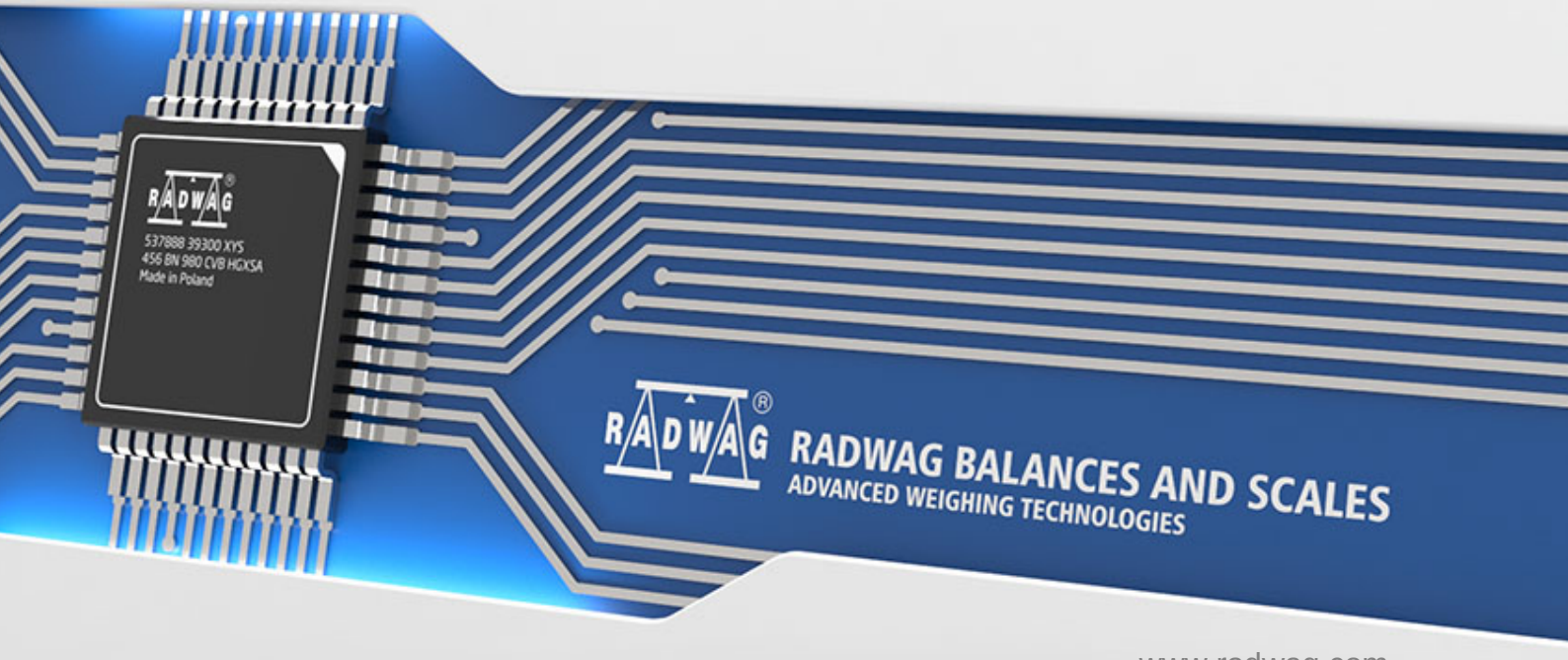
R Series Balances

AS R2.PLUS Analytical Balances
PS R2 Precision Balances

BRIEF USER MANUAL

IMMU-03-S-03-03-21-EN



www.radwag.com

CAUTION:
This is only a brief version of the user manual, it does not provide all product-related information. Prior to moisture analyzer operation it is recommended to read the full user manual version that is to be found on a CD delivered along with the device. The full user manual version describes data crucial for settings and device operation.

If you are reading this, it means that you are bound to achieve success. You have purchased a device that was designed and manufactured to give you years of service.
Congratulations and thank you for selecting RADWAG product.

MARCH 2021

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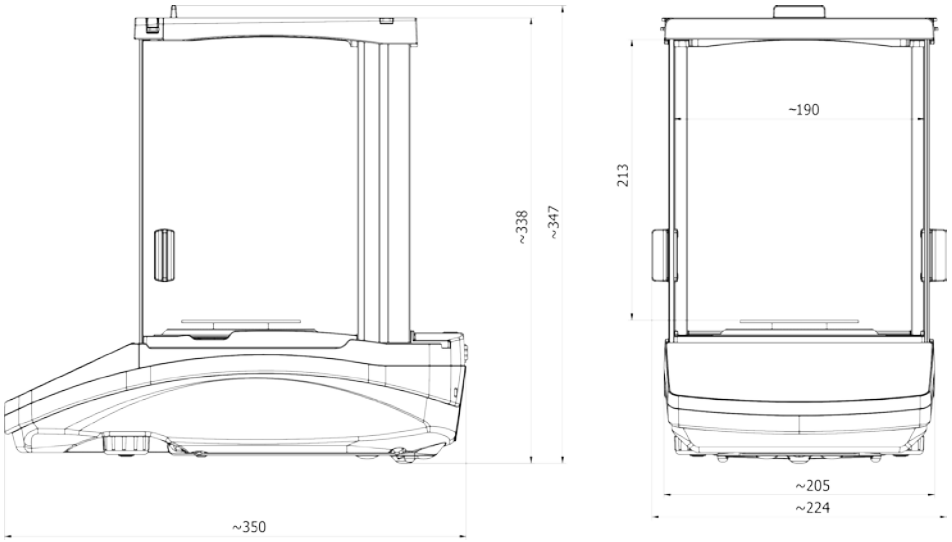
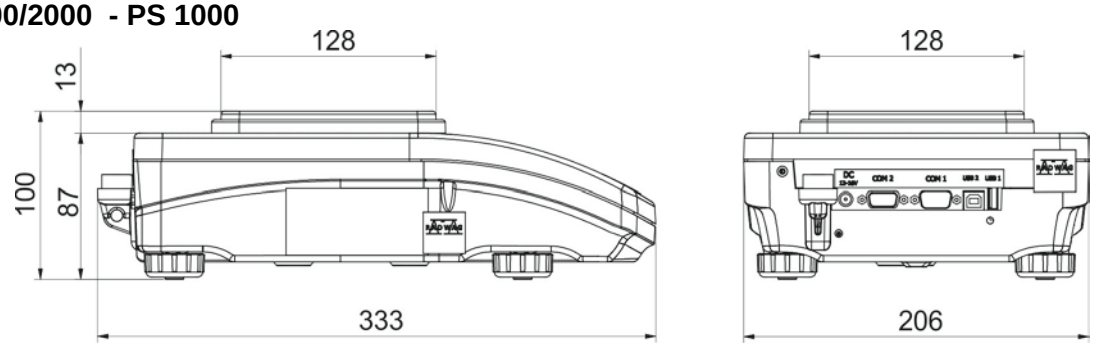
1. GENERAL INFORMATION

