Manual
Laboratory Balances
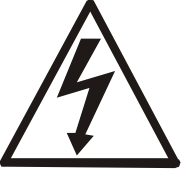# PCE-BT 200 / 2000

1. Introduction

Electrical balance BT series are designed for use in laboratories and many others technical applications, where high measurements precision is not required.

All balances are metrologically tested by manufacturer and they are not designed for calibration certificate. According to order, balances may be calibrated.

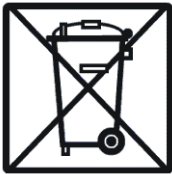Balances classification (PKWiU code) 33.20.31.

2. Completation

Basic set includes:
1. Balance,
2. Pan cover with lid (5 parts),
3. Power supply unit,
4. Accumulators – 6 units (option)
5. Decorating button (option)
6. Instruction manual.
7. Warranty.

3. Security rules

⚡	To avoid electrical shock or damage of the balance or connected peripheral devices, it is necessary to follow the security rules below.

- All repairs and necessary regulations can be made by authorised personnel only.

- To avoid fire risk use a feeder of an appropriate type (supplied with the balance). Pay attention that supply voltage is compatible with specified technical data.

- Do not use the balance when its cover is opened.

- Do not use the balance in explosive conditions.

- Do not use the balance in high humidity.

- If the balance seems not to operate properly, unplug it from the mains and do not use until checked by authorised service.

🗑	According to legal regulations it if forbidden to dispose electronic equipment in waste containers.

- Please return wasted balance to the point of purchase or other company specialised in recycling of wasted electronic components.

4. Technical data

Model of scale	BT200	BT2000
Capacity (Max)	210g	2100g
Reading unit (d)	0,001g	0,01g
Linearity	0,003g	0,03g
Repeatablity	0,003g	0,03g
Pan dimension	φ115mm	145x125mm
Working temperature	+18°C ÷ +33°C	
Weighing time	<3s	
Scale dimensions	175x245x80mm	
Scale weight	1kg	
Power supply	=12V 160mA	
Accumulators	NIMH R3 (AAA size) – 6pcs	
Working time with 1000mAh batteries	~6 h (back light on) ~16h (back light off)	
Batteries charge indicator	✓ (*bAttEry* function)	
Automatic shut-off time	> 5 min (*AutoOFF* function)	
Automatic back light shut-off time	> 30 s (*b_LIGHt* function)	
Calibration weight (OIML)	F2 200g	F2 2000g

5. General view of balance
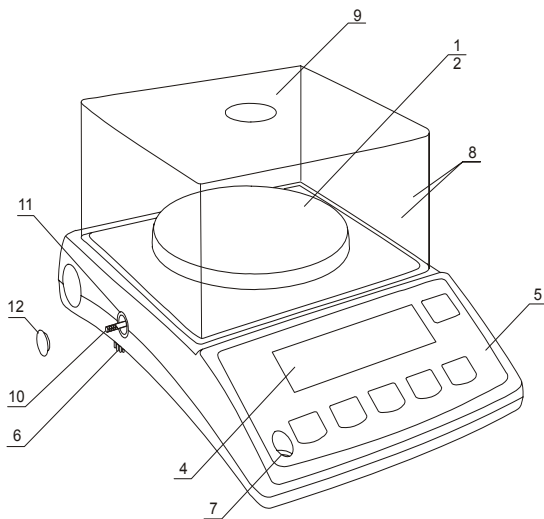
1 – pan welt (pan)
2 – carring pan
   (under welt)
3 – information windows
4 – LCD display
5 – balance keyboard
6 – rotary legs
7 – level
8 – pan cover (complex)
9 – keyboard cover
10 – protection rod
11 – protection cap
12 – decorating button
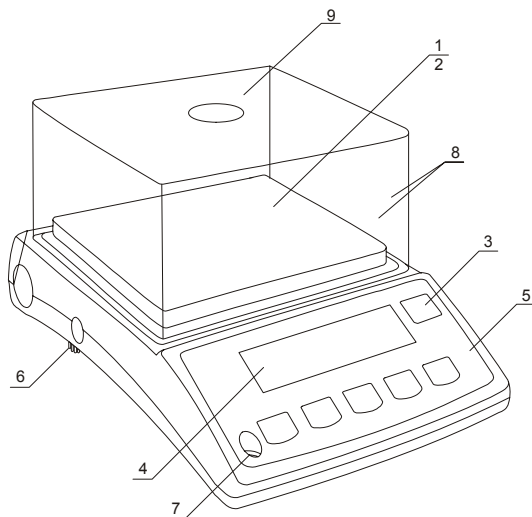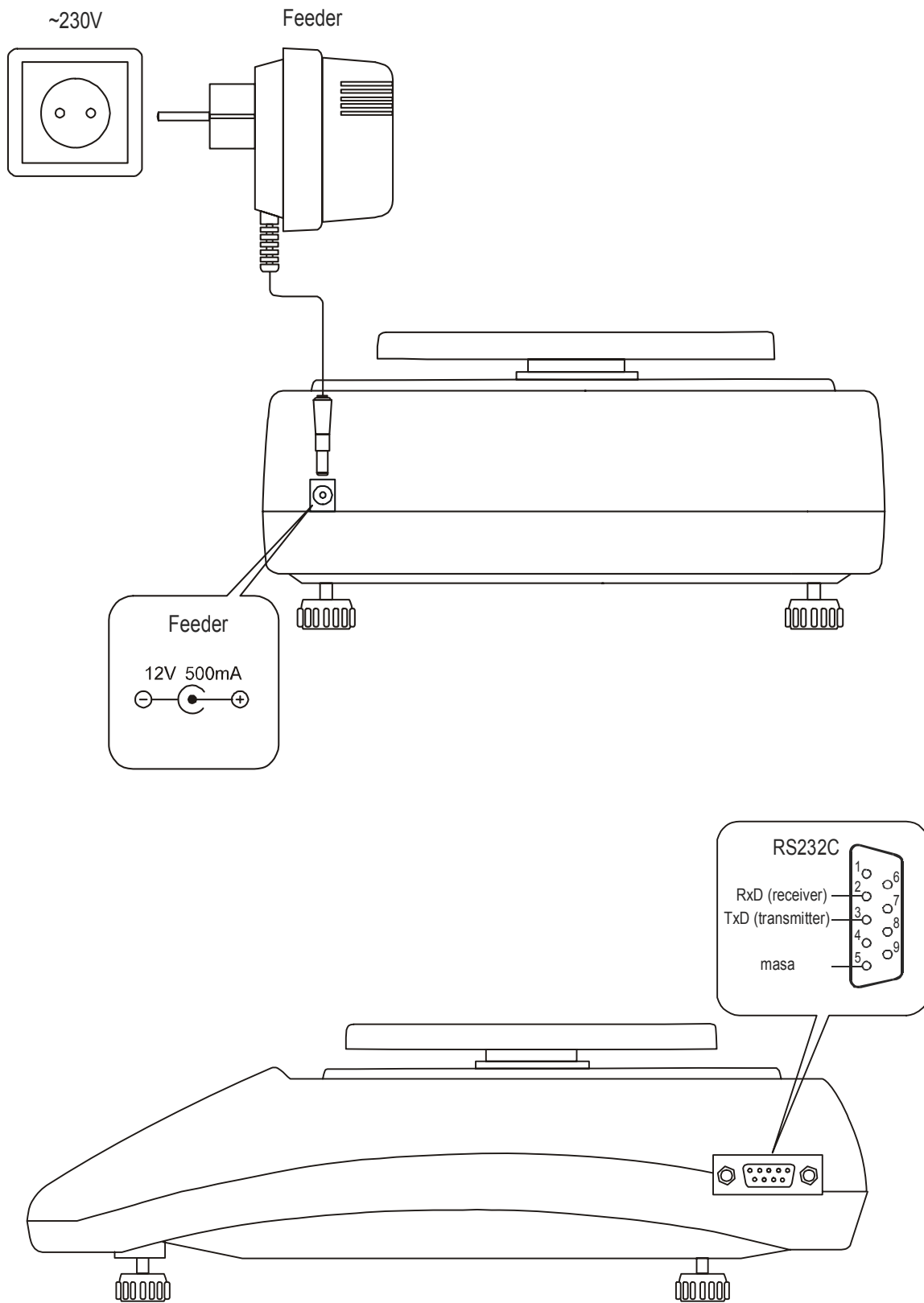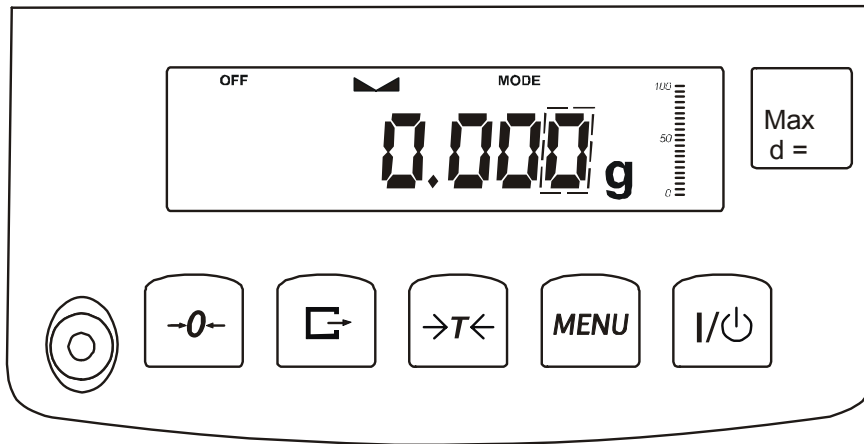

