

User Manual

SCHULER B SERIES BALANCES



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 our product.

JULY 2017

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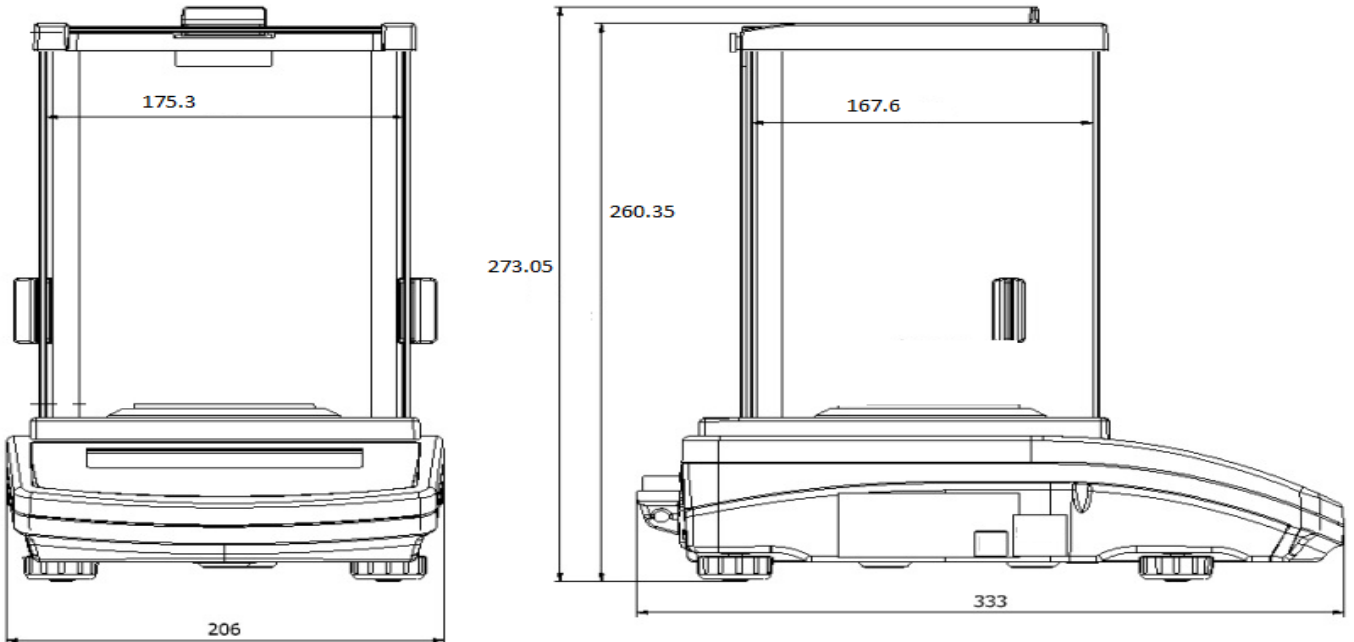
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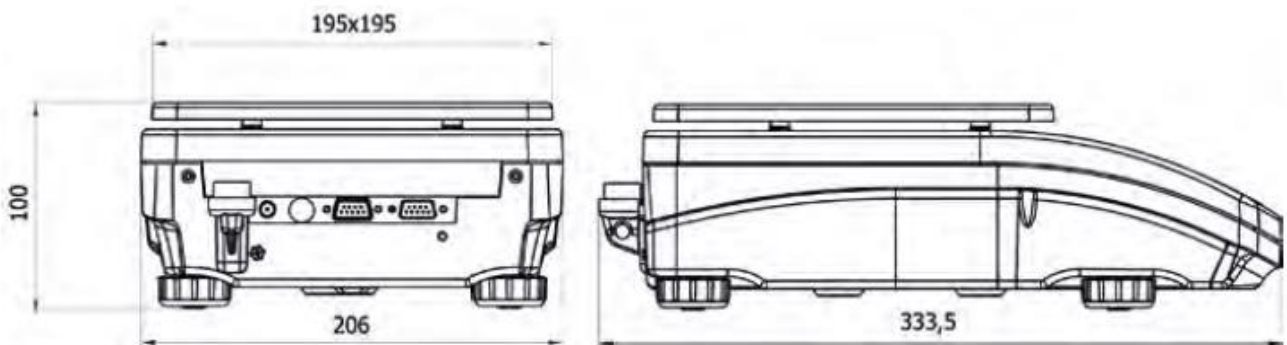
1. GENERAL INFORMATION

1.1. DIMENSIONS

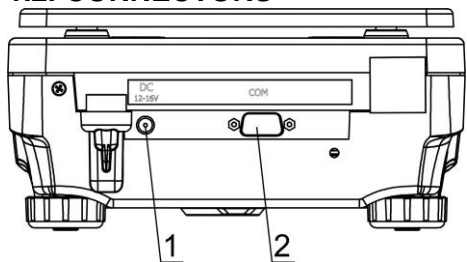
B series with d=0.1mg and d=.001g:



B series with pan 195 x 195 mm:

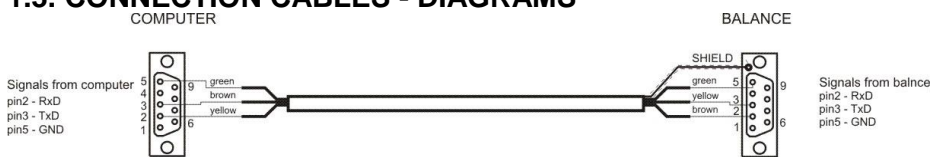


1.2. CONNECTORS



- 1 Power supply socket
- 2 COM connector (printer)

1.3. CONNECTION CABLES - DIAGRAMS



Scale – computer cable (RS232)



Scale – printer cable (CITIZEN, EPSON)

1.4. INTENDED USE

B 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 center of the weighing pan. Weighing result should be read only after stable reading has been obtained.

1.5. INAPPROPRIATE USE

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 stabilization 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.

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.

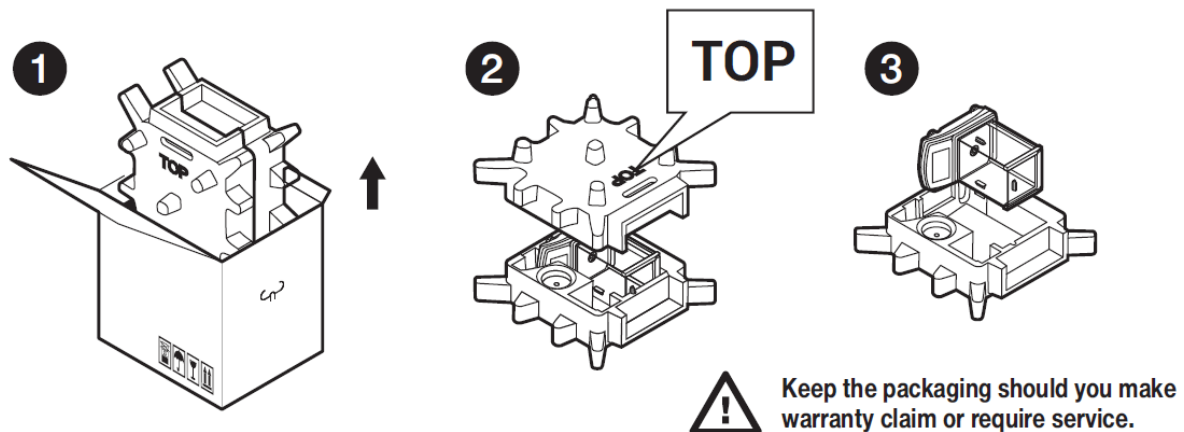
2. UNPACKING AND INSTALLATION

2.1. STANDARD DELIVERY COMPONENTS LIST

- Balance and components shown in Section 2.4 depending on balance model
- Warranty Card
- User Manual

2.2. UNPACKING

To unpack the system, follow the diagram below-



2.3. 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: $+10\text{ °C} \div +40\text{ °C}$.
- 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.
- Keep all package element should your device be transported in the future. Remember that only original packaging can be used for shipping purposes. Prior to packing, uncouple any cables, remove any separable components (weighing pan, shields, inserts). Pack the device components into an original packaging. The original packaging protects the equipment against potential damage during transportation.

2.4. BALANCE ASSEMBLY

Model: SLB-64, SLB-124, SLB-214

Components-



Balance
x 1



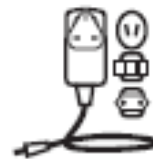
Weighing pan
x 1



Draft shield
x 1



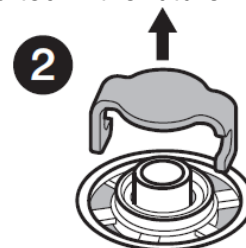
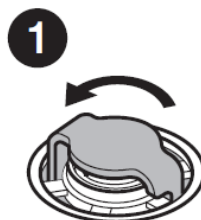
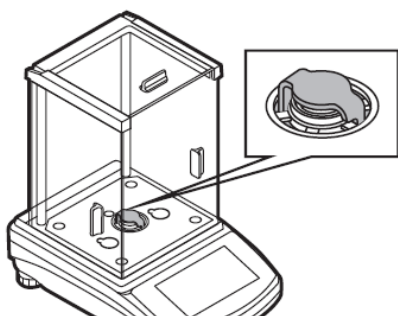
Bottom insert
x 1



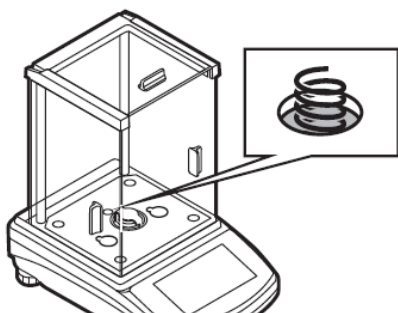
Power adapter
x 1

Installation-

1) Remove the transport lock— gently press the transport lock and turn it accordingly to <OPEN>, keep the transport lock should your balance be transported in the future.

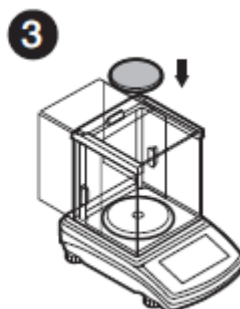
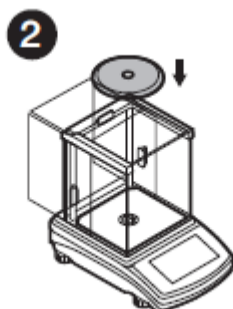
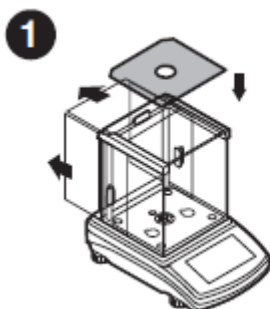


2) Check grounding spring to insure it is in the appropriate location. Make sure that the grounding spring juts slightly out of the hole.