1.1. DIMENSIONS

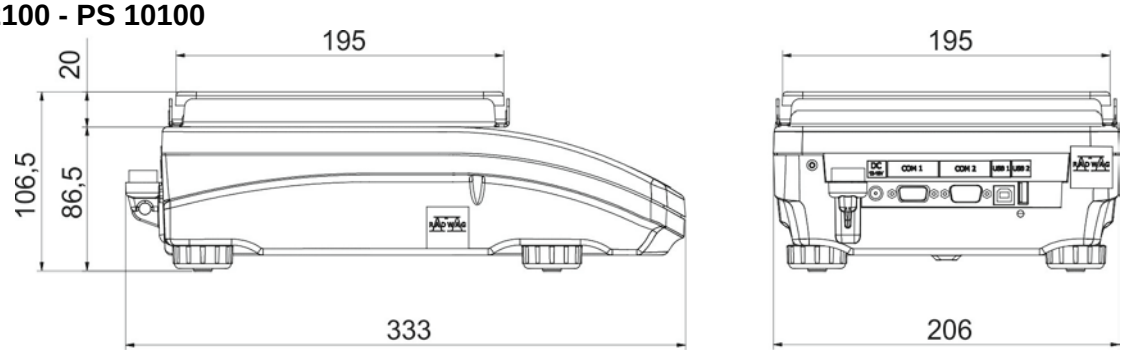
AS PLUS series:



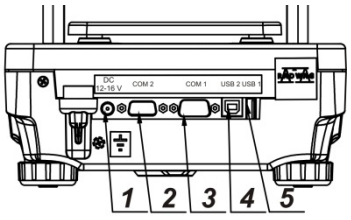
PS 200/2000 - PS 1000



PS 2100 - PS 10100



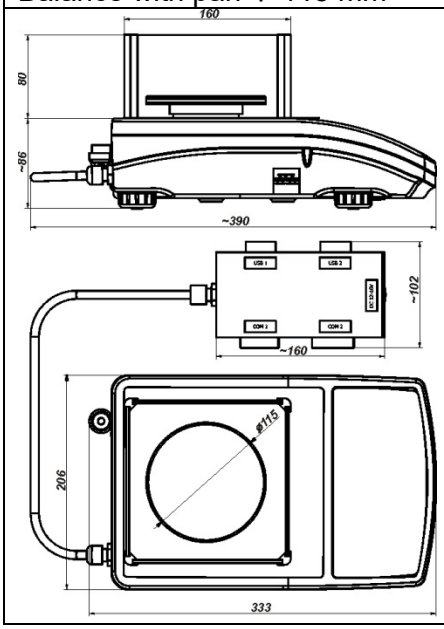
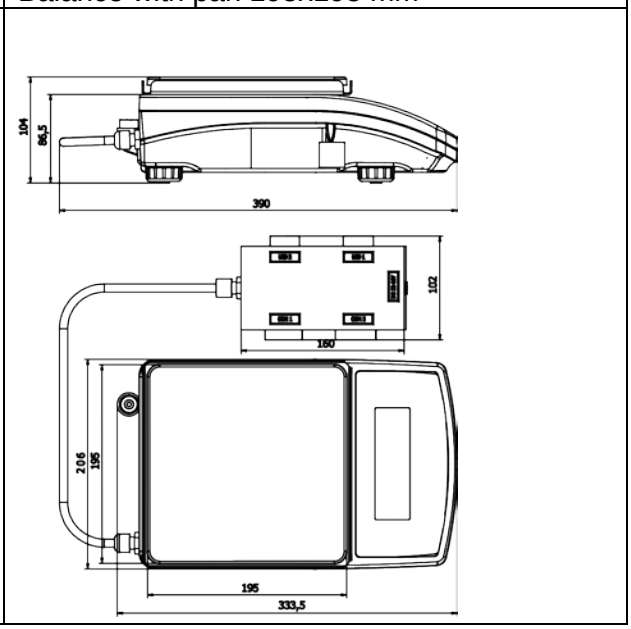
1.2. CONNECTORS



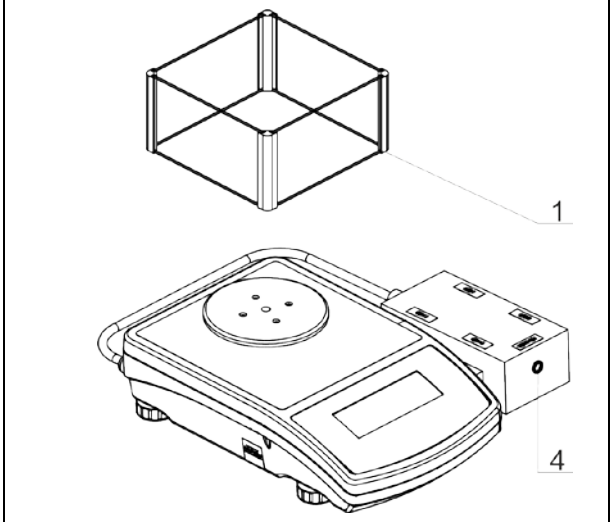
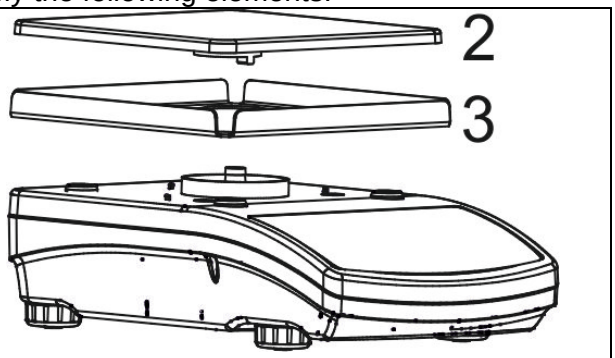
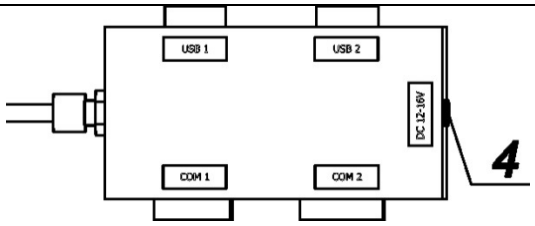
1	Power supply socket
2	COM 2 connector (additional display or external buttons)
3	COM 1 connector (printer)
4	USB 2, type B (computer)
5	USB 1, type A (keyboard)