1 – pan welt (Pan)
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9 – keyboard cover

Connections views:

~230V

Feeder

Feeder

12V 500mA
⊖ ⊙ ⊕

RS232C

1
2 RxD (receiver)
3 TxD (transmitter)
4
5 masa
6
7
8
9

6. Keys and indicators

Keys functions description:

key	I/ ⏻	- switch-on/switch-off (standby),
key	*MENU*	- numeric key / menu,
key	→T←	- tare (subtract package weight from weighed mass)
key	⮕	- numeric key / data output (print / transmission),
key	→0←	- numeric key / zeroing (balances for direct sale use only),

indicator	�	- result stabilisation,
bar indicator		- load indicator 0 ÷ 100%,
indicator	OFF	- stand-by mode,
Max, d		- metrological parameters

Additional functions of keys:

→0← -   Next digit,

⮕ -   Decimal point,

→T← -   Next position,

MENU -   end.

7. Workplace preparation for balance

Balance workplace should be choice carefully in order to reduce influence of factors, that could disturb balance operation. The workplace should assure appropriate work temperature of balance and necessary space for normal balance operation. The balance should stand on stable table that is made of material non–affecting magnetic on balance.
Sudden motion of air, vibration, dustiness, violent changes of temperature and humidity above 90% are forbidden. The balance should stay away from heat sources and devices that emit strong electromagnetic radiation and magnetic field.
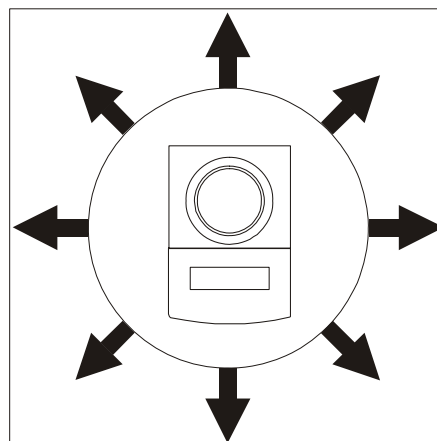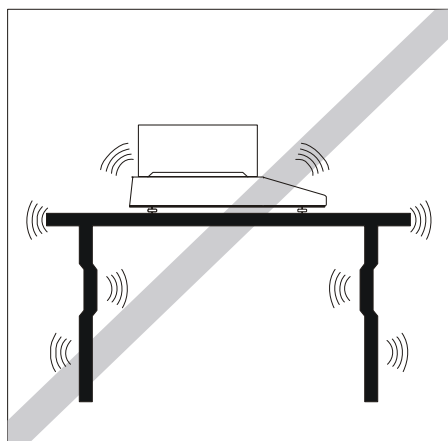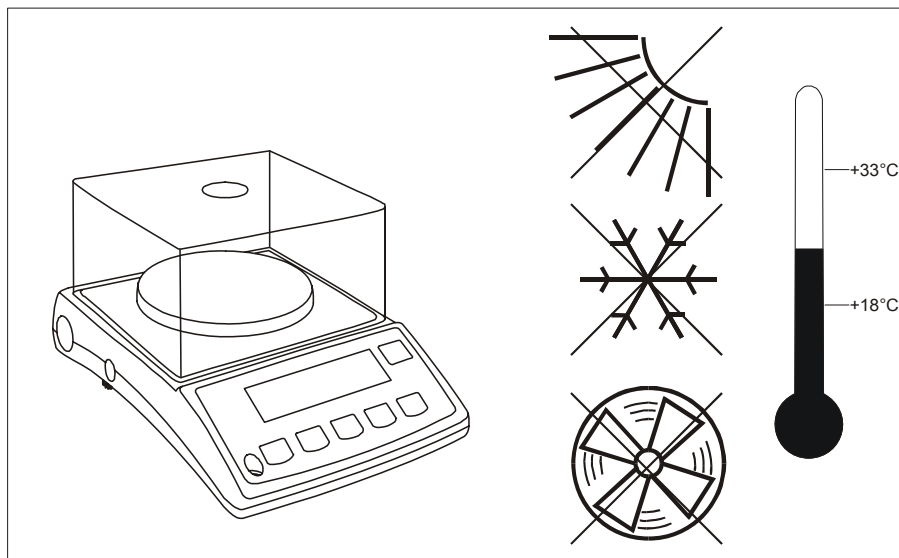
8. Balance preparation for work
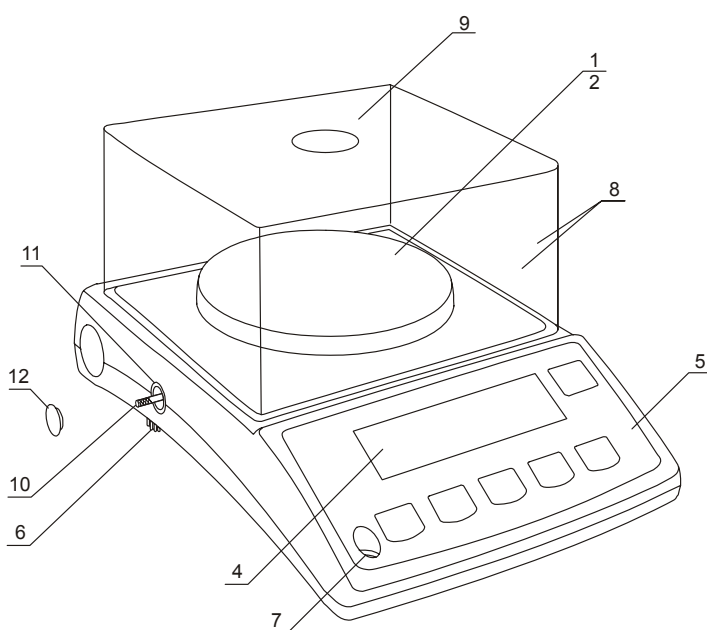
1. Remove balance and power supply unit from the package.

