance does not display stable values or output values beyond a value corresponding to 1 e (maximum permissible error). - Permissible Loss of Performance: The balance indication may become unstable and may exceed 1 e (maximum permissible error) temporarily due to electromagnetic interference, but it does not lead to inaccurate weight indication readings or outputs. Emission: Class B
Ingress Protection	IP65 This product meets IP65 only when: - The pan base and weighing pan are installed; and - Underfloor weigher hole cover is closed; and - The connector cover is closed, or specified water/dust-proof cable is connected (Please contact to your local dealer for the specified cable.); and - The balance is placed upright on the flat surface and water jet is not hit the bottom surface directly; and - The cover of the option slot is closed, or Dry-cell battery case option is adequately installed; and - Relay contact output option is not installed.

Display	LCD (with backlight) - 7-segment: Maximum six digits - Bar graph: 20 steps
Material of the weighing pan	Stainless steel
Output	- RS-232C compliant output is equipped as standard. - Connector: 9-pin D-SUB male (RS-232C output bi-directional, and port for external tare-weighing / zero-setting)

Reference

Please note the followings when selecting the options:

- When the RS422A option is installed, RS232C output is replaced by RS422A on the 9-pin D-SUB connector.
- Optional dry-cell battery case, relay contact output, cannot be selected together.

Legal Metrology

The Hanger fitting option is not approved for use in legal-for-trade applications.

The bucket for animal weighing is not approved for use in legal-for-trade applications.

Appendix 2-3 Display, Readability and Capacity by Each Unit of Weighing

Unit of measurement			GAM820N	GAM2200N	GAM3200N
Name	Indication				
gram	g		620	820	2200
			0.01	0.01	0.1
kilogram	kg		0.62	0.82	2.2
			0.00001	0.00001	0.0001
carat	ct		3100	4100	11000
			0.05	0.05	0.5

Unit of measurement			GAM6200N	GAM8200N	GAM15KN
Name	Indication				
gram	g		6200	8200	15000
			0.1	0.1	1
kilogram	kg		6.2	8.2	15
			0.0001	0.0001	0.001
carat	ct		31000	41000	75000
			0.5	0.5	5

* The view of the table

Upper cell: Capacity
Lower cell: Readability

Appendix 3 Printing in Compliance with ISO/GLP/GMP

Span adjustment with external weight

```
**CALIBRATION**

DATE :
TIME :
     DINI ARGEO
TYPE :
          GAM15KN
S/N :     252554001
ID :

CAL.EXTERNAL
REF :
        0015000  g

COMPLETE
DATE :
TIME :

SIGNATURE


***************
```

Span test with external weight

```
**CAL.TEST**

DATE :
TIME :
     DINI ARGEO
TYPE :
          GAM15KN
S/N :     252554001
ID :

CAL.EXT.TEST
REF :
        0015000  g

COMPLETE
DATE :
TIME :

SIGNATURE


***************
```

Measurement data: Header

```
     DINI ARGEO
TYPE :
          GAM15KN
S/N :     252554001
ID :

START
DATE :
TIME :
```

Measurement data: Footer

```
END
DATE :
TIME :

SIGNATURE


***************
```

Caution	The date and time shown in printing examples are printed only when the dedicated printer (CSP-160 or CSP-240) is used.

Index for Terms

[A]

Absolute value……40
Adjuster……8
Animal……...23
Auto backlight off……21
Auto power off……21
Average sample weight……27

[B]

Bar graph……14

[C]

Calibrate……..70
Command……48

[D]

Deviation value……...40
D-SUB9P cable……7

[F]

Function setting……..16

[G]

Gross……9

[I]

Interface……..53
ISO/GLP/GMP compliant form……59

[L]

Limit value……40

[N]

Net addition……19
Number of samples……26

[O]

Operation key……4

[P]

Pan base……92
Percentage……..20
Printer……106

[R]

Reference weight……28
Response……61
RS-232C……104

[S]

Span adjustment……21
Span test……..21
Specific gravity……31
Stability……19

[T]

Terminators……54

[U]

Underfloor weigher……...7

[W]

Waterproof and dustproof……7
Weighing capacity……..12
Weight limit……..95