1.3. PS R2.H SERIES

The PS R2.H series redefines the level of standard for precision balances. Not only do they share all the features of R series balances, but can also work in adverse operating conditions (condensed dust, drops of water falling down at different angles) typical for IP 54.
Balance housing is made of plastic, whereas its pan of stainless steel.
The PS R2.H series metrological parameters are identical like those of standard design balances.

Balance with pan Φ 115 mm	Balance with pan 195x195 mm
	

Upon unpacking, remove all transport locks and assembly the following elements:

	
- draft shield (1)	- weighing pan shield (3) and weighing pan (2)
	- plug the power supply connector into the socket (4), - plug the power supply to the mains.

CAUTION!
While cleaning it is advisable to follow below precautions. Additionally it is a must to disconnect the device from mains and unplug all the peripherals (printers, computer etc.) remembering at the same time to protect ports by means of stoppers. Only thus prepared device can be cleaned. Upon completion of the cleaning process the device may be connected to mains for further operation.

1.4. INTENDED USE

R2 series balances are designed to provide accurate measurement of weighed loads, performed under laboratory conditions. It is intended for application as a non-automatic weighing instrument only, i.e. the material to be weighed is manually and carefully placed in the centre of the weighing pan. Weighing result should be read only after stable reading has been obtained.

1.5. PRECAUTIONS

Do not use the balance for a dynamic weighing. Even if small quantities of weighed material are added or removed from the weighing pan of the instrument, the reading should be taken only after stabilisation of the measurement results. Do not place any magnetic materials on the weighing pan, as this can cause damage to the measuring system of the instrument.
Be sure to avoid impact shock and overloading the balance in excess of the prescribed maximum measuring range (max capacity), minus any possible tare weight that has been applied.
Never use the balance in an environment where explosion is possible. This balance has not been adjusted for operation in explosive areas.
There must not be any modification made to the balance.

NOTE:
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 radio communications. 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.

NOTE:
This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE:
The grantee is not responsible for any changes or modifications not expressly approved by the party responsible for compliance. Such modifications could void the user's authority to operate the equipment.

1.6. WARRANTY

Warranty is invalid for the following:

- non-observation of the guidelines of this user manual,
- use of the balance other than specified in this manual,
- alteration to or opening of the device,
- mechanical damage and damage caused by media, water, wear and tear,
- inappropriate assembling or defects of electric installation,
- overloading of the measuring instrument.

1.7. METROLOGICAL PARAMETERS MONITORING

Metrological characteristics of the balance require periodical inspection to be carried out by its user. Inspection frequency is dependent on ambient conditions in which the balance is used, types of performed processes and accepted quality management system in organization.

1.8. USER MANUAL SIGNIFICANCE

It is very important to read the user manual carefully before switching on and starting up balance operation, even if the user is experienced and has worked with this type of balance before.

1.9. BALANCE USER TRAINING

The balance should be utilized and supervised only by users who are trained and experienced in using such type of weighing instruments.

2. TRANSPORT AND STORAGE

2.1. DELIVERY CHECKLIST

Upon delivery it is necessary to check the package and the device, make sure that your package bears no signs of damage.

2.2. PACKAGE

Keep all package elements should your device be transported in a future. Remember that only original packaging can be used for shipping purposes. Prior packing uncouple any cables, remove any separable components (weighing pan, shields, inserts). The device components shall be packed into an original packaging, thus being protected against potential damage during transportation

3. UNPACKING AND INSTALLATION

3.1. PLACE OF USE AND ASSEMBLING

- The balance should be stored and used in locations free of vibrations and shakes, free of air movement and dust,
- ambient air temperature should not exceed the range of: +10 °C ÷ +40 °C,
- ambient relative humidity should not exceed 80%,
- during balance operation, ambient temperature in the weighing room should not change rapidly,
- the balance should be located on a stable wall console desk or a stable working table which is not affected by vibrations and distant from heat sources,
- take special precaution when weighing magnetic objects, as part of the balance is a strong magnet. Should such loads be weighed, use under-pan weighing option, which removes the weighed load from area influenced by the balance's magnet. The hook for under-pan weighing is installed in balance's base,
- in order to avoid the influence of static electricity on the measurement process, ground the balance's housing. The grounding bolt is located at the back of the balance's housing.

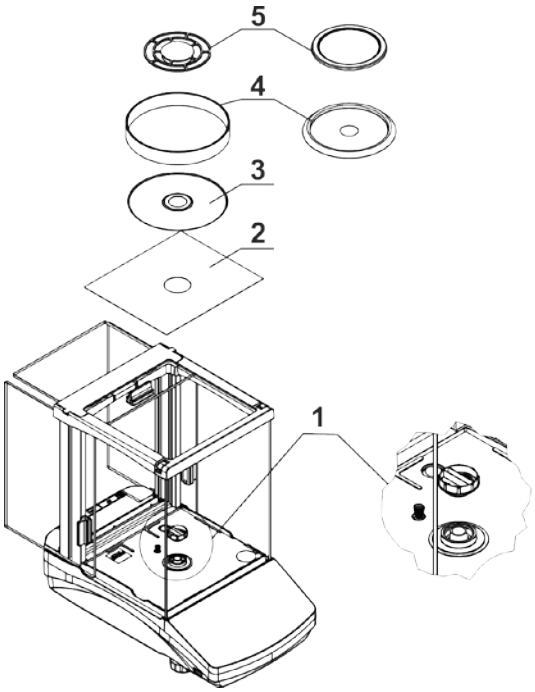
3.2. UNPACKING

Cut the adhesive tape. Take the device out of the packaging. Open the accessory box, take the device components out of it.