2. Place the balance on stable foundation, in place not subjected to mechanical vibrations and air movements.

3. Unscrew protection rod **10** and take it out with protection cap **11** (if it appears in scale). Into the same place push decorating button **12**.

4. Adjust the balance level, using the rotary legs, so the air bubble in the level **7** located in rear part of balance, takes the central position.

5. Connect together walls edges of pan cover **8.**

6. Put pan cover on balance and cover the lid **9**.

Attention: Pos. **10** and **11** are optional.

⚠ If balance was moved from environment with lower temperature to the room with higher temperature, condensate can be formed on the surface of balance. In this situation it is forbidden to turn balance on, because balance can be damaged. Before turning on balance, it should stay in a new environment for 4 hours in order to acclimatization.

9. General principles regarding balance operation

1. During balance operation, in order to confirm its efficiency, it is recommended to check the weighing precision by putting a object of exactly known weight before and after series of measurements. In case of allowable measurement error exceeding it is recommend to make calibration by standard weight or contact authorized Service Company to perform balance adjustment.

2. Weighed mass should be placed in the pan centre.

3. The balance enables tare setting in the whole measuring range. It is performed by pressing "→T←" key. Tare setting does not widen measurement range. It only subtracts tare weight from the mass, currently placed on the balance. To facilitate the mass control on the pan, and avoid the range exceeding, the balances have the load indicator, scaled in 0÷100%.

4. The weighing result should be read during the "↘↗" indicator lighting, which indicates the result stabilization.

5. When there is no weighing, but the balance should be ready for operation, it may be switched off by I/⏻ key. It turns balance reading system off and entering into the standby mode that is indicated by OFF. Balance turning on is performed by pressing " I/⏻" key.

6. In balances with active →0← key (zeroing) before putting weighed mass on the balance, make sure, if zeroing indicator →0← is displayed if the zero indication is not shown, press →0← key and wait for balance zeroing and zero indicator appears. Only then you can put an object on the balance.

7. Balance mechanism is very precision device and sensitive to overload, shocks and impacts.

⚠ **Do not overload the balance over 20% of maximum load.**
Niedopuszczalne jest naciskanie szalki ręką.

⚠ **Make sure, that pan is secured against accidental stress on the period of transport.**

10. Balance operation principles with power supply form accumulator (battery)

1. The balances can be supply from ~230V mains thought power pack delivered with the balance. Moreover accumulators also can be used. They can be placed in box inside balance. It is possible to use normal batteries.

⚠ **In order to exchange accumulators for batteries it is necessary to turn off charging accumulators, by *bAttErY* function (*bAt OFF* option) that is descrapt in the further manual part.**

2. To extant work time of accumulators (battery), it is possible to turn off display and next balance automatically. The settings of timer operation is made by b_LIGHT and Auto OFF functions.

3. Charging of accumulators is made automatically, when balance is connected to power supply unit (also during weighing) Charged state of accumulators can be checked by auxiliary function bAttErY (bat VoL option)
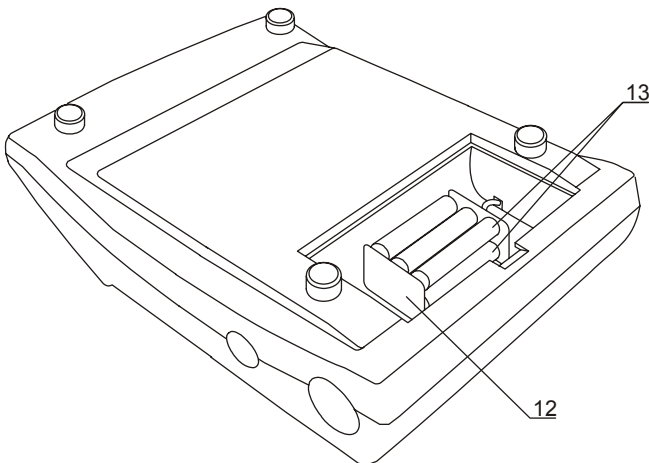
## 11. Accumulators (batteries) exchange
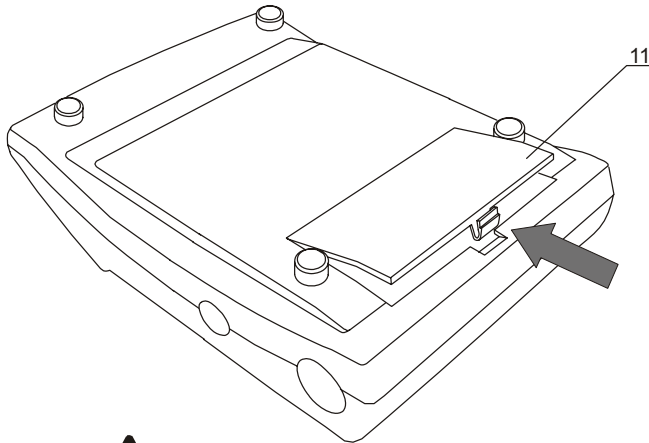
1. Remove pan lid that shields scale pan. Remove pan cover and put it near the balance.
2. Remove pan welt. Turn around balance and put it on the pan cover. Open cover **11**.
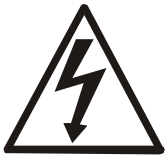
During turning BT200(D) balance around, assure that balance weight does not lean against the pan. Out of control stress puts on pan could damage mechanical balance