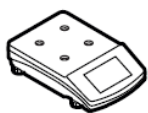
3) Install components following diagram below:

- i. Bottom insert
- ii. Centering ring [embossment side up]
- iii. Weighing pan



Model: SLB-203, SLB-403, SLB-503

Components:



Balance
x 1



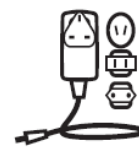
Weighing pan
x 1



Grounding foot
x 1



Foot
x 3



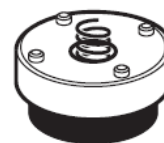
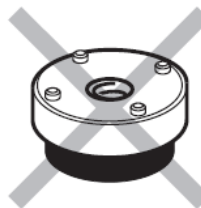
Power adapter
x 1



Bottom insert
x 1

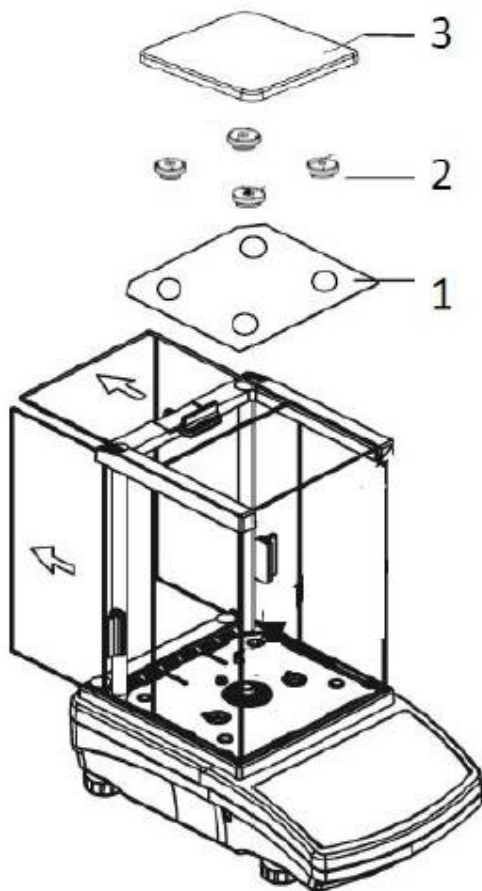
Installation:

1) Check that the grounding spring is in the correct location, the spring juts slightly out of the hole.



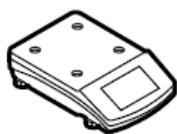
2) Install components following the diagram below:

- i. Bottom Insert
- ii. Rubber feet (grounding foot can be in any location on the balance)
- iii. Weighing pan



Model: SLB-4002, SLB-5002

Components:



**Balance
x 1**



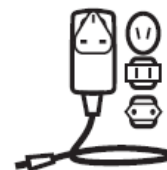
**Weighing pan
x 1**



**Grounding
foot x 1**



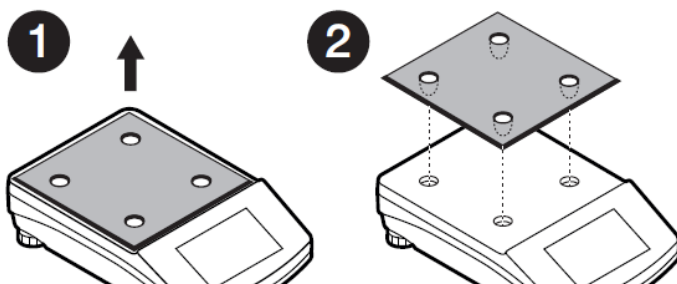
**Foot
x 3**



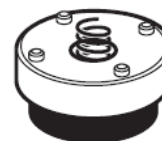
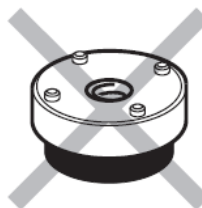
**Power
adapter x 1**

Installation:

1) Remove transport lock, keep the transport lock should your balance be transported in the future.

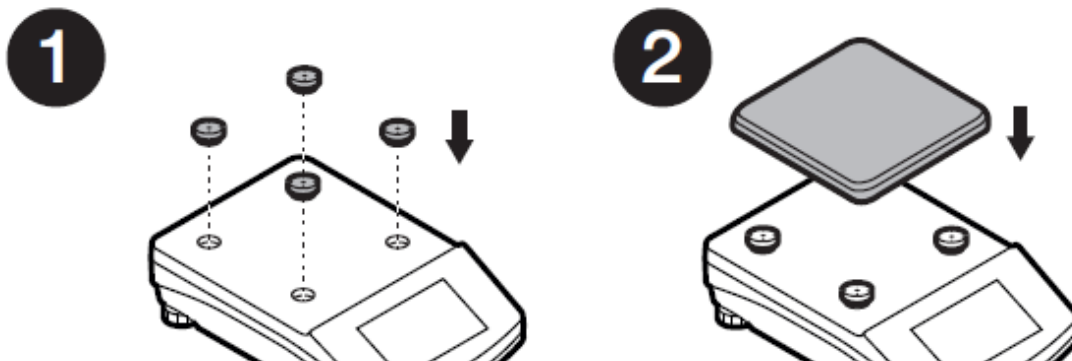


2) Check that the grounding spring is in the correct location, the spring juts slightly out of the hole.



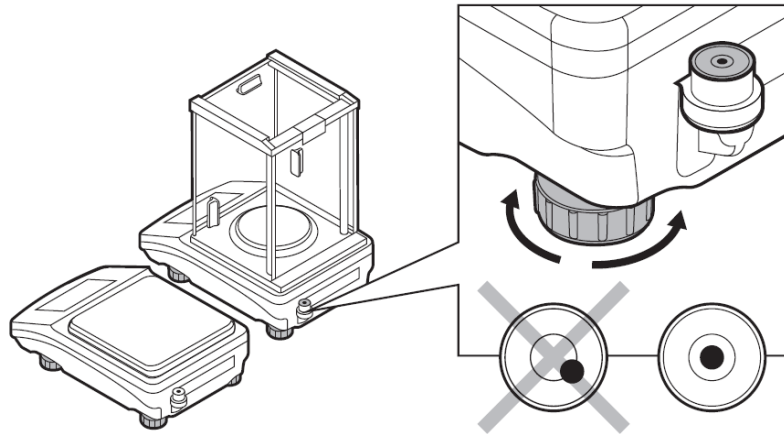
3) Install components following the diagram below:

- i. Rubber feet (grounding foot can be in any location on the balance)
- ii. Weighing pan



2.5. SETTINGS

It is necessary to level the balance prior to plugging it in. To level the balance, turn its feet until the air bubble is in the center position.



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

2.6. MAINTENANCE ACTIVITIES

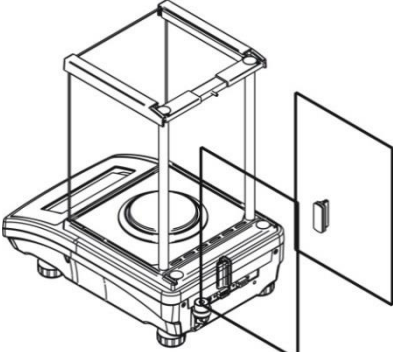
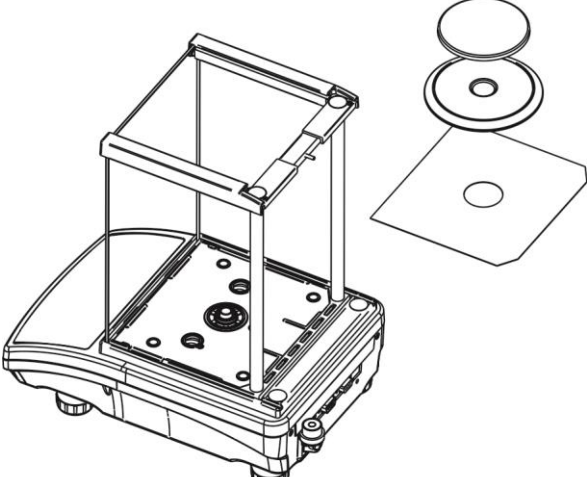
1. Disassembly a weighing pan and other detachable components (the components differ depending on a balance type – see *Unpacking* section). Be careful while detaching the components so as not to cause any damages to the balance mechanism.
2. Using a dry flannel cloth clean glass parts (mild cleanser 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.

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

B2 series with $d=0.1\text{mg}$ and $d=0.001\text{g}$ sequence of actions:

| | |
|--|---|
| | <p>Undo and remove top pane protection, next slide the pane out of a guide bar.</p> |
| | <p>Remove the back pane.</p> |

| | |
|---|---|
|  | <p>Remove side panes.</p> <p>Side panes shall not be swapped therefore it is necessary to remember which one is right, and which one is left in order to install them back properly.</p> <p><i>CAUTION! Do not remove the front pane!</i></p> |
|  | <p>Remove a weighing pan, a draft shield, a bottom insert. Clean the components when detached. With this your balance mechanism is protected against accidental damage.</p> |


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.

2.7. 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). If the indication is different

than zero, please press  button.

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

2.8. CONNECTING ADDITIONAL HARDWARE

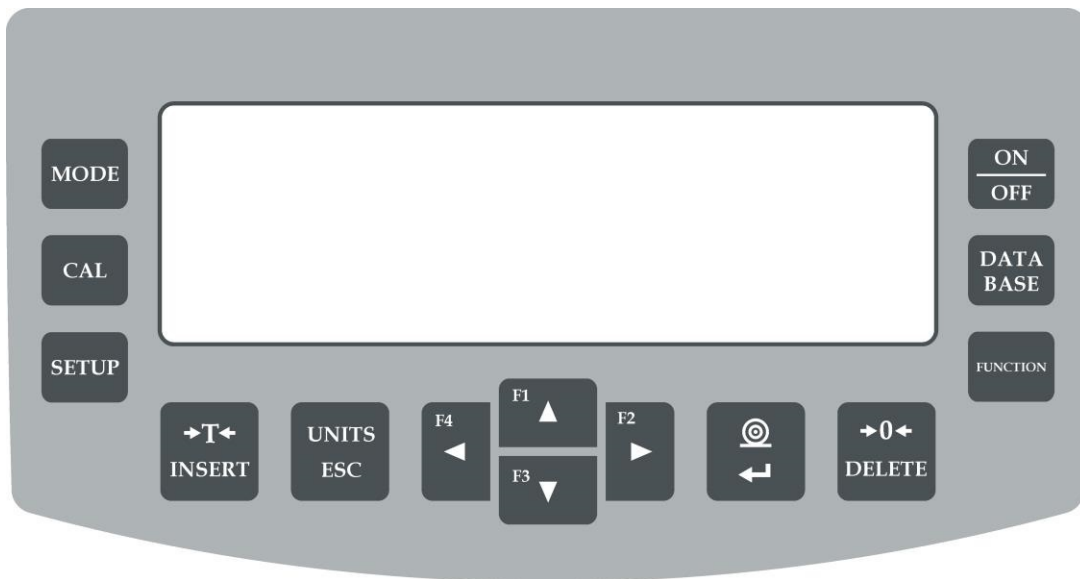
Use only accessories and peripheral equipment recommended by the manufacturer. The balance must be disconnected from the mains before connecting or disconnecting any peripherals. On connecting the peripherals, plug the balance to the mains.

2.9. 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).

3. KEYBOARD – BUTTONS FUNCTION



| | |
|--|---|
| | 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. |
| | Press to access data stored in a database: user, product, tare. |
| | Press to enter directly the active working mode settings. |
| | Press to select working mode. <i>F5 button of the computer keyboard.</i> |
| | 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). |
| | Press to Zero the balance |
| | Press to Tare the balance |
| | Press to start adjustment / calibration process immediately. |
| | Press to enter the main menu of a balance. |
| | Press to operate balance menu or change parameter value. |

4. START-UP

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

4.1. TEMPERATURE STABILIZATION PERIOD

Before start of measuring processes, it is necessary to wait until the balance reaches thermal stabilization.

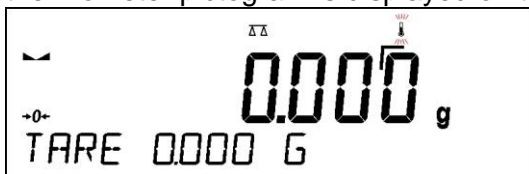
For balances that were stored in much lower temperatures before plugging to mains (e.g. during winter period), thermal stabilization period shall take at least 4 hours for balances with $d=0.001g$ and $d=0.01g$ balances, and 8 hours for balances with $d=0.1mg$ balances. During the thermal stabilization, the indications on the display panel can change.

It is recommended that ambient temperature changes at place of use were insignificant (slow to change).

4.2. AMBIENT CONDITIONS STATE INDICATION

The function is intended to inform on unstable ambient conditions for a balance, it is enabled only for balances with $d=0.1mg$ 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).

4.3. USER MENU

Menu is divided into 9 basic function groups. Each group has an individual name starting with a capital letter, **P**.