3.3. STANDARD DELIVERY COMPONENTS LIST

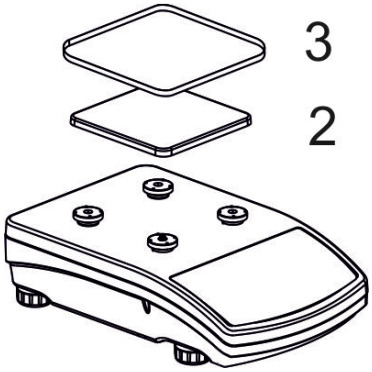
- balance
- bottom insert (*AS balance exclusively*)
- centring ring (*AS balance exclusively*)
- weighing pan, open-work pan for AS with d=0,01/0,1mg exclusively
- draft shield (AS and PS balances, d=0.001g, exclusively).
- power supplier
- user Manual – CD version

AS R2.PLUS

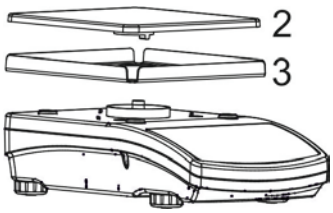


- remove a transport lock (1) – gently press the transport lock and turn it accordingly to <OPEN> instruction, keep the transport lock should your balance be transported in the future.
- Install components following the above diagram:
  - bottom insert (2),
  - centring ring [embossment side up] (3),
  - draft shield (4).
  - weighing pan (5),

PS 200/2000-PS 1000

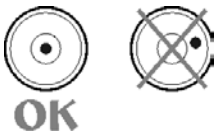


PS 2100-PS 10100



- remove tape protecting the grounding spring, located on one of the rubber mandrels
- install components following the above diagram:
  - weighing pan (2),
  - glass draft shield (3).

3.4. SETTINGS



It is necessary to level the balance prior connecting it to the mains. To level the balance turn its feet until an air bubble takes the central position.

The balance shall rest on a surface firmly, each of the feet must be supported.

3.5. MAINTENANCE ACTIVITIES

1. Disassembly a weighing pan and other detachable components (the components differ depending on a balance type – see *Unpacking* section). Be careful while detaching the components so as not to cause any damages to the balance mechanism.
2. Using a dry flannel cloth clean glass parts (mild cleanser may be applied if it does not contain any abrasive substances) – draft shield disassembly instruction is to be found further down this section.
3. Using a dry flannel cloth clean disassembled components (mild cleanser may be applied if it does not contain any abrasive substances).

CAUTION!
Cleaning draft shield while still installed may cause damage of the measuring system.

<u>Cleaning ABS components:</u>

To clean dry surfaces and avoid smutching use clean non-colouring cloths made of cellulose or cotton. You can use a solution of water and detergent (soap, dishwashing detergent, glass cleaner). Gently rub the cleaned surface and let it dry. Repeat cleaning process if needed.

In the case when contamination is hard to remove, e.g. adhesive, rubber, resin, polyurethane foam residues etc., you can use a special cleaning agents based on a mixture of aliphatic hydrocarbons that do not dissolve plastics. Before using the cleanser for all surfaces we recommend carrying out tests. Do not use products containing abrasive substances.

<u>Cleaning glass components:</u>
Select dissolvent depending on a dirt. Never soak the glass panes in alkaline solutions since they interact with glass and may cause damage. Do not use abrasive substances.

For organic dirt use acetone first, next use water or detergent. For other than organic dirt use diluted acid solutions (soluble salts of hydrochloric or nitric acid) or base solutions (ammonium or sodium base).

To remove ACIDS use protofilic solvent (sodium carbonate), to remove BASE use protogenic solvent (mineral acid of various concentration).

In case of heavy contamination use brush or detergent nevertheless avoid detergents containing large and hard molecules which could potentially scratch glass panes.

Use soft brush with wooden or plastic handle exclusively to avaoid risk of scratches. Do not use wire brush.

At the end of the cleaning process rinse the pane using running water first, distilled next.

Rinsing is a necessary cleaning process stage allowing to remove remaining soap, detergents and other cleansers from the panes prior their reinstallation.

Avoid drying the panes either using paper towel or forced air circulation since some fibres, grains or contamination of other type could permeate into the panes thus causing weighing errors.

One shall not use driers when drying measuring glass tools.

It is a frequent treatment to leave glass components on a rack to dry.

<u>Cleaning stainless steel components:</u>

Avoid using cleansers containing any corrosive chemicals, e.g. bleach (containing chlorine). Do not use abrasive substances. Always remove the dirt using microfiber cloth to avoid damage of protective coating.

In case of a daily maintenance:

1. *Remove the dirt using cloth dipped in warm water.*
2. *For best results, add a little dishwashing detergent.*

<u>Cleaning powder-coated components</u>:
For preliminary cleaning stage you need running water or wet sponge featuring large wholes, this will help you to remove loose, heavy dirt.

Do not use cleansers containning abrasive substances.

Next using cloth and cleanser-water solution (soap, dishwashing liquid) gently rub the cleaned surface.