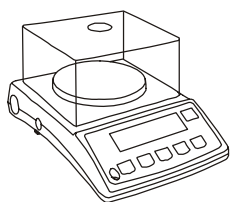3. Remove accumulator box **12** and then put accumulators type AAA inward it.
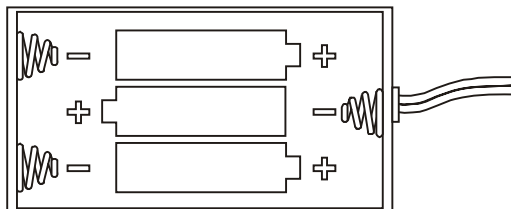
The arrangement method of accumulators in the box.

12. Start-up

Leave the pan empty, plug the feeder to the mains (~230V/50Hz) and plug the feeder connector to the 12V power socket at the back of the scale

The scale proceeds with following start-up actions:

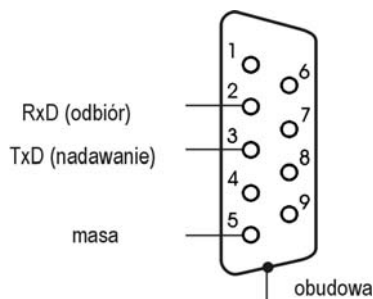|	
C-1 ... C-5	Basic electronic components tests: *C1, C-2, ... C-6.*
bt...	Program version.
--------	Zeroing.
0.00g	Ready.

13. Connecting the balance to a computer or a printer

Balance may send data to the computer or printer through RS232C port.

During the operation with computer the balance sends the weighing result after the initiating signal from the computer, or pressing ⤷ key.
To cooperate with balance, the computer must have the program, enabling the balance data receiving and processing.

AXIS company offers computer programs for cooperation with balances, available on web pages
- **Test RS232C** - program for testing balance serial port (full version),
- **ProCell** – program allowing for balance cooperation with Excel spreadsheet and other Windows applications (demo version).

Standard transmission parameters: 8bits, 1stop, no parity, 4800bps. To change transmission parameters use "rS-232" function (see further part of the manual).

Data transmission protocol description (Long protocol)

Computer→Balance: initialising signal S I CR LF (53h 49h 0Dh 0Ah)
Balance→Computer: balance indication in the following format (16Bytes)

Byte	1	-	sign or space
Byte	2, 11 and 14	-	space
Byte	3÷4	-	digit or space
Byte	5÷9	-	digit, decimal point or space
Byte	10	-	digit
Byte	12	-	k, l, c, p or space
Byte	13	-	g, b, t, c or %
Byte	15	-	CR (0Dh)
Byte	16	-	LF (0Ah)

Connection cable WK-1 (balance – computer / 9-pin):
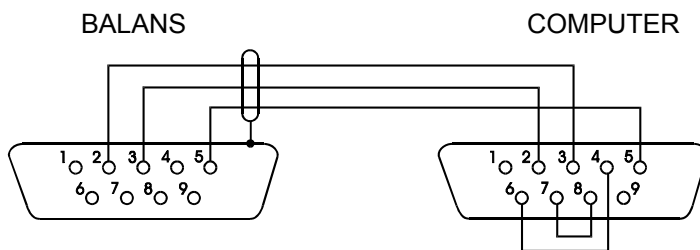
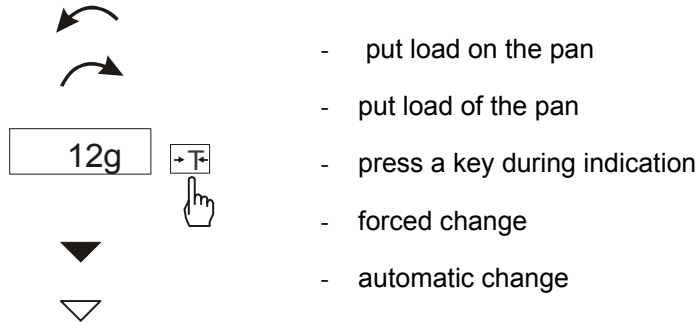**Connection cable WD-1 (balance - KAFKA printer):**
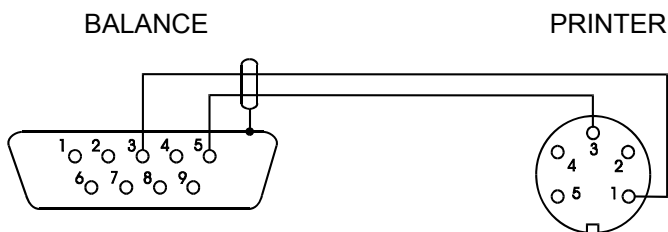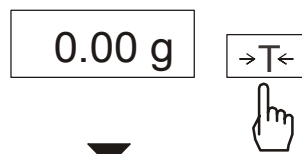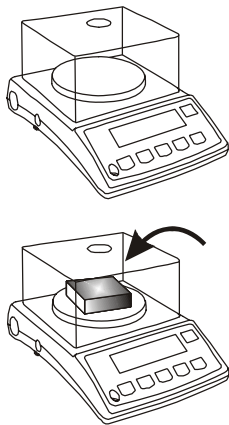

KAFKA printer internal switches set-up:

SW-1	SW-2	SW-3	SW-4	SW-5	SW-6	SW-7	SW-8
on	off	on	off	off	on	off	off

14. Basic balance functions

In further part of this manual the following graphical symbols will be used for balance functions description.