P1 ADJUSTMENT

| | | | |
|------|------------------|--|-----------------------|
| P1.1 | EXT. CALIB. | | [external adjustment] |
| P1.2 | USER CALIBRATION | | [user adjustment] |

P2 WORKING MODES

| | | | |
|------|-----------------|--|---|
| P2.1 | ACCESSIBILITY | | [settings for the accessibility of individual modes while working with the balance] |
| P2.2 | WEIGHING | | [setting for the function weighing] |
| P2.3 | COUNTING PCS | | [settings for the function counting pieces] |
| P2.4 | DEVIATIONS | | [settings for the function deviations % against the mass of the standard] |
| P2.5 | DENS. OF SOLIDS | | [settings for determining density of solids] |
| P2.6 | DENS OF LIQUIDS | | [settings for determining density of liquids] |
| P2.7 | ANIMAL WEIGHING | | [settings for the function animal weighing] |

P3 COMMUNICATION

| | | | |
|------|------|--|--------------------------------------|
| P3.1 | COM1 | | [transmission parameters port COM 1] |
|------|------|--|--------------------------------------|

P4 DEVICES

| | | | |
|------|----------|--|---------------------------|
| P4.1 | COMPUTER | | [PC connection port] |
| P4.2 | PRINTER | | [printer connection port] |

P5 PRINTOUT

| | | | |
|-------|-------------|--|---|
| P5.1 | CAL. REPORT | | [contents of the adjustment report] |
| P5.2 | HEADER | | [contents of the header printout] |
| P5.3 | GLP PRNT. | | [contents of the weighing result prnt.] |
| P5.4 | FOOTER | | [contents of the footer printout] |
| P5.5 | NSD.PRN.1 | | [project of non-standard printout 1] |
| P5.6 | NSD.PRN.2 | | [project of non-standard printout 2] |
| P5.7 | NSD.PRN.3 | | [project of non-standard printout 3] |
| P5.8 | NSD.PRN.4 | | [project of non-standard printout 4] |
| P5.9 | VARIABLE1 | | [project of variable 1] |
| P5.10 | VARIABLE2 | | [project of variable 2] |

P6 OTHER

| | | | |
|------|---------------|--|------------------------------------|
| P6.1 | LANGUAGE | | [menu language] |
| P6.2 | KEY SOUND | | [key sound] |
| P6.3 | BACKLIGHT | | [display backlight level] |
| P6.4 | STAND-BY MODE | | [backlight turn-off time interval] |
| P6.5 | AUTO OFF | | [display turn-off time interval] |
| P6.6 | DATE | | [date settings] |
| P6.7 | TIME | | [time settings] |
| P6.8 | DATE FORM. | | [date format] |
| P6.9 | TIME FORM. | | [time format] |

P7 INFO

| | | |
|------|-------------|--|
| P7.1 | BALANCE ID | |
| P7.2 | SCALE TYPE | |
| P7.3 | PROG.VER. | |
| P7.4 | TEMP. | |
| P7.5 | SETUP PRNT. | |

P8 UNITS

| | | | |
|------|---------------|--|--|
| P8.1 | ACCESSIBILITY | | [declaration of units to be available for balance operation] |
| P8.2 | START UNIT | | [selection of a start unit, unit active on balance start-up] |
| P8.3 | USER UNIT U1 | | [parameter defining user's unit 1] |
| P8.4 | USER UNIT U2 | | [parameter defining user's unit 2] |



CAUTION!


*Balance memory modifications will be saved upon abandoning the menu (on return to weighing).
Press ESC button several times.*

4.4. 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.

4.5. 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  button results with change of the measuring unit.

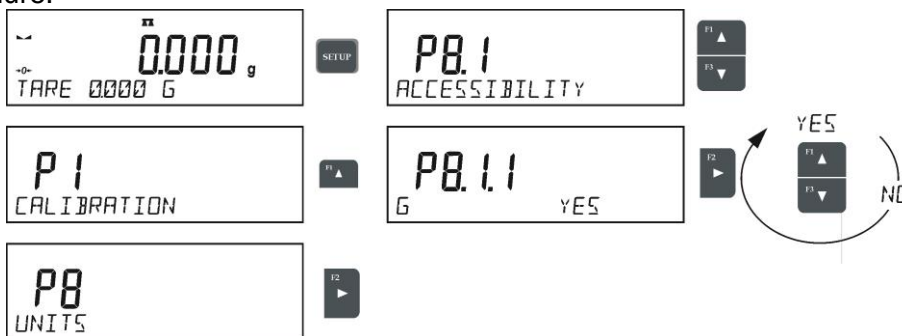
Options:

- For verified balances, you can select from the following: [g], [mg] or [kg], [ct]
- For non-verified balances, you can select from the following: [g], [mg], [kg], [ct], [lb], [oz], [ozt], [dwt], [tlh], [tls], [tlt], [tlc], [mom], [gr], [ti], [N]

4.6. UNITS ACCESSIBILITY

By pressing button , the user may declare units to be available for selection of temporary unit. Units with parameter value set to <YES> are available for selection in specified operating modes.

Procedure:



4.7. START UNIT SELECTION

Upon selection of start unit, the balance activates with the specified unit for these modes where change of the unit is possible.

Ability of selecting a given unit depends on the balance status, i.e. if the balance is verified or not.

Procedure:

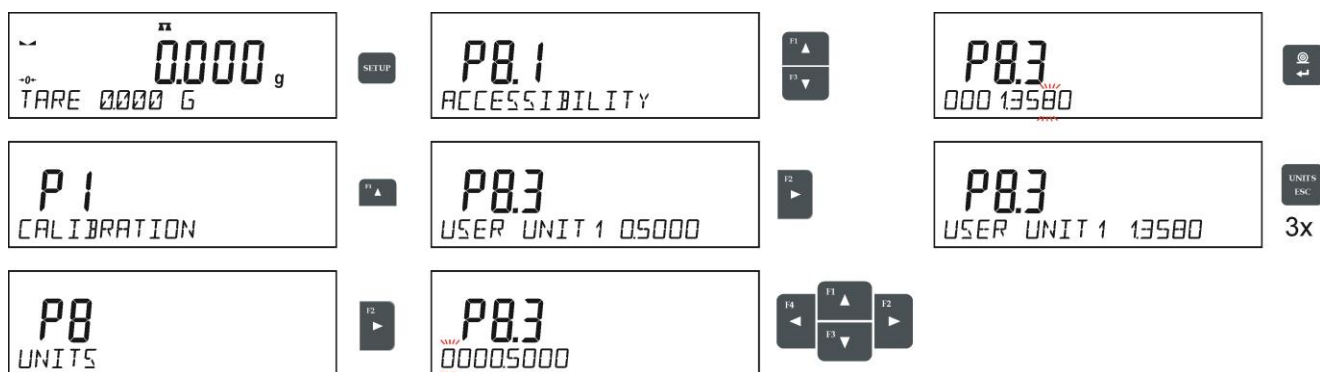


4.8. CUSTOM UNIT

You can declare two custom units. The custom unit is a result of indication multiplied by a specified coefficient.

The units are displayed as [u1] – user unit 1, and [u2] – user unit 2.

Procedure for declaration of coefficient for the custom unit:



Custom units are valid for verified balances exclusively.

5. MISCELLANEOUS PARAMETERS

You can set up parameters which influence balance operation. These parameters are to be found in parameters group **P6 OTHER**.

Settings modification for particular parameters of this parameter group proceeds likewise as described in the previous section.

Menu language

Language parameter enables selecting the language of the balance menu descriptions.

Available languages: POLISH, ENGLISH, GERMAN, SPANISH, FRENCH, TURKISH, CZECH, ITALIAN, HUNGARIAN.

“Beep” sound – reaction to operation of pressing a key

Sound parameter enables switching on/off a ‘beep’ sound responsible for informing a user about pressing any key of balance overlay.

NO - ‘beep’ sound off

YES - ‘beep’ sound on.

Backlight, and display brightness adjustment

The parameter enables setting the brightness of the backlight or switching off the display brightness completely.

100 - maximum brightness of the backlight

10 - minimum brightness of the backlight

NONE - display brightness switched off

Backlight turn-off time

Parameter <P6.4 STAND-BY MODE> enables use of function responsible for activation of the display stand-by mode when weighing process is not being performed (stable indication is a necessary condition for activation of the stand-by mode).


NONE – backlit turn-off time not activated

0.5; 1; 2; 3; 5 – time given in minutes

If the software registers stable indication for a specified time interval, set in parameter <P6.4 STAND-BY MODE>, then the display goes out immediately.


The backlight activates upon change of indication (no stability pictogram on the display) or pressing any key on the balance keypad. Blanking works also when balance menu is entered.

Auto switch-off

Parameter <P6.5 AUTO OFF> enables use of function responsible for automatic display deactivation (functions as  button). Upon display deactivation the other subassemblies are powered and the balance turns to stand-by mode.

NONE – auto switch-off not activated
0.5; 1; 2; 3; 5 – time given in minutes

If the software registers stable indication for a specified time interval, set in parameter <P6.5 AUTO OFF> settings, then the display is turned-off immediately (inactive backlight function, no indication on the display, clock displayed).

To start-up the balance it is necessary to press  button located on the balance keypad. The balance will automatically return to weighing.
The balance cannot be turned off if any process is started or if balance menu is entered.

Date

Date parameter enables setting the current date.
Procedure:



Time

Date parameter enables setting the current time.
Procedure:



Date format

Date form. parameter enables altering the date format on the printout [YYYY.MM.DD / YYYY.DD.MM / DD.MM.YYYY / MM.DD.YYYY], where: YYYY – year; MM – month; DD – day.

Time format

Time form. parameter enables specifying time format for a printout [12h / 24h].

For [12h] option selected, <A> or <P> letter is displayed next to presented time value, where: **A** stands for hours before noon; **P** stands for hours after noon.

6. CALIBRATION (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.

Calibration (Adjustment) should be carried out:

- Before the beginning of weighing procedure
- If long breaks between following measuring series occur
- If temperature inside the balance changes more than: 1°C for B2 balances with d=0.1mg or 2°C for B2 balances with d=0.001g and d=0.01g.

Types of calibration (adjustment):

- Manual external calibration (adjustment)
- Calibration (adjustment) with an external weight of declared mass which cannot be modified or of any mass, but not lower than 30% of maximum range.

6.1. CALIBRATION MENU SETTINGS

- **P1.1 EXT. CALIB. – External calibration (with an external weight)**

Calibration with an external weight, value of which is saved in factory settings (function unavailable for verified balances).



- **P1.2 USER CALIB. – User calibration (with an external weight)**

Calibration with an external weight of any mass within balance range, however not lower than 30% of Max range.





6.2. MANUAL ADJUSTMENT

External Adjustment

The external adjustment for B2 series balances should be carried out with an external mass standard of class F₁.

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 **P1.1 EXT.CALIB.**


User Adjustment

The external adjustment for B2 series balances should be carried out with an external mass standard of class F₁ (function unavailable for verified balances).

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 $\geq 30\%$ 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 USER CALIB.**

6.3. ADJUSTMENT REPORT PRINTOUT

At the end of each adjustment process or adjustment test, an adjustment report is generated automatically and sent to a communication port COM 1. The content of the report is declared in menu P5.1 CAL REPORT.

The report can be printed out via a printer connected to the balance or it can be sent to the computer and saved as a file for archiving purposes.