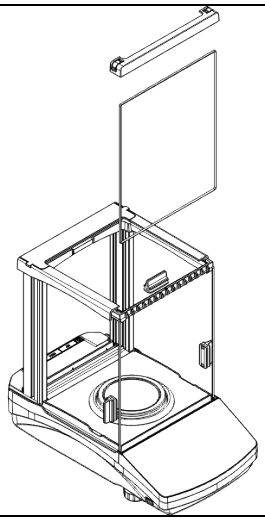
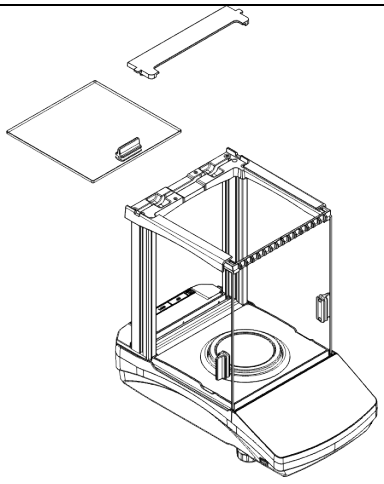
Avoid using cleanser without water since it may result with damage of the cleaned surface, please mind that large amount of water mixed with cleanser is a must.

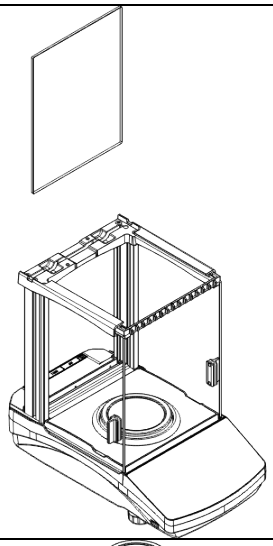
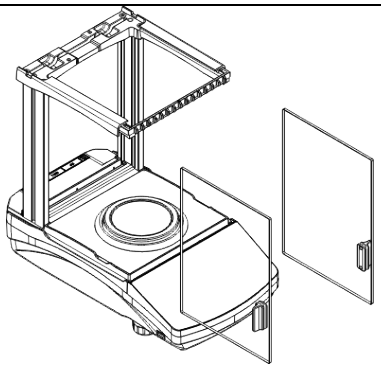
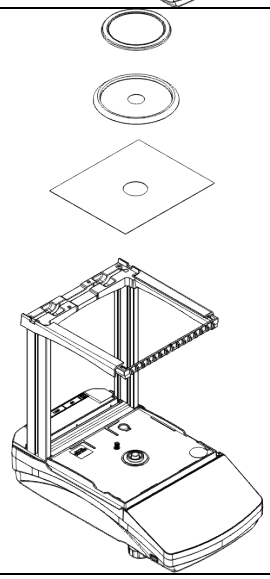
<u>Cleaning aluminium components</u>:
While cleaning aluminium components use products acid by nature, e.g. spirit vinegar, lemon. Do not use abrasive substances. Avoid using hard brush, this may cause scratches. It is recommended to use microfibre cloth.

While polishing the surface use circular movements. Use clean, dry cloth.

In order to ease cleaning of glass draft shield panes, it is permissible to remove them following the below instruction.

AS R2.PLUS series balances; disassembly steps:

	Detach the front part of the frame and take out the front pane.		Detach the back part of the frame and take out the top pane.

	Remove the back pane of the chamber.		Remove the left and the right side pane.
	Carefully disassembly the weighing pan, the draft shield and the bottom insert.		

Clean the weighing chamber and the panes. All the operations have to be done carefully. Pay special attention to the spot where the weighing pan is installed; dirt and other small elements might enter the balance construction through this opening. This may cause incorrect operation of the instrument.
Upon maintenance completion carry out the same set of actions in a reverse order. Pay a special attention to the left and the right side panes, assembly them on the correct side of the balance.
Thus prepared draft shield and panes can be properly cleaned. All the operations should be done carefully. Pay special CAUTION to the spot where the weighing pan was installed: dirt and other small elements might enter the balance construction through this opening, which might negatively influence the balance parameters.

3.6. POWERING THE DEVICE

Balance can be connected to the mains only with a power adapter that comes standard with the particular model. Nominal power supply of the power adapter (specified on the power adapter data plate) should be compatible to the power from the mains.
Plug the balance to the mains – connect the power adapter to the socket, next connect its connector to port located at the back of the balance housing.
Test of the display unit takes place right after connecting the balance to the power, all the elements and pictograms are backlit for a short time. Next, the name and the program number appears, the indication gets to ZERO (displayed reading unit depends on the balance). During the balance start, the test of an internal mass adjustment mechanism occurs (single location and elevation of the internal mass adjustment). If the indication is different than zero, please press →0← Delete button.

CAUTION!If the balance is "verified", automatic adjustment occurs right after switching the balance on.

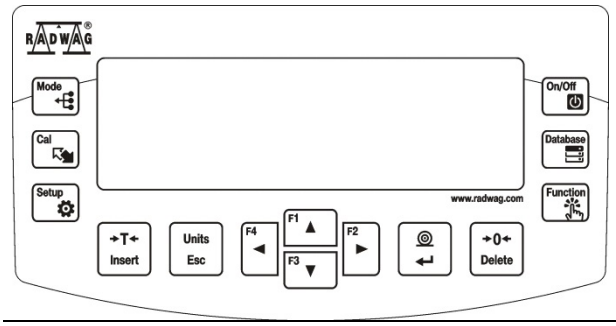
3.7. CONNECTING ADDITIONAL HARDWARE

Use only accessories and peripheral equipment recommended by the manufacturer. The balance must be disconnected from the mains before connecting or disconnecting any peripherals (printer, PC computer, computer keyboard). On connecting the peripherals, plug the balance to the mains.

3.8. INFORMATION ON THE BALANCE

<INFO> menu provides information on the balance: balance type, software version, internal temperature of the balance. The parameters are strictly informative.
<SETUP PRNT.> parameter has been designed to enable sending balance settings to printer (all parameters).

4. KEYBOARD – BUTTONS FUNCTION



On/Off	Press to switch the balance **ON/OFF**. If switched off, balance components other than the display are powered, and balance is in stand-by mode. ***F9** button of the computer keyboard.*
Database	Press to access data stored in a database: user, product, tare. ***F10** button of the computer keyboard.*
Function	Press to enter directly the active working mode settings. ***F11** button of the computer keyboard.*
Mode	Press to select working mode. ***F5** button of the computer keyboard.*
Units Esc	Press to change measuring units.
	PRINT/ENTER button Press to send measurement to a printer or a computer (PRINT). Press to confirm selected parameter value or function (ENTER).
→0← Delete	Press to **Zero** the balance
→T← Insert	Press to **Tare** the balance
Cal	Press to start adjustment / calibration process immediately. ***F6** button of the computer keyboard.*
Setup	Press to enter the main menu of a balance. ***F7** button of the computer keyboard.*
F4 F1 F3 F2	Press to operate balance menu or change parameter value.