- put load on the pan

- put load of the pan

- press a key during indication
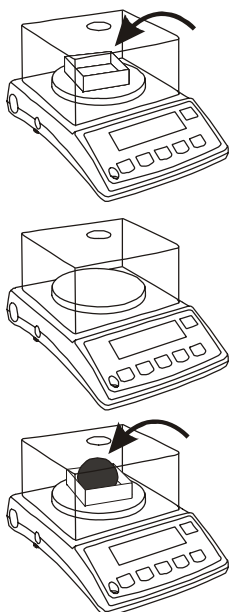
- forced change

- automatic change

14.1 Normal weighing

When the pan is empty and indication is different than zero press →T← key.
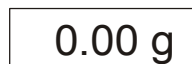
Weighing result should be read when the indicator "�▼▲" lights.

14.2 Weighing with tare

The balance is equipped with tare equal to its range.

Total amount of tare and net mass can not be exceeded max. Balance range.

11

15. Balance special functions

All balances, besides the basic metrological functions: weighing and tare setting, have a set of balance special functions.
Basic set of includes the following special functions:
- Automatic zeroing function (*AutotAt*)
- pieces counting (PCS),
- Convert mass units (*UnIt*)
- Convert percentage (*PErCEnt*)
- Preparation of recipes (*rECIPE*)
- Calibration by standard weight / internal calibration option (*CALIbr*)
- setting of work mode for serial port (*rS-232*)
- charging a battery settings (*bAttErY*),
- bright light settings (*b-LIGht*)
- automatic turning off balance (*Auto OFF*)
- weight indication resolution settings (*rES*),
- *Activation of* above-mentioned *functions (ACtIV)*
- Return unit to default settings (*dEFAULt*).

Other functions may be available as options for demand (description of all special functions is presented in the separate document).

After pressing Menu button, start menu will be displayed. The functions are displayed with the successive numbers: F1-PCS, F2-AutotAr, ect.

⚠️ User may change the menu content by activating or deactivating the available special functions with the Menu update function (*ACt*).

During the special functions switching the display shows the *MODE* indicator.

15.1 Autozeroing (AutotAr)
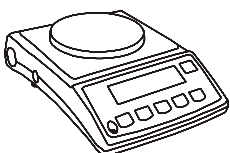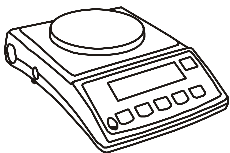
When *AUtotAr* function is activated, a balance automatically keeps zero indication if a pan is empty or if zero indication is acquired by pressing →*T*← key.
To leave the function press *MENU* key, then with →*T*← key chose *AUtOtAr* and *AUt oFF* .

Note: Autozeroing function is activated automatically for 10 min. after switching-on

15.2 Pieces counting function (PCS)
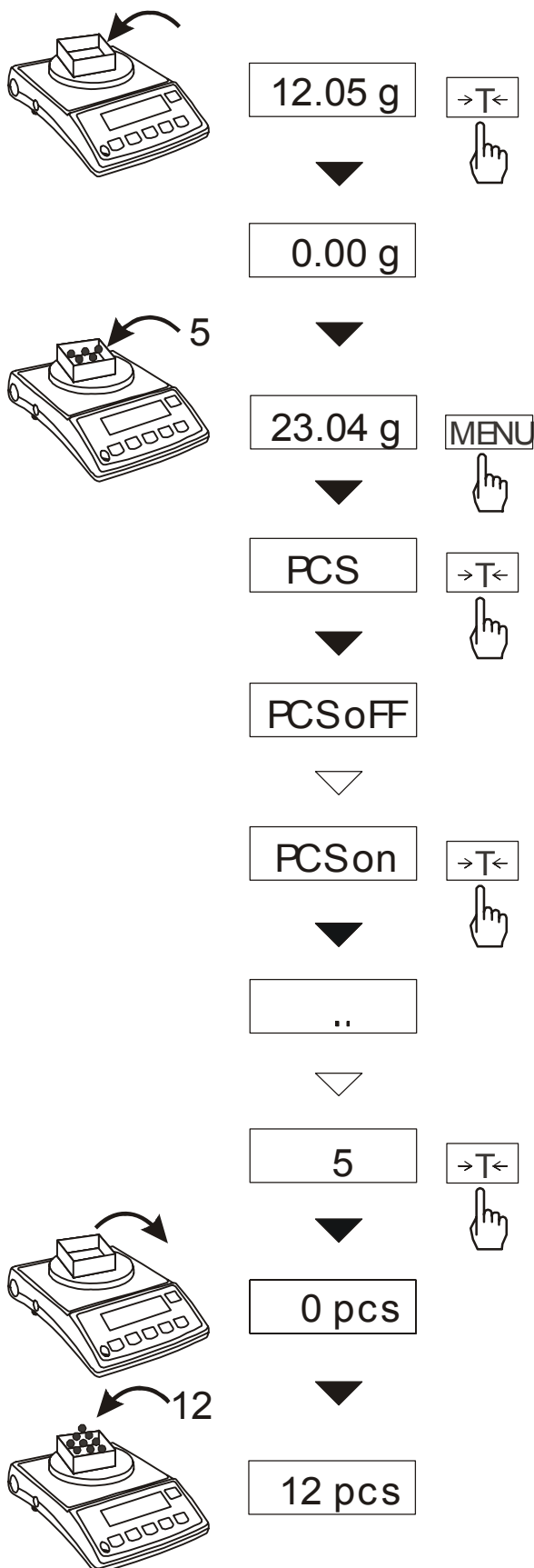
That function allows for counting the identical details, e.g. tablets or buttons, contained in the weighed batch.

The measurement takes place in two phases:

- **first phase** – calculation of single detail weight upon the basis of sample of specified number of pieces 5, 10, 20, 50, 100, 200, or 500 detils,

- **second phase** – counting the details in the weighed batch.

12.05 g →T←

0.00 g

5

23.04 g MENU

PCS →T←

PCSoFF

PCSon →T←

..

5 →T←

0 pcs

12

12 pcs

Functions has the following options:

- PCS OFF – function deactivation,

- PCS on – start preparation of recipes

- PCS ... – use the last written unitary mass.

- PCS 5, 10, 20, 50, ect – number of pieces in a batch

- PCS SEt – write free number of pices in a batch

- PCS MJ – direct write a unitary mass

- out – exit without saving

Notes:
1. It is recommended, that the single detail weight is higher than the balance reading graduation, and the weight of sample, used in the first phase is higher than 100 of reading graduations.

2. Err-PCS massage indicates that pan is empty or when the single detail weight is lower than one reading graduation (user may calculate the pieces, keeping in mind, that it increases the error).