7.DETERMINING PRINTOUT CONTENT

7.1. ADJUSTMENT REPORT

P5.1 CAL. REPORT, is a group of parameters enabling user to declare data that is to be printed on an adjustment printout.

| Variable | Overview |
|-------------|---|
| PROJECT | Option enables naming the project (name associated with a particular type of weighing). The name may consist of 16 characters' maximum. |
| CALIB TYPE | Option enables printing out the type of the adjustment being carried out. |
| USER | Option enables printing out the name of a logged-in user. |
| PROJECT | Option enables printing out the name of the project (see parameter Project). |
| DATE | Option enables printing out the date of the carried out adjustment. |
| TIME | Option enables printing out the time of the carried out adjustment. |
| BALANCE ID | Option enables printing out the balance ID number. |
| CAL. DIFFER | Option enables printing out the difference between mass of an adjustment weight measured during the last adjustment and the current measured mass of this weight. |
| DASHES | Option enables printing out dashes that separate the date of a printout from a signature. |
| SIGNATURE | Option enables providing an area for the signature of a user performing the adjustment. |

For the parameters described above, one of these values must be selected:

- NO** - do not print
- YES** - print

7.2. HEADER, FOOTER, GLP PRINTOUTS

| | |
|--------------|---|
| HEADER | group of parameters enabling to declare data that is to be printed on a header printout. |
| GLP PRINTOUT | group of parameters enabling to declare data that is to be printed on a measurement result printout |
| FOOTER | group of parameters enabling to declare data that is to be printed on a footer printout |

Printout variables list:

| Variable | Overview | Active for |
|--------------|---|------------------------|
| WORKING MODE | Option enables printing out the name of a working mode. | Header Footer |
| BALANCE TYPE | Option enables printing out the balance type. | Header Footer |
| BALANCE ID | Option enables printing out the balance ID number. | Header Footer |
| USER | Option enables printing out the name of a logged-in user. | Header GLP printout |

| | | |
|-------------|--|----------------------------------|
| | | Footer |
| PRODUCT | Option enables printing out the name of a currently selected product. | Header GLP printout Footer |
| DATE | Option enables printing out the date of the carried out adjustment. | Header GLP printout Footer |
| TIME | Option enables printing out the time of the carried out adjustment. | Header GLP printout Footer |
| VARIABLE 1 | Option enables printing out the value of VARIABLE 1. | Header GLP printout Footer |
| VARIABLE 2 | Option enables printing out the value of VARIABLE 2. | Header GLP printout Footer |
| NET | Option enables printing out net weight value in a basic unit (calibration unit). | GLP printout |
| TARE | Option enables printing out the tare value in the current unit. | GLP printout |
| GROSS | Option enables printing out the gross mass value in the current unit. | GLP printout |
| CURR.RES | Option enables printing out the current measurement result (NET weight) in a current unit. | GLP printout |
| CAL.REPORT | Option enables printing out a report from the last adjustment, according to the settings declared for the adjustment report printout (see sec. 14.1 of this user manual). | Header GLP printout Footer |
| DASHES | Option enables printing out separating dashes. | Header Footer |
| EMPTY LINE | Option enables printing out an empty separating line. | Header Footer |
| SIGNATURE | Option enables providing an area for the signature of a user performing the adjustment. | Footer |
| NSTD. PRNT. | Option enables printing out one of 100 non-standard printouts on the footer printout. The way of entering non-standard printouts is described further down this user manual. | Header GLP printout Footer |

For the parameters described above, one of these values must be selected:

NO - do not print;

YES - print

7.3. NON-STANDARD PRINTOUTS

The balance software enables entering 4 non-standard printouts. Each of them can consist of approximately 160 characters.

Non-standard printout may include:

- variables dependent on the working mode and other needs (mass, date etc.)
- permanent text from the user menu, remember to use capital letters exclusively, no polish signs allowed
- Non-standard printout can consist of 160-character long string.

Inserting Text

List of variables mutual for all working modes, having the same values:

| | |
|----|--|
| %% | Printout of a "%" character |
| %V | Current net mass in the current unit |
| %N | Current net mass in the basic unit |
| %G | Current gross mass in the current unit |
| %T | Current tare mass in the current unit |
| %D | Current date |

| | |
|----|---|
| %M | Current time |
| %I | Balance number |
| %R | Program number |
| %P | Project number |
| %U | User number |
| %F | Name of a current function – working mode |
| %C | Date and time of the last adjustment |
| %K | Type of the last adjustment |
| %S | Currently weighed product |
| %Y | Deviation for the last adjustment |
| %1 | Variable 1 |
| %2 | Variable 2 |

Variables depending on the currently used working mode

| Variable | Description | Mode for which the variable is active |
|----------|---------------------|---------------------------------------|
| %W | Standard mass 1 pcs | PARTS COUNTING |
| %B | Reference mass | PERCENT WEIGHING |

Non-standard characters used in designing non-standard printouts

| | |
|----|-----------------------------------|
| \\ | a single „\” character |
| \C | CRLF |
| \R | CR |
| \N | LF |
| \T | Tabulator |
| \F | Form feed (for PCL printers) |
| %E | Crop the paper for EPSON printers |

Every single printout can contain max 160 characters (letters, numerals, non-standard characters, spaces). You can apply non-standard characters depending on type of data that is to be printed out.

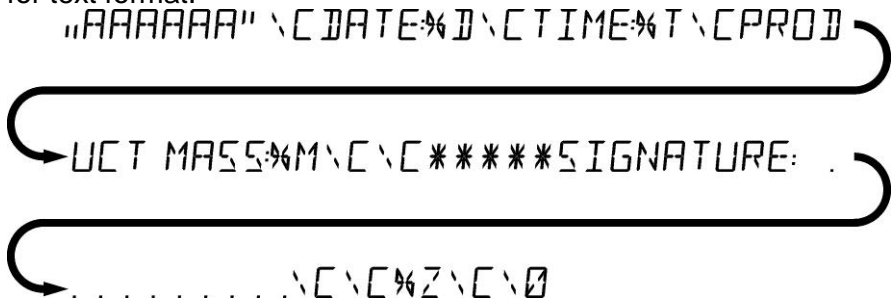
Example 1:

“AAAAAA”
DATE: <current measurement date>
TIME: <current measurement time>
PRODUCT MASS: <current mass indication>

*****SIGNATURE:.....

<current working mode>

Enter printout content settings and design the printout using respective data variables and characters for text format.



7.4. VARIABLES

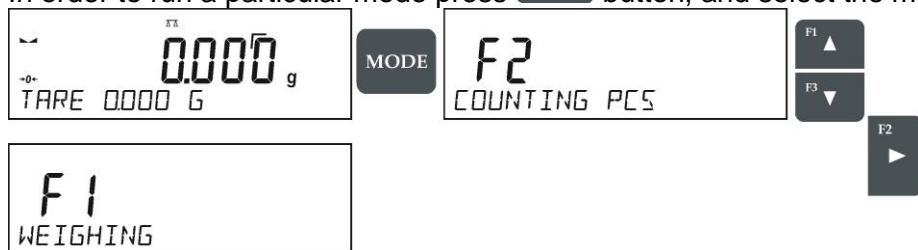
Variable is defined as alphanumeric data which can be linked to printouts, products or other information related to weighing. Every variable is characterized by its content, the content must be given. Variables are used for entering various data during the weighing process, e.g. serial number or batch number. The program allows to enter two variables. Each can consist of max 32 characters.


In order to input a variable content, the user needs to enter variable settings (parameter P5.9 – VARIABLE 1 or P5.10 – VARIABLE 2) and enter the respective values using direction keys (arrows) on the balance keypad or a computer keyboard. Procedure for entering texts is the same as for non-standard printouts.




8. WORKING MODES

- Weighings
- Parts Counting
- Deviations % in reference to mass of the standard
- Density Determination of Solids
- Density Determination of Liquids
- Animal Weighing

In order to run a particular mode press  button, and select the mode from the list.



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

 or  - press to select working mode
 - 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 later sections of this user manual.

8.1. WORKING MODES ACCESSIBILITY

Group of parameters enabling the user to declare which functions are to be accessible. You can deactivate functions that are not used in course of balance operation, to do it, value **<NO>** has to be selected for a particular parameter.

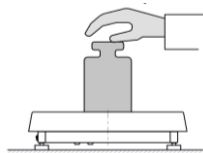
8.2. WEIGHING OPERATION

Good Weighing Practice

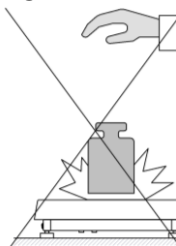
In order to ensure long lasting use of a balance plus correct and reliable measurement of weighed loads, follow below procedures:

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

YES

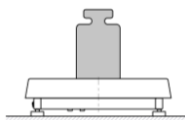


NO

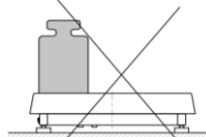


- Place weighed loads centrally on the weighing pan:

YES

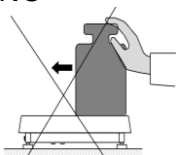


NO

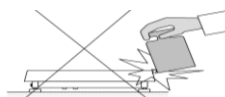


- Avoid side loading, in particular side shocks:

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" $\rightarrow 0 \leftarrow$ and whether measurement is stable $\blacktriangle \blacktriangleleft$, if not, press $\rightarrow 0 \leftarrow$ / **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 $\rightarrow T \leftarrow$ / **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.

Balance Zeroing



Zeroing is a function allowing to zero mass indication. In order to zero mass indication, press $\rightarrow 0 \leftarrow$ button. Mass indication of zero value shall be displayed together with precise zero $\rightarrow 0 \leftarrow$ and stability $\blacktriangle \blacktriangleleft$ 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 $\pm 2\%$ range of instrument's maximum capacity. If the zeroed value is above $\pm 2\%$ of the maximum capacity, then the software indicates an error message, Err2.

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  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.

Manual tare determination

Procedure:

- While in optional mode press quick access key F, to which <ENTER TARE> option has been assigned (setup instruction to be found further down this user manual, point <F shortcut key>).
- Wait for a respective window to open.
- Use the arrow buttons to enter the tare value and press  button,
- The balance returns to the weighing mode, and the display indicates entered tare value with minus „-“ sign.

Deleting tare

Entered tare value can be deleted by pressing  button on the overlay or by entering tare value of 0.000g (see description above).

WEIGHING Mode Settings

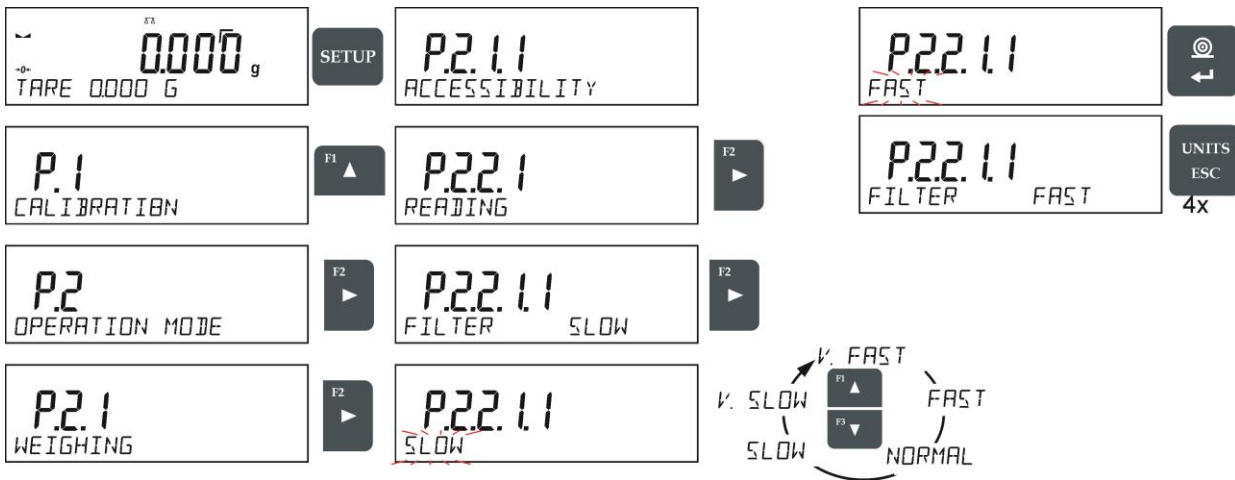
The software allows setup of operating parameters (filters, value release and autozero function, deleting the last digit and other settings) separately for each working mode.

It enables customizing the instrument and utilizing its properties depending on the user's needs and expectations, or on specific requirements for selected working mode (e.g. DOSING); as a result, the device operation is quick and easy.