5. START-UP

When plugged to mains, the balance displays program name and number, next it proceeds to the weighing mode.

CAUTION! In accordance with the EN 45515 standard verified balances cannot display mass value below -20e. If the indication value is below -20e, <Lo mass> information is displayed. Press →0← Delete *key to zero the balance.*

It is not recommended to run screensaver mode in balances with d=0.01 mg, this is due to the fact that switching the backlight on/off causes temperature change, which may affect the error of repeatability. In the case of balances with d=0.01 mg it is advised to set the backlight parameter to value <None>.

5.1. TEMPERATURE STABILIZATION PERIOD

Before start of measuring processes, it is necessary to wait until the balance reaches thermal stabilisation.
For balances that were stored in much lower temperatures before plugging to mains (e.g. during winter period), thermal stabilisation period shall take at least 4 hours for PS balances, and 8 hours for AS balances. During the thermal stabilization, the indications on the display panel can change.
It is recommended that ambient temperature changes at place of use were insignificant (slow to change).

5.2. AMBIENT CONDITIONS STATE INDICATION

The function is intended to inform on unstable ambient conditions for a balance, it is enabled only for AS R series balances.
The function controls dynamic temperature changes occurring in the balance during its operation. If the variation is greater than set limit values (temperature changes speed), then a blinking thermometer pictogram is displayed on the screen.

The blinking thermometer pictogram means that temperature inside the balance is not stable, this may result in inaccurate mass measurement. For such a case it is recommended to wait until the temperature stabilizes or to perform balance adjustment (blanking of the blinking thermometer pictogram).

5.3. LOGGING

In order to have full access to user parameters and be enabled to edit databases, the balance operator should log in as **<ADMINISTRATOR>** each time running the balance. The software enables the entry of 10 users with various access rights.

First Log In operation - procedure:

- Run home screen and press Function button, next select <**LOG IN**> option, operators database window opens with list of available users, or press function button with <**LOG IN**> function assigned, or press Database button, enter users database and select <**ADMIN**> user.
- Press ↵ button for confirmation, wait to be asked for a password.
- Enter the password: „1111", next press ↵ for confirmation.
- Home screen of the software is displayed again automatically.
- When logged, add users and set the permissions levels.

On future Logging In, select a user from the list and enter the password, the software initiates operation with permissions level set for the selected user.

If any user is logged in, a pictogram is displayed.

Log out operation – procedure:

- Select <**NONE**> position out of the list of available users
- Home screen of the software is displayed again, and the display shows no logged-in user (no logged-in user, no pictogram on the display).

5.4. UNITS

UNITS parameter group enables the user to change availability of mass units (the change can be performed in-course of balance operation), and to define two custom units, thus positively effecting comfort and speed of operation. It is possible to change unit to other than unit [g] during weighing process or during operation of other modes. Working modes *Parts Counting* and *Percent Weighing* are exceptions.

5.5. TEMPORARY MEASURING UNIT

Function enables selecting a measuring unit which is to be indicated next to mass reading during the operation. The set measuring unit will be in use from the moment of its activation until its change or switching the balance off and on.

Each pressing of the Units Esc button results with change of the measuring unit.

Units list:

Unit	Denotation	Verified balance	Unit	Denotation	Verified balance
gram	[g]	yes	Taele Singapore	[tls]	no
milligram	[mg]	yes *	Taele Taiwan	[tlt]	no
kilogram	[kg]	yes *	Taele China	[tlc]	no
carat	[ct]	yes *	Momme	[mom]	no
pound	[lb]	no	Grain	[gr]	no
ounce	[oz]	no	Newton	[N]	no
ounce Troy	[ozt]	no	Tical	[ti]	no
pennyweight	[dwt]	no	baht	[baht]	no
Taele Hongkong	[tlh]	no	tola	[tola]	no

** - Accessibility of measuring units is conditioned by balance type.*

6. ADJUSTMENT

In order to ensure the highest weighing accuracy, it is recommended to periodically introduce a corrective factor of indications to balance memory, the said factor must be referred to a mass standard. In other words, balance adjustment shall be performed from time to time.

Adjustment should be carried out:

- Before the beginning of weighing procedure,
- If long breaks between following measuring series occur,

Types of adjustment:

- Internal automatic adjustment
- Manual internal adjustment
- Adjustment with an external weight of declared mass which cannot be modified or of any mass, but not lower than 30% of maximum range.

CAUTION!
In case of verified balances (with an internal automatic adjustment system) only automatic internal adjustment and manual internal adjustment are available. Remember to carry out the adjustment process when there is no load on the pan! When the weighing pan is loaded, command ***<RANGE EXCEEDED>*** *is displayed. In such a case remove the load and restart the adjustment process. Adjustment process can be aborted if necessary by pressing* ***Esc*** *button at any time during the process.*

6.1. INTERNAL ADJUSTMENT

Adjustment process can be initiated automatically and manually.

Manual means of activating adjustment procedure is achieved by pressing 

button. System of automatic adjustment will carry out the process fully automatically and will inform the user on successive process stages.

Cycle of automatic adjustment process:

- Balance software detects the necessity of carrying out adjustment and signals it by displaying a thermometer or clock pictogram and <Cal> sign at the top of the display, about 2-minute long time interval within which weighing procedure can be completed takes place,
- As the 2-minute long time elapses, balance display indicates message **CAL_30** and starts counting down from 30..29..28 to 0 (indicated value is the counter),
- Balance user has 30 seconds to make a decision
- In order to start adjustment, do not take any actions
- In order to complete weighing procedure, press **Esc.** When pressed, balance returns to weighing procedure and displays last weighing result. In about 5 minutes balance indicates **CAL_30** message again**.**
- The adjustment process can be postponed for multiple times, but it needs to be pointed out that postponing of adjustment for a long time may lead to larger errors of weighing process. The errors are the effect of temperature changes and as a consequence changes of balance sensitivity.