15.3 Weighing unit selection (UnIt)
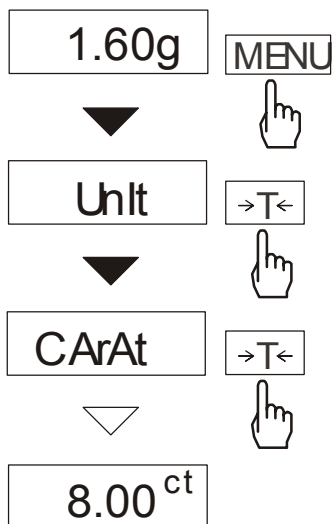
Use this function to choose weighing unit:

- CarAt (1 ct= 0,2 g),
- MGrAM (1mg=0,001g),
- KGrAM (1kg=1000g),
- Pound (1 lb=453,592374g),
- Ounce (1oz=28,349523g),
- OunCEt (1ozt=31,1034763g),
- GrAIn (1gr=0,06479891g)
- PennYW (1dwt=1,55517384g),
- Gram (1g).

The example at the left presents how to set carats as weighing unit.

```
1.60g       MENU
  ▼
UnIt        →T←
  ▼
CArAt       →T←
  ▽
8.00 ct
```

15.4 Percentage weighing (PErCEnt)
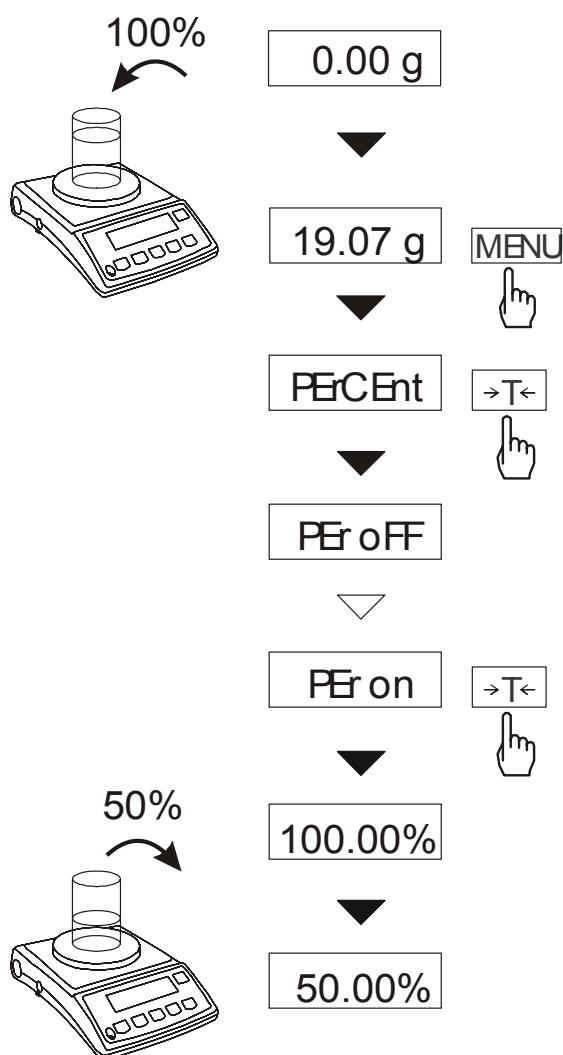
This function enables to display weighing result as a percentage of a reference sample.

A measurement is performed in two phases:

- first phase – weighing a reference sample,

- second phase – measuring specific sample as a percentage of the reference sample.

Weighing result is displayed in different format, depending on the reference sample weight value. For values of 0÷3,5% of weighing range the format is "100.0", for values 3,5÷35% it is "100.00" and 35÷100% - "100.00"
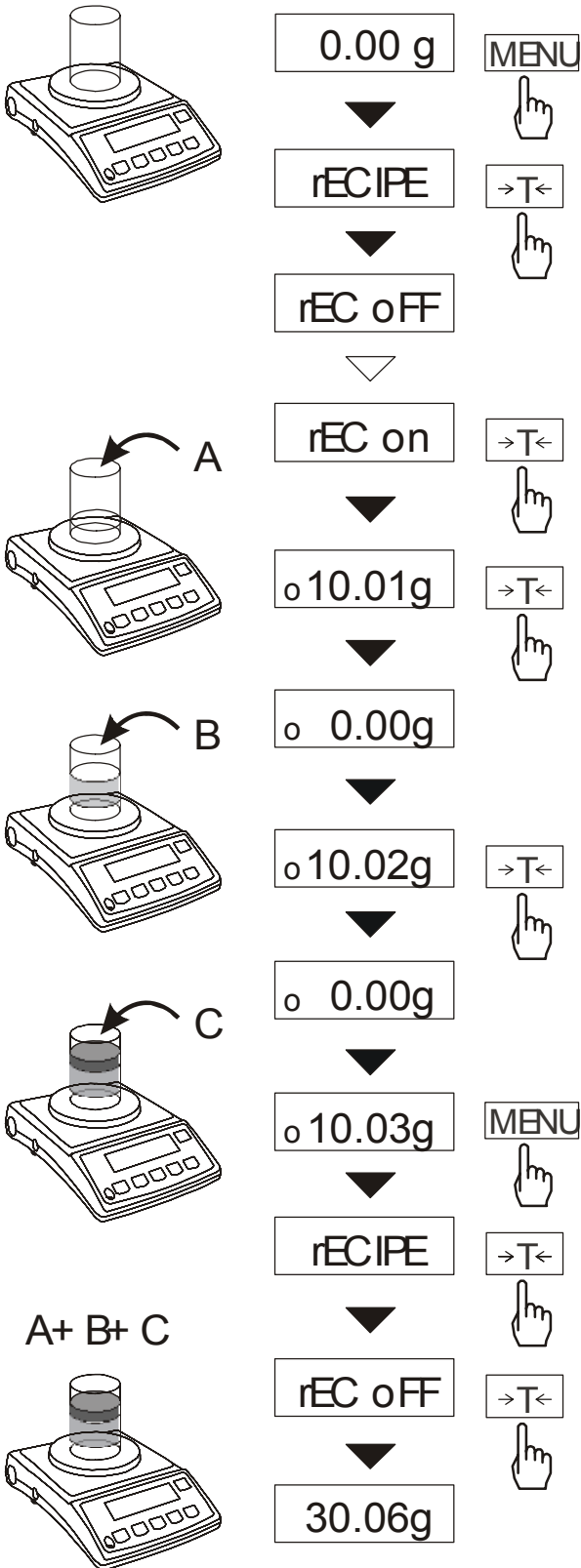
The function has the following options:

- **PEr oFF** – disables the function,

- **PEr on** – stores current indication as 100% and activates percentage weighing,

- **out** – exit without change.