Filter level setting

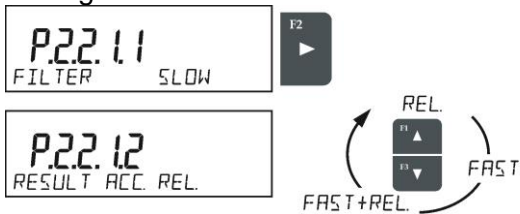
Filter settings adjustment depends on the working environment. For the best possible conditions, the filter can work in a very fast mode (V.FAST value for Filter parameter); however, if the conditions are poor (shakes, drafts), the filter should be set to slow or very slow option (SLOW or V. SLOW value for Filter parameter). The effectiveness of the filter is different throughout the weighing range. The filter works slower when “approaching” the weighed mass, it works more intensively for weighed mass within the set range of the filter (the parameter for setting filter range is accessible only from the service menu – the user does not have any access to it).

Depending on the filter, the weighing time is shorter (V.FAST and FAST) or longer (SLOW and V. SLOW).



Value release

Since ambient conditions at a workplace vary, it is necessary to determine the value release parameter in the most preferable way enabling balance adaptation, parameter options are: FAST.+REL., FAST or RELIABLE. Depending on the selected option, weighing time is either shorter or longer.



Autozero function

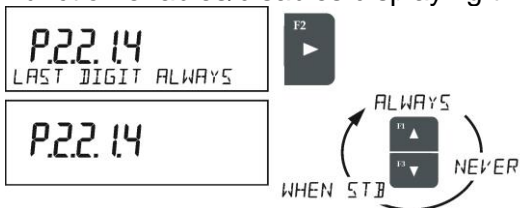
The software features an autozero function (Auto) ensuring precise mass indication. This function automatically controls and corrects zero indication. When Autozero is enabled, it compares balance indications at declared time intervals e.g. 1s, provided that weighing pan is unloaded and display indication is close to zero. If results vary less than the declared AUTOZERO range e.g. one division, balance zeroes automatically, marker of stable measurement result –▲▲, and precise zero marker –0– are displayed.

If AUTOZERO function is enabled, then each weighing process starts from precise zero point. There are, however, some cases when this function can be a disturbing factor for the measuring process; e.g. very slow placing of a load on the weighing pan (load adding). Here, zero indication correction can also correct actual indication of loaded mass.



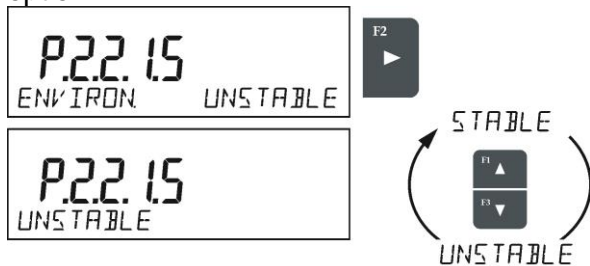
Last digit display

Function enables/disables displaying the last digit of decimal place for a weighing result.



Balance ambient conditions

Parameter relating to ambient and environmental conditions in which the balance operates. There are two options: STABLE and UNSTABLE. Selecting STABLE mode makes the balance work much faster, i.e. weighing takes much less time than for UNSABLE mode. If the ambient conditions are unstable it is recommended to use UNSTABLE mode. By default, the parameter is set to STABLE option.



AUTOTARE

Autotare is used for quick determination of net weight for loads with different tare values, wherein they are measured one after another.

When the function is active (<AUTOTARE> parameter set to <YES> option), the operating process takes the following steps:

- Make sure that the weighing pan is empty and press button responsible for zeroing.
- Put product packaging on a weighing pan.
- After measurement stabilization, **automatic taring** of the packaging mass proceeds (**Net** marker appears in the upper part of the display).
- Put product that is to be packed into the packaging.
- The display shows net weight of the product.
- Take off the product together with the packaging.
- The balance cancels tare value (packaging weight recorded in balance storage during the first step of the operating process) after the gross weight value (set in <AUTO THRES> parameter) has been exceeded.
- Put packaging of the next product on a weighing pan, automatic taring of the packaging weight proceeds after measurement stabilization (**Net** marker appears in the top section of the display);
- Put a next product that is to be packed.

For correct operation of the balance with AUTOTARE function, it is necessary to adjust the threshold value.




<AUTO THRES> parameter is connected with the following functions:




- automatic tare,
- automatic operation,

No automatic taring takes place as long as the gross weight value stays within the range set in <AUTO THRES> parameter.

Print Mode

Function designed to enable print mode setting, it activates  key.

Print mode options:

- <WHEN STAB>, for this option stable measurement result, along with the settings for parameter <GLP PRINTOUT>, is sent to the printer port. On pressing  key, when the result is not stable (no  marker on a display), the balance software sends the measurement result to the port after reaching stability for the measurement.
- <EACH>, for this option every single pressing of  button results with sending the measurement indication to the printer port along with the settings for <GLP PRINTOUT>

parameter. Every single indication is sent (stable and unstable). For unstable indication <?> character appears at the beginning of the printing frame. **This function applies to non-verified balances exclusively.**

- <AUTO> - select this option to enable automatic printing of measurements. If this option has been selected, remember to set <AUTO THRES> parameter to suit your needs.
- <AUTO+INT.> select this option to start automatic printout and record of indications in Weighings database and Alibi database, carried out in a cyclic manner in a specified time interval. The interval is set in minutes, in parameter P2.2.3.3 <AUTO INT.>. Interval range is 1-9999 min.

For automatic operation with interval it is necessary to specify interval value in [min].

The picture presents interval setting, value set to 2 min.






CAUTION!

Automatic operation with interval starts at the moment of switching the function on and it lasts until it is switched off.

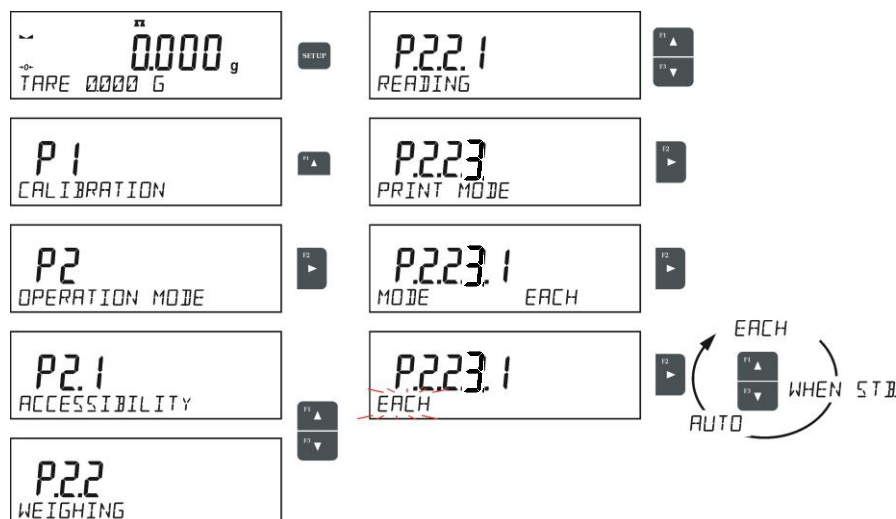
On switching the function of auto print with interval, PRINT button becomes inoperative (no indication is printed when pressed).

Automatic operation procedure:



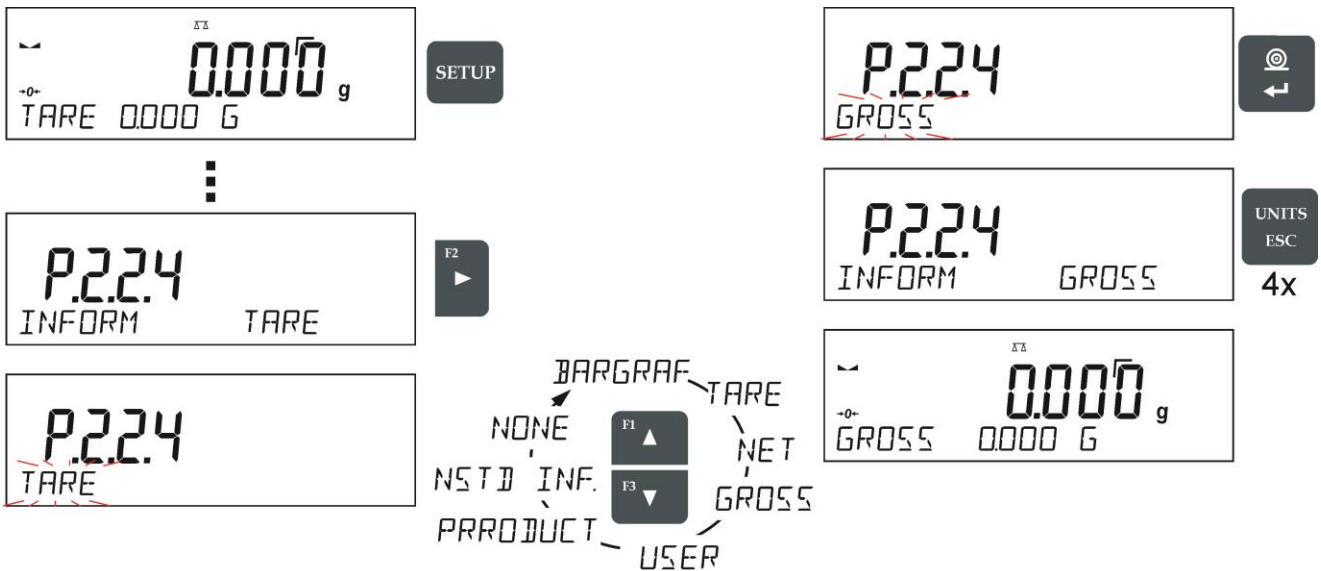
- Press  button to zero the balance (marker of stable measurement  and zero marker  are shown on a display).
- Deposit load, the balance sends the first stable measurement to the printer port.
- Remove the load from the pan.
- The next measurement is possible when the indication is lower than the set value of <AUTO THRES.> parameter (next measurement does not require zero value).

Procedure:



Information

Function enables displaying additional information in the bottom line. Depending on the needs, you can choose the following options, which are shown while working in <WEIGHING> mode:



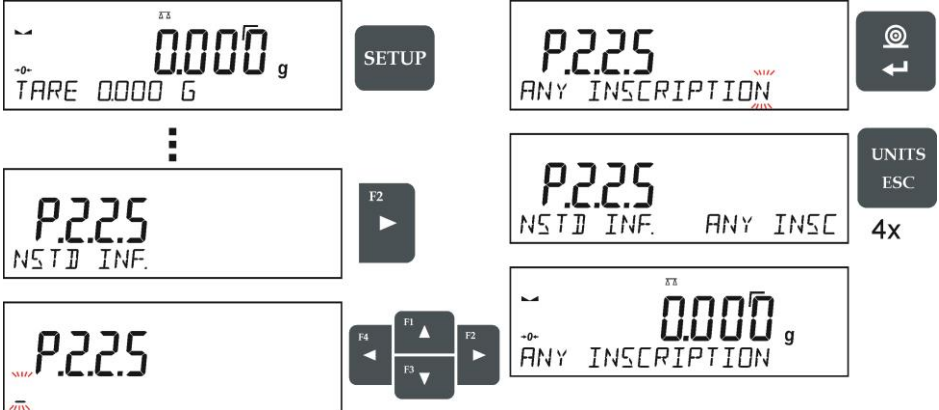
<BARGRAF> option presents amount of used weighing capacity in a graphic form, it covers 0 – MAX range.



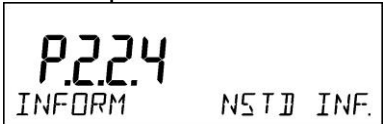
Example of a balance display with bargraph option on: 500 g heavy load placed on a weighing pan means that 50% of max capacity has been used (half-filled bargraph bottom line). It is possible to enable <BARGRAF> option for the following modes: PARTS COUNTING, PERCENT WEIGHING, WEIGHING, ANIMAL WEIGHING.