Automatic adjustment process has been designed for three different cases:

- Adjustment on plugging the balance to the mains – verified balances.
- Adjustment triggered by temperature change inside the balance. The balance is equipped with a very precise system for monitoring temperature. At each adjustment process, the temperature

is recorded. The next adjustment is automatically initiated if temperature changes more than 1°C or 2°C (AS, PS series balances) from the last saved temperature.

- Adjustment triggered by elapsing time. You can declare time intervals which are criteria for balance adjustment (this option is only available for non-verified balances).

6.2. MANUAL ADJUSTMENT

6.2.1. Internal Adjustment

The balance performs internal adjustment automatically. During adjustment process do not load the weighing pan with any load. The message <**DO NOT TURN OFF CALIBRATION**> is displayed in the bottom line. Once adjustment process is completed, balance saves its result in memory and returns to weighing mode.

CAUTION!
- Press Esc button to abort adjustment process.
- If a weighing pan is loaded, message informing about an error turns out on the display. Adjustment process is aborted, balance returns to the weighing mode. Adjustment process may be repeated upon removal of the excess load.

6.2.2. External Adjustment

The external adjustment for PS series balances should be carried out with an external mass standard of class F_1 (function unavailable for verified balances).

Procedure:

- Run an external adjustment process, the balance displays a command ordering to unload the weighing pan, **<REMOVE MASS>** (the weighing pan must be empty). When the weighing pan is unloaded, press  button.
- The balance determines mass of an empty pan, message <**CALIBRATION**> is displayed in the bottom line. Next, message <**PLACE MASS**> and mass value to be placed on the weighing pan are displayed, **e.g. 200.000g** (depending on the type of balance).
- Place an external adjustment weight of displayed mass value and press  button**.** The balance determines the mass, message <**CALIBRATION**> is displayed in the bottom line. On completing adjustment process the balance returns to submenu **P1.2 EXT.CALIB.**

6.2.3. User Adjustment

The external adjustment for PS series balances should be carried out with an external mass standard of class F_1 (function unavailable for verified balances).

Procedure:

- Run an external adjustment process, the first step of the process is to declare the mass of a weight that is to be used for adjustment. The mass must be ≥ 30% Max capacity.
- Once the mass of the weight is entered and confirmed, the message prompting the user to remove the weight from the pan is displayed: **<REMOVE MASS>** (the weighing pan must be empty). Unload the pan and press  button.
- The balance determines the weight of an unloaded pan, message <**CALIBRATION**> is shown in the bottom line. Next, message <**PLACE MASS**> and mass value to be placed on the weighing pan are displayed, **e.g. 200.000g** (depending on the type of balance).
- Place an external adjustment weight of displayed mass value and press  button**.** The balance determines the mass, message <**CALIBRATION**> is displayed in the bottom line. On completing adjustment process the balance returns to submenu **P1.2 EXT.CALIB.**

7. DATABASES

The balance software has 3 databases that can be edited (USERS, PRODUCTS, TARES) as well as 2 databases (WEIGHINGS AND ALIBI), to which all the measurements, carried out by means of the balance, are saved.

Data saved within particular databases:

USERS – 10 different users.

PRODUCTS – 1000 different products.

TARES – 10 different masses of the packaging.

WEIGHINGS – 5 000 consecutive measurements

ALIBI – 100 000 consecutive measurements

8. EXPORT AND IMPORT OF DATABASES

This option allows the user to:

- Archive data relating to the carried out weighings – WEIGHINGS database and ALIBI database.
- Copy the products, tares and users databases between balances of this series.

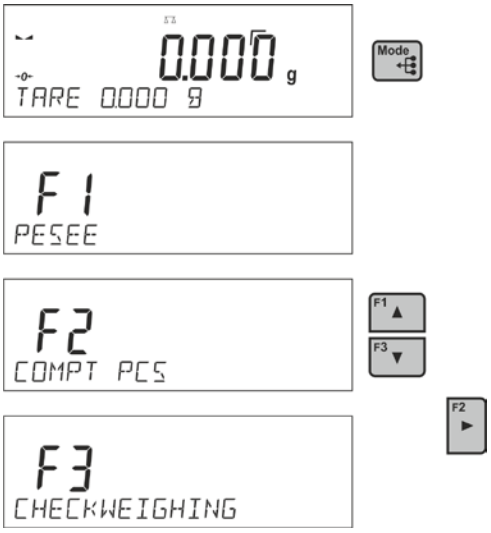
This can be performed by using external USB flash drive, which shall feature <**FAT files system**>

9. WORKING MODES

- Weighings
- Parts Counting
- Checkweighing
- Dosing
- Deviations % in reference to mass of the standard
- Animal Weighing
- Density Determination of Solids
- Density Determination of Liquids
- Statistics
- Totalising
- Peak Hold
- Pipettes Calibration

In order to run a particular mode press 

button, and select the mode from the list.



Once the button Mode has been pressed, the name of the first available function is shown.

F1 or F3 - press to select working mode

F2 - press to enter the selected working mode

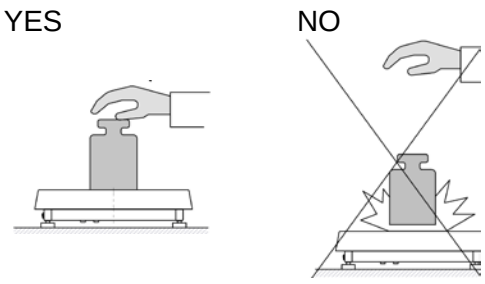
CAUTION!
Upon restart, the balance is launched with the most recently operated working mode!!! For settings of this function read of this user manual.