Note:
When the function is activated →T← key function does not change.

```
100%        0.00 g
  ▼
19.07 g     MENU
  ▼
PErCEnt     →T←
  ▼
PEr oFF
  ▽
PEr on      →T←
  ▼
50%         100.00%
  ▼
            50.00%
```

15.5 Weigh summing (rECIPE)

This function enables to weigh few ingredients in one container and to display aggregated sum of all ingredients.

The function has the following options:

-**rEC oFF** – leave the function and display aggregated sum of all ingredients,

-**rEC on** – activate the function,

-**rEC Con** - return to previous series of weighing,

- **out** – exit without change.

Before weighing each ingredient (A, B, C, etc.) remember to tare the balance.

To read aggregated sum of all previously weighed components use MENU key, rECIPE and rEC oFF option.

Note:
When rECIPE function is active, the sign o is displayed at the left of the display.
When rEC oFF option was used, SUM indicator disappears after pressing →T← key.

15.6 Calibration with external weight (CALIb)

Calibration with external weight standard in verified balances should be performed in case balance indications exceed permissible error. To calibrate the balance a service centre should use calibration weight as stated in Technical Data table (or of better accuracy).

Operations sequence:

0.00g	MENU
▼	
CALIbr	→T←
▼	
CAL oFF	
...	
CAL on	→T←
▼	
- CAL -	
▽	
0.00g	
▽	
LOAD	
▽	
m	
▽	
0.00g	
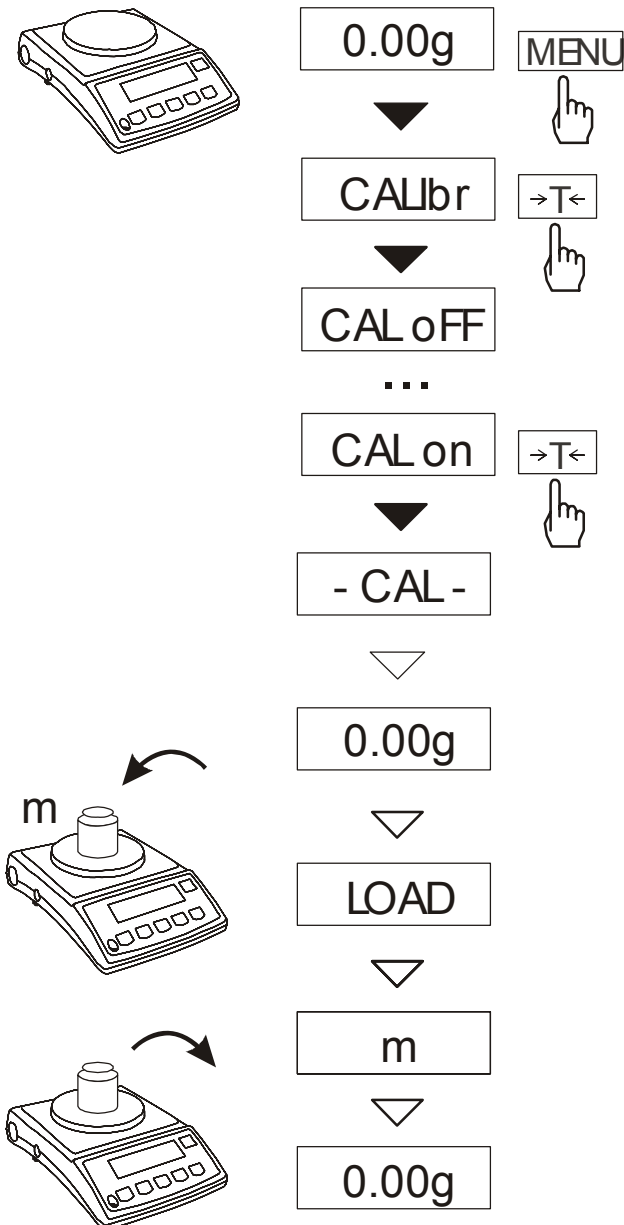
Klawiszem *MENU* wywołać pojawiające się kolejno funkcje użytkownika.

Press *MENU* key to call functions menu and to choose *CALIbr* with →T← key.
Calibration function options:
- *CAL oFF* – turn autocalibration off
- *CAL on* – start calibration with external weight
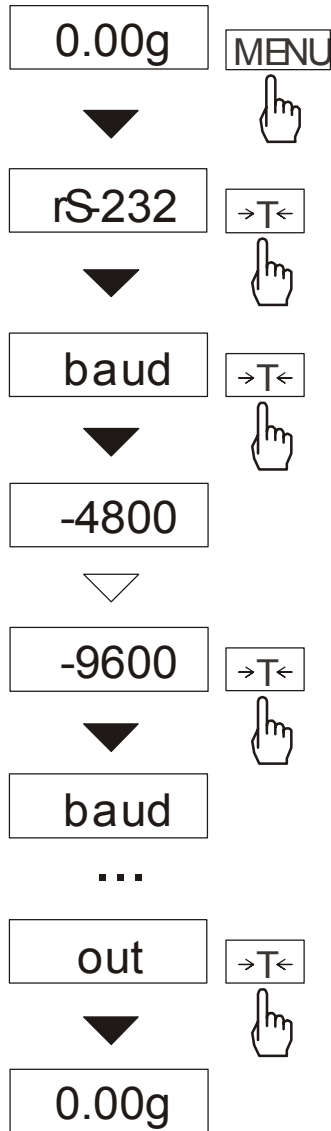- *out* – exit without saving

Press press →T← to choose *CAL on.*

Wait until zeroing is finished.

When *LOAD* communicate put a calibration weight on the pan.

Wait until calibration process is finished and zero indicated.

15.7 Serial port setting (rS-232)

The function enables to set the following transmission parameters:

- *bAud* (*4800, 9600, ..., 115200*) - transmission speed,

- *bitS* (*7, 8*) - the number of bits in a byte,

- *PArItY (0, 1)* - parity control,

- *Odd (0, 1)* – parity control way,

- SendInG - transmission type of result by serial port

  - *Stb* –transmission after used of button and stabilization of result,

  - *Stb* – transmission after used of button ⤷ without result stabilization,

  Stb – automatic transmission after putting load and result stabilization,

- *Cont.* – continuous transmission approx. 10 results per second.

Default parameters are underlined.

In order to set the required parameters activate *rS-232* function, select the proper parameter and press →T← key during displaying of required parameter or option value.

On the adjacent diagram setting of transmission rate of 9600 bps is shown. Setting of others parameters is analogous.

After setting of appropriate parameters and options exit by selecting *out*.