Non-Standard Information

Function enables declaring non-standard information, which is to be displayed in the bottom line of the display. You can insert any text consisting of 19 characters' maximum.

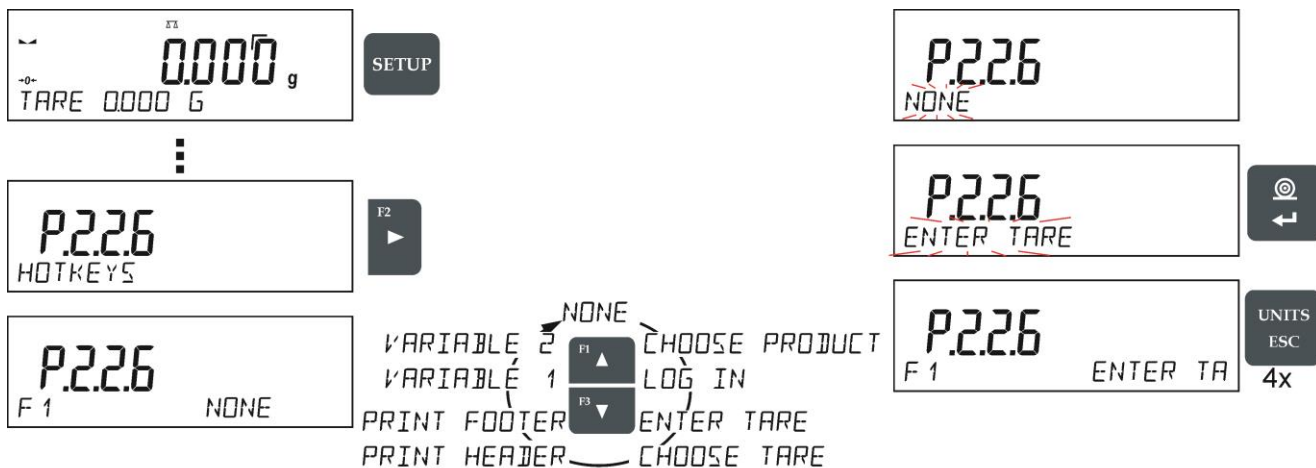


If you want the declared non-standard information is to be visible, set parameter P2.1.2 to < NSTD. INF. > option.



F Shortcut Keys

Function enables assigning quick access for weighing functions which are to be accessible by pressing F1, F2, F3 or F4 keys. You can choose between the following options for <WEIGHING> mode: <NONE / ENTER TARE / PRINT HEADER / PRINT FOOTER / VARIABLE 1 / VARIABLE 2>. These options can be freely assigned to any of the F keys. For other modes there are more available options (see further sections of this manual).



Functions for particular working modes:

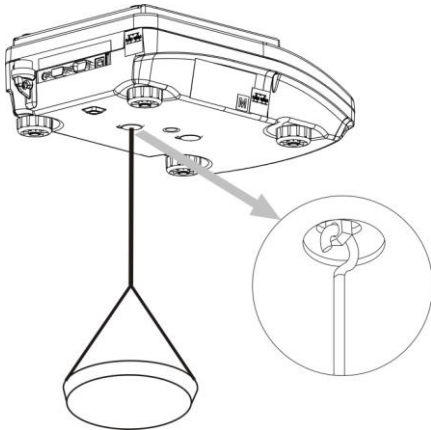
| Function | Modes featuring the function |
|-------------------|--|
| SELECT PRODUCT | All modes |
| LOG IN | All modes |
| ENTER TARE | All modes |
| SELECT TARE | All modes |
| PRINT HEADER | All modes |
| PRINT FOOTER | All modes |
| VARIABLE 1 | All modes |
| VARIABLE 2 | All modes |
| ON/OFF LAST DIGIT | All modes |
| ENTER SAMPLE | Parts Counting, Percent Weighing |
| DETERMINE SAMPLE | Parts Counting, Percent Weighing |
| START | Animal Weighing, Solids Density, Liquids Density |

Under-Pan Weighing

In standard analytical and precision balances, loads can be weighed under a weighing pan. Such means of operation requires placing a balance in an uplifted position.

For under-pan weighing follow below procedure:

- Remove plastic hole plug located in the balance base,
- Under the plug you can find a special holder with an opening dedicated for suspending the load (fixed permanently)
- The opening is used for fixing a hook intended for either load or a dedicated weighing pan, once depositing a load one can start weighing
- Upon completing under-pan weighing, put the plastic plug back onto its place.



CAUTION!

The suspension for hook must not be turned, twisted or manipulated in any direction. Such actions may cause damage to balance mechanism.

Mass of all additional elements of under pan weighing kit, like the hook, weighing pan, string, etc. should be

zeroed by pressing  or .

8.3. COUNTING PARTS OF THE SAME MASS

The standard version of a balance is equipped with an option of counting small objects of the same mass.

When the function is initiated for the first time, mass standard weight equals 0.0000g. If the mass standard weight is determined and has been used in <PARTS COUNTING> mode, then the software accepts the most recently used mass value as the mass standard weight.

PARTS COUNTING Mode Settings

The software allows entering settings of each working mode. Some settings are identical for all working modes. They are described in section relating to <WEIGHING> mode.

This section covers only settings for <PARTS COUNTING> mode.

F Shortcut Keys

You can declare which particular weighing function is to be launched using F1, F2, F3 or F4 keys. For procedure informing you how to declare the particular function, read *F Shortcut Keys* section.

Setting the Reference Mass: Mass Determination from the Sample of Known Quantity

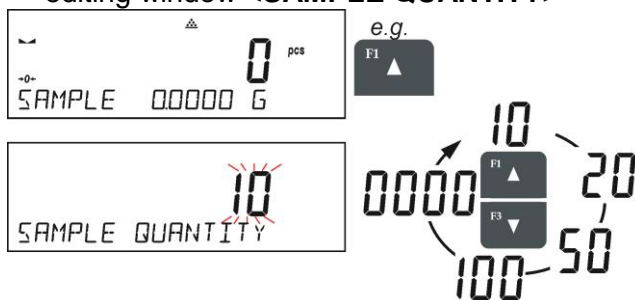
While determining the mass of a single piece, **ACAI** function (Automatic Accuracy Correction) is in use.



Means of operation of ACAI function:

- Number of pieces (on adding) on balance's weighing pan has to be greater than before
- Number of pieces (on adding) on balance's weighing pan must be less than twice the amount displayed before adding parts
- Current quantity of parts must be within the $\pm 0,3$ tolerance of the total value,
- Measurement result has to be stabilised.

Procedure:



- Place the container on the pan and tare its mass,
- Press F button to which the function <DETERMINE SAMPLE> is assigned, wait to see the editing window <SAMPLE QUANTITY>



- Use arrow buttons  or  to select the correct sample quantity.
- For optional quantity variable (displayed value <0000>) enter any number using arrow buttons
- Confirm selected sample quantity, confirmation message - <PLACExx PCS> - shall be seen.





- Place the declared number of pieces in the container and when the result is stable (the symbol

 is displayed) confirm the mass by pressing  button,

- The balance software automatically counts a single piece mass and enters the mode <PARTS COUNTING> displaying the number of pieces which are on the pan (pcs). In the bottom line, a single piece mass value is shown (if the option has been selected for <INFORMATION> function).



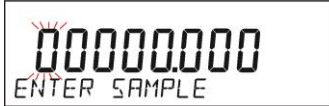
CAUTION!
Remember that:

- The total mass of all the pieces put on the weighing pan must not be greater than the balance maximum weighing range.
- The mass of a single piece cannot be lower than **0.1 reading unit** of the balance. If this condition is not met, the balance displays message: <Single part mass too low>.
- While determining the number of pieces, wait for the stability pictogram , next confirm the quantity.
- You can confirm the declared quantity by pressing  button only after the stability pictogram is displayed. Otherwise, the balance will not accept the measurement.

Setting the Reference Mass: Entering Mass Value

Procedure:

- Press F button to which the function <ENTER SAMPLE> is assigned, wait to see the editing window <ENTER SAMPLE>



- Use arrow buttons to enter the known weight value of a single piece.



- The balance software automatically enters <PARTS COUNTING> mode displaying the number of pieces which are on the pan (**pcs**). In the bottom line, a single piece mass value is shown (if the option has been selected for <INFORMATION> function)



8.4. PERCENT WEIGHING CONTROL WITH RELATION TO REFERENCE MASS

The balance software has an option of control of deviation (in percentage) between weighed loads mass and specified reference mass. The reference mass can be determined by means of a weighing process or it can be entered into memory by the user.

F Shortcut Keys

You can declare which particular weighing function is to be launched using F1, F2, F3 or F4 keys. For procedure informing you how to declare the particular function, read *F Shortcut Keys* section.

Setting the Reference Mass: Weighing Reference Sample

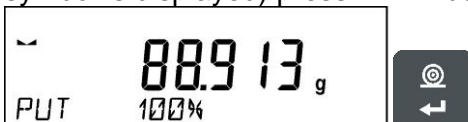
Procedure:

- Press F button to which function <DETERMINE SAMPLE> is assigned, <PUT 100%> editing window is displayed.



- Place the reference sample (to represent 100%) on the pan, and when the result is stable (◀▶ symbol is displayed) press

button to confirm.



- The software automatically enters the measured load value as a reference sample and enters <PERCENT WEIGHING> mode displaying the value of 100.000%, the bottom line displays reference mass value (if such an option has been selected for <INFORMATION> function).




Setting the Reference Mass: Entering Mass Value

Procedure:

- Press F button to which function <ENTER SAMPLE> is assigned, <ENTER SAMPLE> editing window is displayed.



- Use arrow buttons to enter the known reference mass value, press  button to confirm.
- The software automatically enters <PERCENT WEIGHING> mode displaying the value of 0.000%, the bottom line displays entered reference mass value (if such an option has been selected for <INFORMATION> function).



8.5. ANIMAL WEIGHING

Animal Weighing mode enables reliable determining of mass of objects that is in motion. In principle, objects in motion generate unstable measurement, thus Animal Weighing mode requires using a different filtering method of measurement signal.

Additional Settings

Apart from standard settings for this mode (i.e. weighing mode settings) some additional parameters have been designed to describe operation of the mode.

Additional settings list:

- AVERAGING TIME** – Amount of time during which recorded measurement results are analysed. Obtained data is used to determine average measurement result.
- THRESHOLD** - It is a value expressed in mass measuring units. In order to start measurement, the indication value has to exceed the set threshold value.
- AUTOSTART** - Determines start criterion for measurements: whether they are to be initiated manually, on pressing a button or selecting START, or automatically. When the parameter is set to <YES> option, the measurement starts automatically if an indication on a balance display exceeds the set threshold value. The following measurement can start on removing the weighed object from a balance pan (the indication has to return below the value set in the threshold), and on loading the pan with a new object at a moment when the set threshold value indication is exceeded.

Prior to tests it is necessary to adjust settings of the above options so that correct values were provided. The selected options shall be respective to needs and expectations resulting from working environment.