10. WEIGHING OPERATION

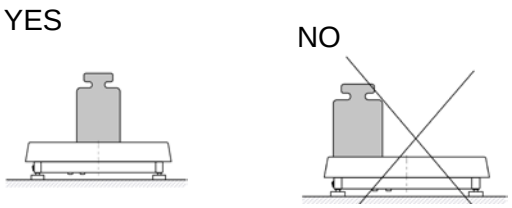
10.1.1. Good Weighing Practice

In order to ensure long lasting use of a balance plus correct and reliable measurement of weighed loads, follow below procedures:

- Start the balance with no load on the weighing pan (permissible value of load on the weighing pan on balance start is ±10% of its maximum capacity).
- Load the weighing pan steadily avoiding shocks:



- Place weighed loads centrally on the weighing pan:



- Avoid side loading, in particular side shocks:

NO NO

The balance requires adjusting before weighing process start or in case of drastic change of ambient conditions at a workstation.

- Before the start of weighing procedure, it is recommended to load the weighing pan a few times with mass close to balance max capacity,
- Check if unloaded balance indicates "precise zero" →0← and whether measurement is stable ◣◢, if not, press →0←**/Delete** button,
- Press **UNITS** button, to set a measuring unit:
- Place weighed object on the weighing pan and read result only on measurement result stabilization,
- Mass indication of a load placed on the weighing pan can be tared multiple number of times by pressing →**T←/Insert** (pay CAUTION not to exceed maximal capacity of a balance by applying multiple tare function).

The balance shall stay plugged to the mains in between measurement series. It is recommended to switch off the balance display by pressing **ON/OFF** button. On repeated **ON/OFF** button pressing, the balance is ready for operation and carrying out the following measurements.

10.1.2. Balance Zeroing

Zeroing is a function allowing to zero mass indication. In order to zero mass indication, press →0← Delete button. Mass indication of zero value shall be displayed together with precise zero →0← and stability ◣◢ markers.
Zeroing process is an equivalent for determining new zero point, recognized by the balance as precise zero. Zeroing is possible only for stable status of display indication.

CAUTION!
Zeroing the display indication is possible only within ±2% range of instrument's maximum capacity. If the zeroed value is above ±2% of the maximum capacity, then the software indicates an error message, Err2.

10.1.3. Balance Taring

Taring is a function allowing to determine net weight of a measured object. In order to determine net weight of the object, place object's container (packaging) on the weighing pan, and on stabilization of measurement result press →T← Insert key. The display indicates mass equal zero and symbols: **Net** and ◣◢. On taking off the weighed load and its packaging from the weighing pan, the display indicates sum of total tared mass with minus sign.

The software enables assigning tare value to a database-stored product. Using this option, the software automatically uploads data on tare value for a particular product upon its selection from the database.

CAUTION!
Taring negative values is impossible. On taring negative values the balance responds with an error message, Err3. In such case, zero balance indication and repeat taring procedure.

11. COMMUNICATION

Communication menu enables configuration of port settings. The settings are accessed upon pressing Setup button.
Communication with peripheral devices is established via the following ports:

- COM 1 (RS232),
- COM 2 (RS232),
- USB type A
- USB type B
- WIFI,

Parameters of USB ports are not configurable. The port type B is designed to connect a printer or a computer, and the port type A is designed to connect a computer keyboard, a bar code reader or the flash drive.

12. PERIPHERAL DEVICES

PERIPHERAL DEVICES menu is comprised within Parameters menu. It is accessed by pressing Setup key. The menu features list of devices that can cooperate with the balance.

- Computer
- Printer
- Barcode Reader
- Additional Display
- External Buttons

13. COOPERATION WITH PERIPHERALS

CAUTION!
A peripheral device that is connected to RS 232 or USB port of a balance, has to be powered from the common low voltage grid equipped with common anti-shock protection in order to provide that possible occurrence of different potentials in zero cables of the peripheral device and the balance is precluded.

Value indicated on a display can be sent via RS232 or USB port to a peripheral device in one of four accessible ways:

- manually - on pressing button
- automatically - on stabilisation of a weighing result
- continuously - on activation of a function or sending a command
- on command sent from a peripheral device (see additional functions).

Value indicated on a display can be sent via COM port or USB port in the following form:

- stable – data is sent immediately on stabilisation of weighing result (button)
- unstable – on pressing button, display status is sent immediately to a peripheral device (on a printout such status is marked with <?> symbol located in front of the weighing result). This option is only available for non-verified balances.

13.1. TRANSFERRED DATA FORMAT

The measurement result can be transferred from a balance to an external device by pressing  button, located on the balance, or by sending a control command from a computer.

13.2. FORMAT OF DATA SENT ON PRESSING PRINT BUTTON

CAUTION!
Unstable measurement printout is disabled for a verified balance.

Printout format for unverified balances:

1	2	3	4 - 12	13	14 - 16	17	18
stability marker	space	character	mass	space	unit	CR	LF

Stability marker	[space] if stable
	[?] if unstable
	[^] if high limit is out of range
	[v] if low limit is out of range
Character	[space] for positive values
	[-] for negative values
Mass	9 characters with right justification
Unit	3 characters with left justification

Printout format for verified balances:

1	2	3	4 - 14	15	16 - 18	19	20
stability marker	space	character	mass	space	unit	CR	LF

Stability marker	[space] if stable
	[?] if unstable
	[^] if high limit is out of range
	[v] if low limit is out of range
Character	[space] for positive values
	[-] for negative values
Mass	11 characters with right justification (contains decimal marks)
Unit	3 characters with left justification

14. COMMUNICATION PROTOCOL

General information

A. A character based communication protocol balance-terminal is designed for establishing communication between a RADWAG balance and a peripheral device via RS-232C serial interface.

B. It consists of commands sent from a peripheral device to the balance and responses from the balance.

C. Responses are sent from the balance on each receipt of a command as a reaction to a specific command.

D. Commands, forming the communication protocol, enable both, obtaining data on balance status and influencing balance operation, e.g.: acquiring measurement results from the balance, zeroing, etc.

15. ERROR MESSAGES

-Err2- Value beyond zero range

-Err3- Value beyond tare range

-Err8- Taring / Zeroing operation time exceeded

-NULL- Zero value from converter

-FULL- Measurement range exceeded

-LH- Start mass error

RADWAG BALANCES AND SCALES
ADVANCED WEIGHING TECHNOLOGIES