15.8 Charging a battery settings function (bAttErY),
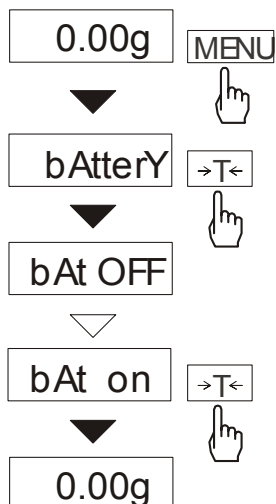
bAttErY function enables to turn on or off charging a batteries and check charging state during working with power supply unit

Functions has the following options:

- **bAt OFF** – charging accumulators is turned off (this option is necessary in case of using non-rechargeable batteries

- **bAt on** – charging accumulators is tunr off. Accumulators are charging after turning off balance by I/⏻ key,

- **bAt VoL** – readout of charging accumulators state in % (return to readout of mass by press *MENU* key)

- **out** – Exit without saving
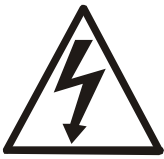
Charging non-rechargeable batteries to test can cause damage of balance.

### 15.9 Display setting function (b_LIGHt)
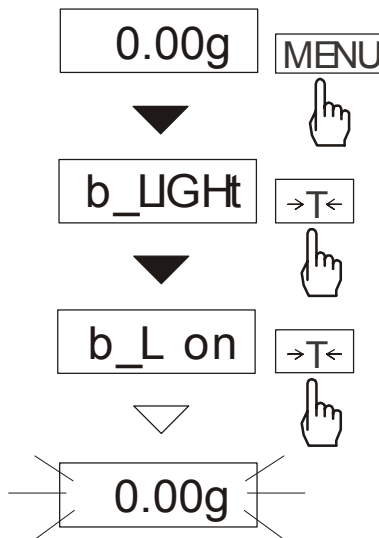
The function is used to choose action method of display bright light

- **b_L OFF** – bright light function deactivation,

- **b_L on** – bright light function activation,

- **b_L ECO** – turn this function after 30 seconds of inactiving

- **b_L bAt** – the same as above but only during supply from accumulators.

- **out** – Exit without saving

Turning bright light function off reduces energy consumption that is essential with power supply from accumulators.

15.10 Automatic turning off balance (Auto OFF)
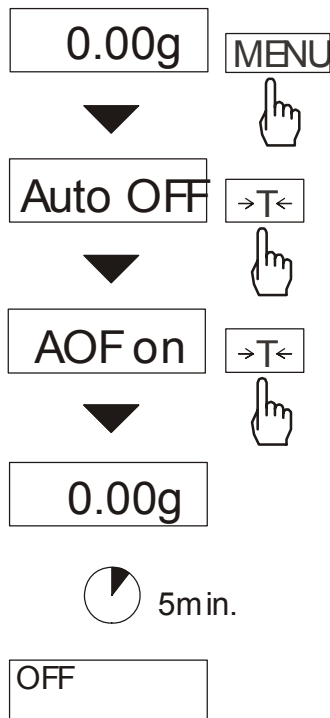
The function turns balance off automatically without any balance activity. It reduces energy consumption and extend working time of balance with power supply from accumulators:

- *AOF OFF* – balance will not turn off automatically

- *AOF on* – turn balance off after 5 minutes of inactiving

- *AOF bAt* – the same as above but only during supply from accumulators.

- *out* – Exit without saving
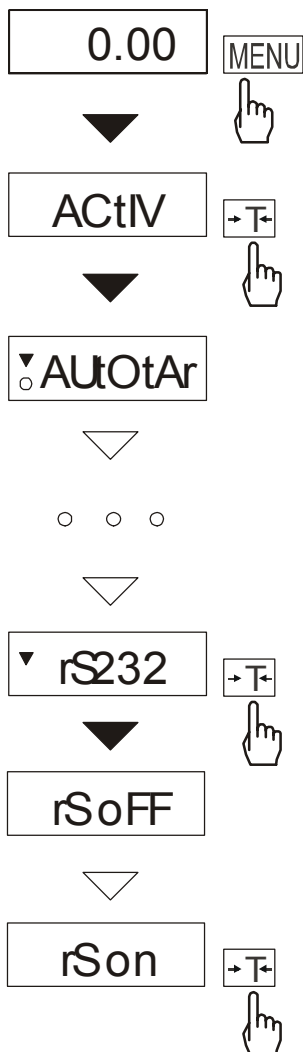
15.11 Reading unit choosing (rESOLUt)
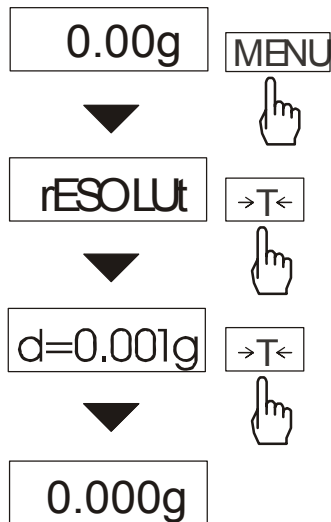
This function enables to choose reading unit value (resolution). The function is only available in BT200 and BT2000.

Available reading units:

- wagi BT200: *d=0,01g* i *d=0,001g*,

- wagi BT2000: *d=0,1g* i *d=0,01g.*

15.12 Function Menu customisation (ACtIV i dEFAULt)

This function enables to select special functions that will be displayed after pressing *MENU* key. Easy access to the most useful functions will shorten operation time and make work more comfortable.

To differ *ActIV* function from the function menu, ▼ indicator is displayed at the left side of the display.

It is possible to return to default setting by special function *dEFAULt*

Operation sequence shown on the picture, presents how to add RS232C parameters setting function (*rS-232)* to the function menu.

To remove a function from the Function Menu choose *rS oFF* in the last operation.

16. Maintenance and repairs of small defects

1. The balance should be kept clean.

2. Take care that no dirt gets between the casing and the pan. If found any, remove the pan (lift it up), remove dirt and then replace the pan.

3. In case of improper operation caused by short-lasting power supply decay, unplug the balance from the mains and then plug it again after few seconds.

4. To calibrate the balance contact nearest service.

5. It is forbidden to make any repairs by unauthorised persons.

6. To repair the balance, please contact our nearest service.

Error communicates:

Communicate	Possible cause	Remedy
C-1...6 (over 1 min.)	selftests failed	if displayed more than 1 minute, contact an authorised service
balance doesn't work	protection rod	remove protection rod and cap
L	pan missing	put the pan on
	mechanical damage	contact an authorised service
H	overloading	remove the load from the pan
	mechanical damage	contact an authorised service
◣ ◢ indicator does not appear	unstable ground vibrations air flows	place the balance on a stable ground not affected by mechanical vibrations and airflows
	balance damage	contact an authorised service
- - - - - -	taring in progress	as above