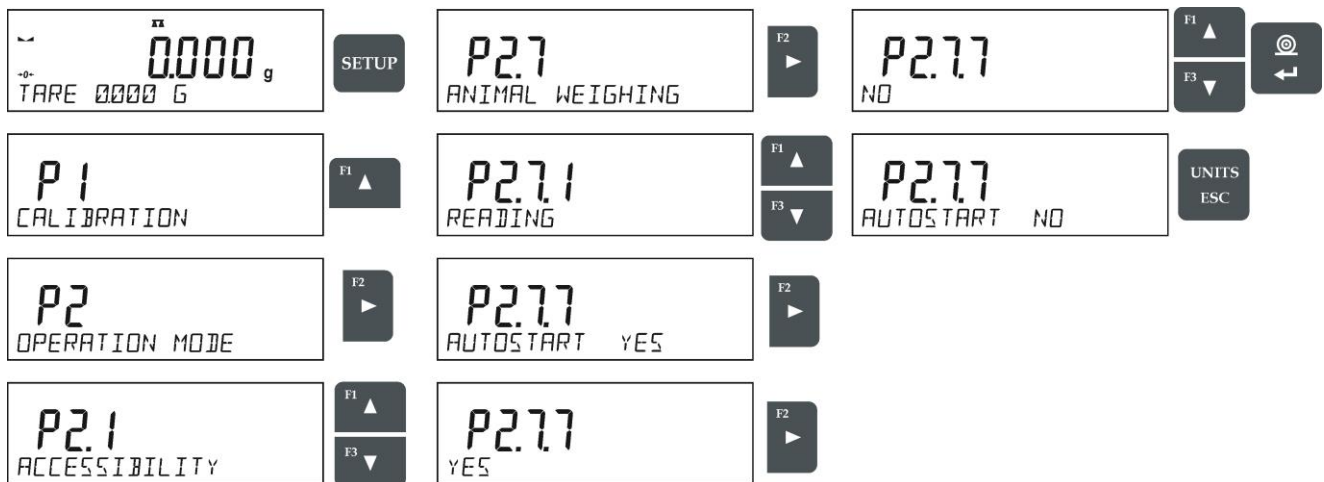
F Shortcut Keys

You can declare which particular weighing function is to be launched using F1, F2, F3 or F4 keys. For procedure informing you how to declare the particular function, read *F Shortcut Keys* section.

Running the Process Manually – Means of Operation

To start the process of weighing manually, enter the mode settings, select an <AUTOSTART> parameter and set <NO> value.

Procedure:



UNITS
ESC

After altering the settings, return to the main window by pressing button repeatedly. Next, set the averaging time in seconds. It is the time, during which the balance software acquires measurements and based on these measurements the average result is determined.

The <THRESHOLD> parameter is not required for this measurement mode.

Select <ANIMAL WEIGHING> mode.

Place the container in which the measurement is to be carried out on the weighing pan and when the indication is stable carry out taring.

Next, enter the mode options and start the measurement procedure following the instruction below.



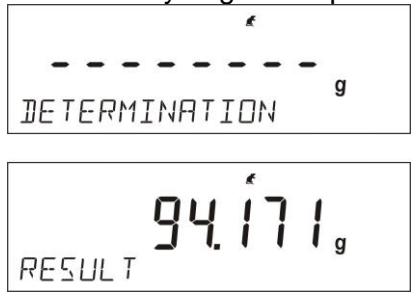
After weighing process completion, the measurement result is locked and automatically printed.

Running the Process Automatically – Means of Operation

To start the process of weighing automatically, enter the mode settings, select an <AUTOSTART> parameter and set <YES> value, follow description form the previous paragraph. Additionally, set parameters <AVERAGING TIME> and <THRESHOLD>.

In order to carry out the measurement in a container (TARE) for this mode, select the option <ENTER TARE>, for the option overview to be found in weighing mode options description.

To start the process (after setting the options), enter the weight of the container, then put the container on the pan and place the object that is being weighed in the container. The balance automatically begins the process of measurement after exceeding the set mass threshold.



After weighing process completion, the measurement result is locked and automatically printed.



In order to finish the measurement, press button.

The program automatically returns to the main window of Animal Weighing mode.

8.6. DENSITY OF SOLIDS

Solids Density is a working mode enabling determination of density of a representative sample material.

In order to operate this mode, an optional density kit (supplementary equipment), appropriate to a model of used balance, is required. Please contact your Schuler Scientific Representative to obtain the appropriate kit.

F Shortcut Keys

You can declare which particular weighing function is to be launched using F1, F2, F3 or F4 keys. For procedure informing you how to declare the particular function, read *F Shortcut Keys* section.

Density Determination

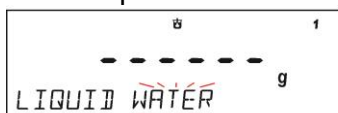
Density determination of solids can be carried out by means of two pre-defined types of liquids or user-defined liquid of specified density:

- **WATER** (distilled water),
- **ETHANOL** (spirit 100% +/- 0.1% in temp. 20°C),
- **OTHER** (another liquid of specified density).

When determining density in water or alcohol it is necessary to specify their temperature. For liquid of specified density, its value (density) is inserted from balance keyboard. Density determination is carried out by weighing a sample first in the air (top weighing pan (4) of the density kit), and then weighing the same sample in liquid (on the bottom weighing pan (2) of the density kit). As the same sample is weighed in liquid, the result of density determination is automatically indicated on a balance display.

In order to determine the density, you need to:

1. Install the density determination kit.
2. Enter <SOLIDS DENSITY> function.
3. Prepare a sample.
4. Initiate the process.
5. Set the process following the displayed messages.
6. Select liquid in which the determination is to be carried out.



7. After selecting and entering a liquid type by pressing <ENTER> button, the software proceeds to setting the liquid temperature.

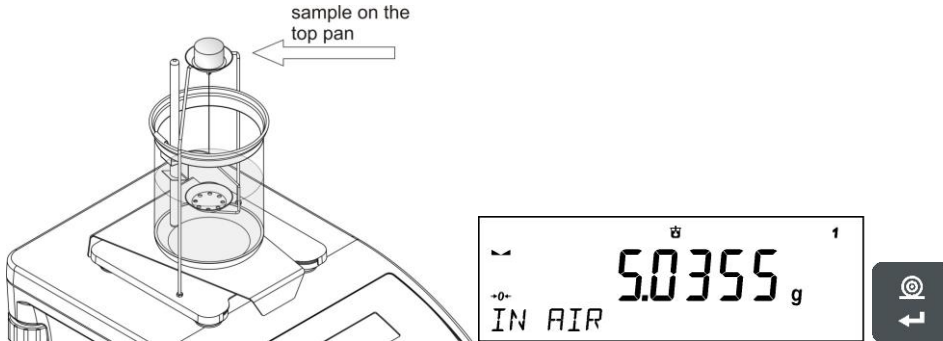


8. If <OTHER> liquid of determined density has been chosen, enter its density.

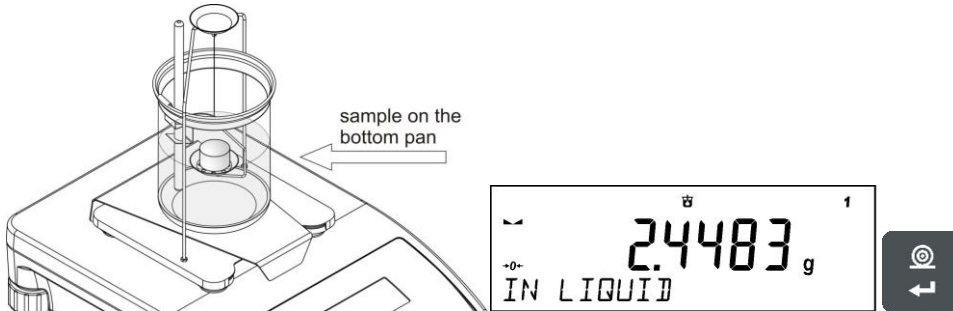


9. With this data entered, the program proceeds to weighing.

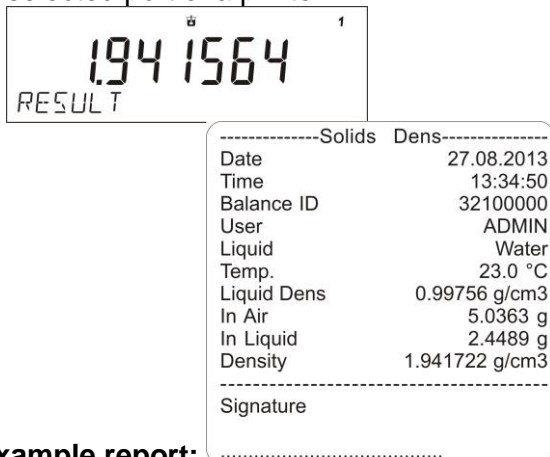
10. First, place a mass sample on the top weighing pan of the kit (weighing in the air), and confirm the indication when stable.





11. Next, place a mass sample on the bottom pan of the kit (mass determination in the liquid), and confirm the indication when stable.



12. On the second confirmation of the indication, the program automatically calculates and displays the tested solid object density. At the same time, a report on the measurement is sent to a selected port of a printer.



An example report:

The report may be reprinted upon pressing  button. In order to finish, press  button. The software returns to the main window of the mode and a next measurement can be performed. The balance operates with previously set parameter values (liquid, temperature) thus shortening time needed for the exact measurement.

8.7. DENSITY OF LIQUIDS

Liquids Density is a working mode enabling determination of density of any liquid.

In order to operate this mode, an optional density kit (supplementary equipment), appropriate to a model of used balance, is required. Density determination kit is the same for solids and for liquids (for the kit description read the previous section). Please contact your Schuler Scientific representative to obtain the proper kit.

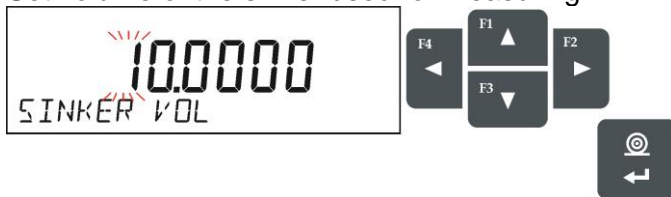
Settings for button shortcuts are the same as for <SOLIDS DENSITY> function (see the previous point).

Density Determination

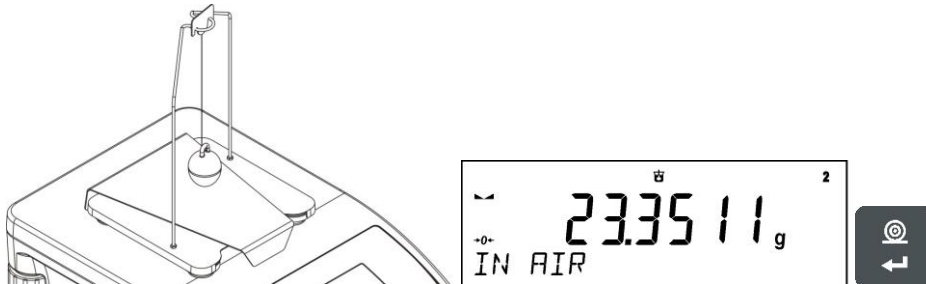
The basic element for measuring liquids density is the sinker (9). Its volume is precisely determined and given on a sinker's hanger. Before starting liquid density determination, enter sinker's volume value to the balance memory. In order to measure the density of liquid, first determine mass of the sinker in the air. Then, measure mass of the same sinker in the tested liquid. The result of liquid density determination is automatically indicated on balance display.

In order to determine the liquid density, you need to:

1. Install the density determination kit.
2. Enter <LIQUIDS DENSITY> function.
3. Prepare a sample.
4. Initiate the process.
5. Set the process following the displayed messages.
6. Set volume of the sinker used for measuring.



7. On entering the data, the software proceeds to weighing.
8. First, place the sinker on the hook (a sample mass determination in the air), and confirm the indication when stable.



9. Next, take the sinker out of the hook, put the beaker with liquid on the beaker's basis (the beaker cannot touch the hook), gently hang the sinker on the hook providing that it is totally immersed in the tested liquid (sample mass determination in liquid) – and confirm the indication when stable.





10. On the second confirmation of the indication, the program automatically calculates and displays the tested solid object density. At the same time, a report on the measurement is sent to a selected port of a printer.




An example report:

| -----Liquid Dens----- | |
|-----------------------|----------------|
| Date | 28.08.2013 |
| Time | 9:38:39 |
| Balance ID | 32100000 |
| User | ADMIN |
| Sinker vol. | 10.0000 cm3 |
| In Air | 23.3511 g |
| In Liquid | 17.1834 g |
| Density | 0.616770 g/cm3 |
| ----- | |
| Signature | |
| | |

The report may be reprinted upon pressing  button. In order to finish, press  button. The software returns to the main window of the mode and a next measurement can be performed. The balance operates with previously set parameter values (liquid, temperature) thus shortening time needed for the exact measurement.

