Installation Environment, Basic Handling Method, and Precautions for Weighing of a Balance <*G1-8-182*>

(はかり(天秤)の設置環境，基本的な取扱い方法と秤量時の留意点〈*G1-8-182*〉)

The mass to be weighed should be usually larger than the minimum weight. Before weighing, tools used for weighing should be prepared and kept tidy and in order (cleaning), and the sensitivity of a balance should be adjusted. The installation environment of a balance, basic handling method, and precautions for weighing are shown as follows.

1. Installation environment of a balance

It is desirable to install a balance at a place whose surrounding environment is unchanged at any time in a room not too spacious, avoiding vibration sources, ventilation ports, and wall surfaces that receive heat radiation from the room light and direct sunlight. It is desirable to use a balance in the corner of a room or near a large pillar where the impact of vibrations is considered to be small. It is also desirable that a weighing table (anti-vibration table, vibration isolated table, etc.) on which a balance is installed has enough mass by itself, it is so rigid that it is not distorted vertically even if the load of a heavy object is applied, and magnetism and electrification are taken into consideration. Especially for a balance with the number of readable digits of not more than 0.1 mg, precautions must be taken for installation or relocation because displayed values become unstable from the transmission of minor vibrations that cannot be sensed by humans to a sample itself or the reaction of the weighing sensor of the balance to minor vibrations. For the aspect of maintenance and control, an environment without sudden temperature changes, which may cause condensation, is required to avoid the deterioration of the components of a balance. The installation environment for a balance as an electronic device should be within a temperature range from 5℃ to 40℃ and relative humidity range from 20% to 80%, and a relative humidity of not less than 45% is desirable when considering the effect of static electricity.

2. Operation check before the use of a balance

The following items should be checked before using a balance.

2.1. Securement of preheating standby time

After turning on the power, secure a preheating standby time to stabilize the internal temperature of the detector. It is desirable to secure the following preheating standby time of not less than 30 minutes when the number of readable digits is 10 mg or more, not less than 1 hour when it is 1 mg to 10 mg, not less than 2 hours when it is not more than 1 mg, and not less than half a day when it is not more than 0.01 mg.

2.2. Check of installation condition

Check that a balance is level using the level gauge installed, for example, the air bubble in the gauge is positioned at the center. For the level adjustment, it is desirable to visually check whether the balance is unstable and whether there is no gap between the legs of the balance, which contact the weighing table, and the surface of the table.

2.3. Implementation of sensitivity adjustment

In the case of a balance equipped with a sensitivity adjustment function (equipped with an internal weight for adjustment), it is possible to perform appropriate sensitivity adjustments depending on the surrounding temperature condition at the zero point and around the balance's capacity. The higher the resolution, the greater the effect of changes in sensitivity, and measurement errors due to changes in sensitivity generally become relatively large from the zero point to around the mass weighed. As for a device that is not equipped with a sensitivity adjustment function, it is desirable to manually adjust sensitivity using the weight of around the balance's capacity.

3. Cleaning

To avoid weighing an object other than the target object, cleaning should be performed periodically. If the structure of a balance is understood, and the balance can be simply dismantled and cleaned, clean each part using a glass cleaner and lint free cloth frequently and keep the weighing pan and the inside of the weighing room clean.

4. Elimination of external factors that affect weighing results

External factors that affect weighing results must be eliminated as much as possible. In the case of samples that are prone to moisture absorption, adsorption, volatilization, or evaporation, measures must be implemented according to the characteristics of the sample to prevent the deviation of weighed values. For example, when a hygroscopic sample is weighed, weighing with good repeatability is possible if a balance is installed in a constant temperature and humidity box, and the sample is weighed after it is acclimated to the specific temperature and humidity conditions in advance. External factors that affect weighing results other than the characteristics of a sample itself are shown below.

4.1. Temperature differences between around the weighing pan and a sample (including sampling container)

Temperature differences between around the weighing pan and a sample occur because of the refrigerated storage of a sample, bringing a sample from outside of the room with a different temperature, heat treatment, heat conduction by body temperature, and other factors. If the temperature of a sample and sampling container is higher than the temperature in the weighing room, slight upward wind (convection)

generates around the weighing pan, and the sample and sampling container are pushed up by the phenomenon, resulting in a decrease or instability of displayed values. If the relationship of the temperature is contrary, an opposite trend appears. These phenomena are physical phenomena that occur around the weighing pan and therefore cannot be avoided even if a balance is equipped with a windshield device. Therefore, weighing should be performed under the condition where the temperature in the weighing room of a balance and the temperatures of a sample and a sampling container are as equivalent as possible.

4.2. Wind due to air conditioners, etc.

When the weighing pan is affected by an airflow generated by an air conditioner, access to the weighing room by people, and the weighing operation of a person who performs measurement, the displayed values become unstable. To suppress the impact of such wind, a windshield device should be installed to prevent direct wind onto the weighing pan. Or, relocate it to a place where there is no wind. When a balance equipped with an open/close door is used under the condition where it is affected by direct wind, it is important not to open the open/close door wider than necessary.

4.3. Static electricity

When using a sample such as powders and a sampling container, which are likely to be electrified by friction, or the inside of a weighing room is in a low humidity condition of relative humidity of 40% or lower, weighing results were affected by displayed values that fluctuate upward or downward due to the action of the force of electrical charges. The following items are considered to prevent such static electricity: keep humidity in the weighing room at 45% or higher, wait for dissipation of accumulated static electricity, and change the sampling container to an antistatic container. If these measures cannot be implemented, it is recommended to perform measurement after performing discharging as much as possible using an instrument, such as an ionizer, which neutralizes charged electrical charges or promotes the dissipation of the charges. However, avoid using an instrument that directly blows wind, which makes displayed values unstable, to the weighing pan during discharging.