9.COMMUNICATION

Communication menu enables configuration of port settings. The settings are accessed upon pressing  button.

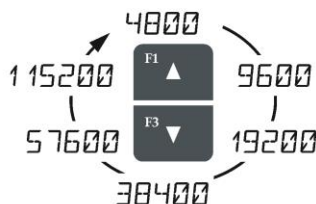
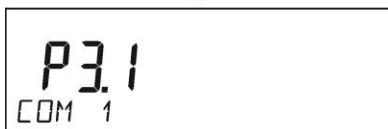
Communication with peripheral devices is established via the following ports:

- COM 1 (RS232),

9.1. RS 232 PORTS SETTINGS (COM)

Procedure:

- Select communication port <COM 1>,
- Set respective values



The RS 232 ports enable the following setting of transmission parameters:

- Baud rate – 2400, 4800, 9600, 19200, 38400, 57600, 115200 bit/s
- Parity – NONE, ODD, EVEN

10. PERIPHERAL DEVICES

PERIPHERAL DEVICES menu is comprised within Parameters menu. It is accessed by pressing

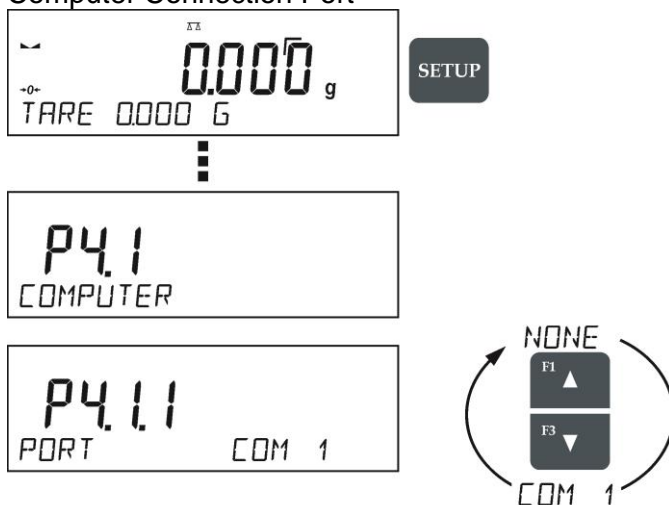
 key. The menu features list of devices that can cooperate with the balance.

10.1. COMPUTER


<COMPUTER> submenu allows the user to select a port for connection of a computer running software which enables:

- communication with a balance,
- switching the continuous transmission on and off, and
- cooperation of a balance with RLAB software

Computer Connection Port



Procedure:

- press  button
- enter <P4 DEVICES> menu
- enter menu group: <P4.1 COMPUTER>
- select port to which a computer is to be connected,
COM 1– RS 232 port, to which the computer is connected

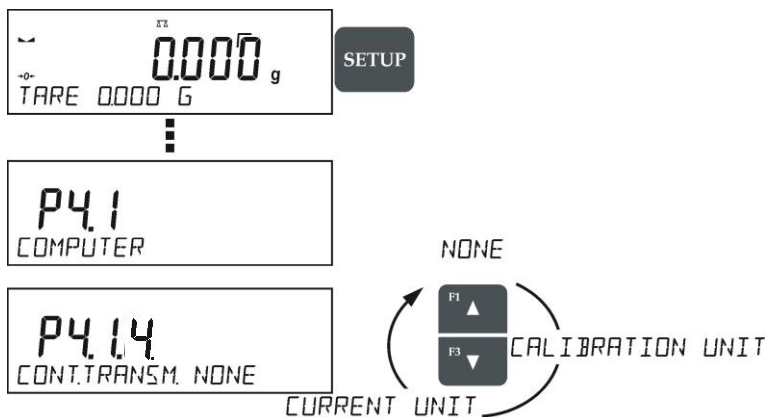
Continuous Transmission

Continuous transmission parameter enables turning on/off continuous transmission of a measurement result.

Available options:

- Continuous transmission in a calibration unit <CAL. UNIT>, independently from currently chosen weight unit, measurements are transmitted in unit set on a main measuring device (calibration unit)
- Continuous transmission in a current unit <CURRENT UNIT> measurements are transmitted in a current unit; the unit changes dynamically whenever the user presses Units button in order to modify the unit on a display.
- Continuous transmission off <NONE>

Procedure:



CAUTION!

Continuous transmission may be turned on/off by means of a command sent from a computer (go to COMMUNICATION PROTOCOL section)

Printouts Interval for Continuous Transmission

Parameter <P4.1.5. INTERVAL> enables setting frequency of printouts for continuous transmission. Frequency of printouts is set in seconds, wherein the accuracy is 0.1s. The user may set any time value ranging from 1000 to 0.1 s.


10.2. PRINTER

Submenu <PRINTER> allows the user to choose a port and a device, to which the data is to be sent



upon pressing button on a balance. Content of data being transferred is set in parameter <PRINTOUTS/PRINTOUT GLP>.

Procedure:

- press  button
- enter <P4 DEVICES> menu
- enter menu group: <P4.2 PRINTER>
- select port to which the printer is to be connected:
COM 1– RS 232 port, to which the printer is connected

Example of the measurement printout is described in the PRINTOUTS section.

Additionally, you can enter a controlling code (of a hexadecimal form) to a printer either at the beginning of the printout - <P4.2.3 PREFIX> or at the end of it - <P4.2.4 SUFFIX>. Sending these codes allows to control globally both, information and actions carried out at the beginning and/or at the end of each printout sent from a balance to a printer.

This function is most frequently used to send an information about the code page of a printout sent by a balance, at the beginning, and to send a command enabling the crop of a paper in EPSON printers (if the printer is equipped with an auto cutter blade), at the end.

<PREFIX> and <SUFFIX> parameters settings are available for all the printouts sent from balance, e.g. calibration reports, density, statistics etc., and for the header, footer and GLP printouts.

CAUTION:

It must be remembered that inserting paper crop command to <SUFFIX> parameter (control code) results in sending the code after each printout. If the user wishes for one whole printout to consist of: HEADER, GLP PRINTOUT and FOOTER and to be cropped underneath the FOOTER, then the paper crop command should be inserted only for FOOTER settings as a non-standard printout with <%E> value (paper crop for EPSON printer). In such a case <SUFFIX> command must remain empty.

To ensure correct cooperation of the balance with the printer (correct printout of diacritical signs of a given language), respective baud rate obligatory for a given printer must be chosen (see the printer settings). Additionally, code page of a sent printout must be accordant with a code page of a printer.

Accordance of a code page may be obtained in two ways:

- setting the right code page in the settings of a printer (see a user manual of the printer) – it must be accordant with the printout code page of a balance (**1250** code page for POLISH, CZECH, HUNGARIAN; **1252** for ENGLISH, GERMAN, SPANISH, FRENCH, ITALIAN; **1254** for TURKISH),
- sending the control code from the balance, which automatically sets the right code page of the printer (code page accordant with the one of a balance) prior to printout of data taken from the balance (this possibility is available only for printers with such option – see a user manual of the printer).

CAUTION! CODES MUST BE ENTERED IN A HEXADECIMAL FORM!

Example balance settings for correct cooperation with **TM-U220B** EPSON matrix printer connected to RS232 port (since this printer features only 852 code page, there won't be any Polish signs on a printout):

Communication parameters for port to which the printer is connected:

- BAUD RATE - 9600 bit-s
- PARITY – none

Printer parameters for a PERIPHERALS group:

- PORT – COM1 or COM2 (the one to which the printer is connected)
- PREFIX - **1B742D** (**1250** code page)
- SUFFIX - **1D564108** (paper crop for EPSON printers equipped with an auto cutter blade)

If on the printout in the place of the last digit there are any unexpected signs (for verified balances), then <P4.2.3 PREFIX> parameter should incorporate, apart from code page, code of the UK signs chart: **1B5203**. In such a case the <P4.2.3 PREFIX> parameter setting should be as follows:

- PREFIX - **1B742D** (1250 code page and UK signs chart)

Control codes for exemplary code pages:

| <i>Control code</i> | <i>Page or other command</i> |
|---------------------|------------------------------|
| 1B742D | code page 1250 |
| 1B7410 | code page 1252 |
| 1B7430 | code page 1254 |
| 1B5203 | UK signs chart |
| 1B5202 | DE signs chart |
| 1D564108 | Paper crop |
| 0C | Form feed (for PCL printers) |

11. COOPERATION WITH PERIPHERALS



CAUTION!

A peripheral device that is connected to RS 232 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.

Balance transmission parameters must correspond to the parameters of a device that is connected to the balance.

- Baud rate - 4800 ÷ 115200 bit / s
- Parity control - NONE, ODD, EVEN

Value indicated on a display can be sent via RS232 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 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.

11.1. 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.



11.2. FORMAT OF DATA SENT ON PRESSING PRINT BUTTON



CAUTION!

Unstable measurement printout is disabled for a verified balance.

Printout format:

| 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 decimal point and right justification
- Unit 3 characters with left justification

Response Format

On receipt of a command, the balance responds as follows.

- first:
 - XX_A CR LF command understood and in progress
 - XX_I CR LF command understood but not accessible at this moment
 - XX_^ CR LF command understood but max threshold is exceeded
 - XX_v CR LF command understood but min threshold is exceeded
 - XX_E CR LF time limit exceeded while waiting for stable measurement result
(time limit is balance characteristic parameter)
- Where XX stands for command name.

- next:

| 1 – 3 | 4 | 5 | 6 | 7 | 8 – 16 | 17 | 18 - 20 | 21 | 22 |
|---------|-------|------------------|-------|-----------|--------|-------|---------|----|----|
| command | space | stability marker | space | character | mass | space | unit | CR | LF |

| | |
|------------------|---|
| Command | 1-3 characters |
| 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 decimal point and right justification |
| Unit | 3 characters with left justification |

12. COMMUNICATION PROTOCOL

General information

- A character based communication protocol balance-terminal is designed for establishing communication between a balance and a peripheral device via RS-232C serial interface.
- It consists of commands sent from a peripheral device to the balance and responses from the balance.
- Responses are sent from the balance on each receipt of a command as a reaction to a specific command.
- 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.

12.1. LIST OF COMMANDS

| Command | Command overview |
|------------|---|
| Z | Zero balance |
| T | Tare balance |
| OT | Give tare value |
| UT | Set tare |
| S | Send stable measurement result in basic measuring unit |
| SI | Immediately send measurement result in basic measuring unit |
| SU | Send stable measurement result in current measuring unit |
| SUI | Immediately send measurement result in current measuring unit |
| C1 | Switch on continuous transmission in basic measuring unit |
| C0 | Switch off continuous transmission in basic measuring unit |

| | |
|------------|--|
| CU1 | Switch on continuous transmission in current measuring unit |
| CU0 | Switch off continuous transmission in current measuring unit |
| DH | Set min checkweighing threshold |
| UH | Set max checkweighing threshold |
| ODH | Give value of min checkweighing threshold |
| OUH | Give value of max checkweighing threshold |
| SM | Set mass value of a single item |
| TV | Set target mass value |
| RM | Set reference mass value |
| NB | Give balance serial number |
| SS | Value release |

| | |
|------------|---|
| K1 | Lock balance keypad |
| K0 | Unlock balance keypad |
| OMI | Give available working modes |
| OMS | Set working mode |
| OMG | Give current working mode |
| UI | Give accessible units |
| US | Set unit |
| UG | Give current unit |
| BP | Activate sound signal |
| PC | Send all implemented commands |
| BN | Give balance type |
| FS | Give Max capacity |
| RV | Give program version |
| A | Set autozero function |
| EV | Set ambient conditions state |
| FIS | Set filter |
| ARS | Set value release |
| LDS | Set last digit |
| NT | Cooperation with PUE 7.1, PUE 10 terminal |

CAUTION!

Each command must end with CR LF characters;

13. 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