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Manual
PCE LS 500 / PCE-LS 3000

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1. General description

AG series balances are destined for high accuracy weighing in laboratory practice.
Balances are equipped with internal calibration system for proper accuracy control during operation. The user should also own weight standard of OIML F2 or F1 class for periodical control of the balance (weight value stated in Technical Data sheet) - available for extra fee.
All balances are metrologically tested - calibration or legal verification certificate on demand.

Legal verification is required for balances used in some applications: direct sale, pharmaceutical prescriptions, medical and pharmaceutical analysis, goods packing and others.

Balances with legal verification are mark with the following:
- protective seal placed on the casing mounting screw at the back of the balance,
- calibration switch protective seal,
- notified body stamps and green metrological marking placed on the balance name plate.

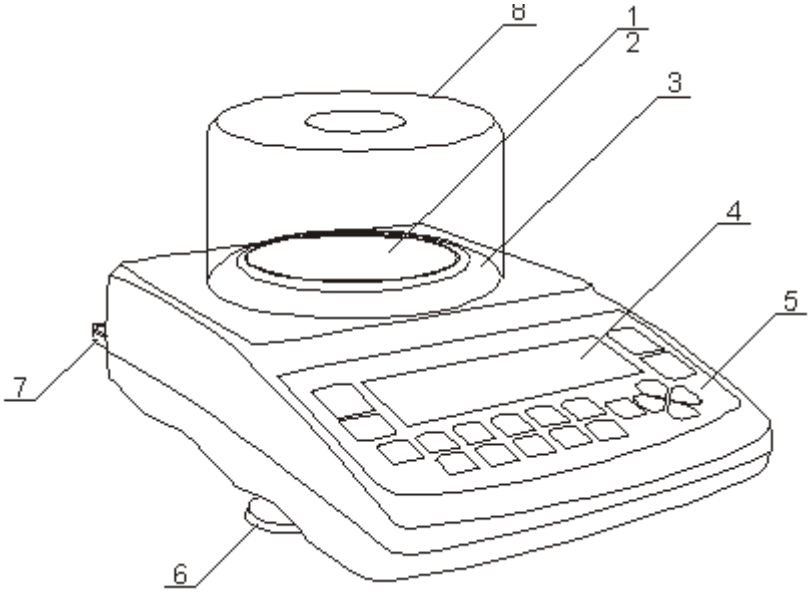
PCE LS series balances are destined for purposes where verification is not required. PCE LS series balances do not have internal calibration system and also all functions connected with it are removed.

2. Completeness

A standard set consist of:
1. Balance
2. Pan elements:
   - AG50-AG600 (round pan): a pan base and a pan,
   - AG1000-AG4000, AG8 (rectangular pan): gum nuts (4pcs) and a pan,
3. Feeder (ZN12V/500mA)
4. User manual
5. Guarantee Card

3. Balance description

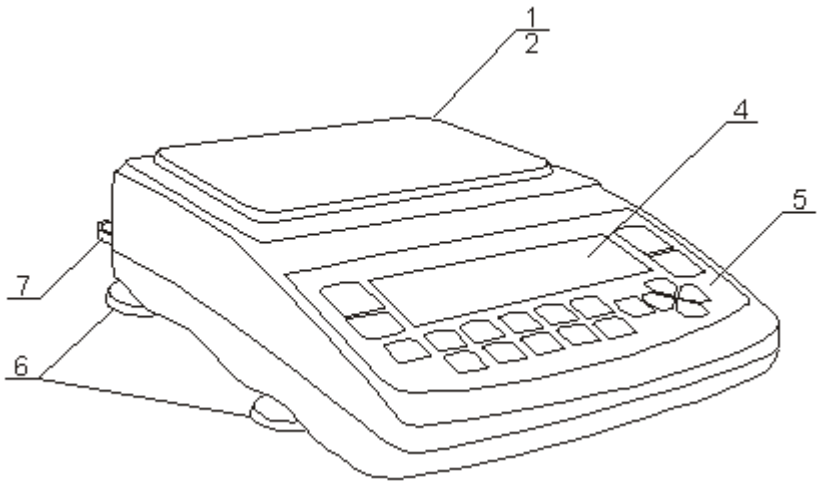
Front view (AG100-AG600)



1 – pan
2 – pan support
3 – pan ring
4 – LCD display
5 – keys
6 – rotating legs
7 – water level
8 – antiblast shield

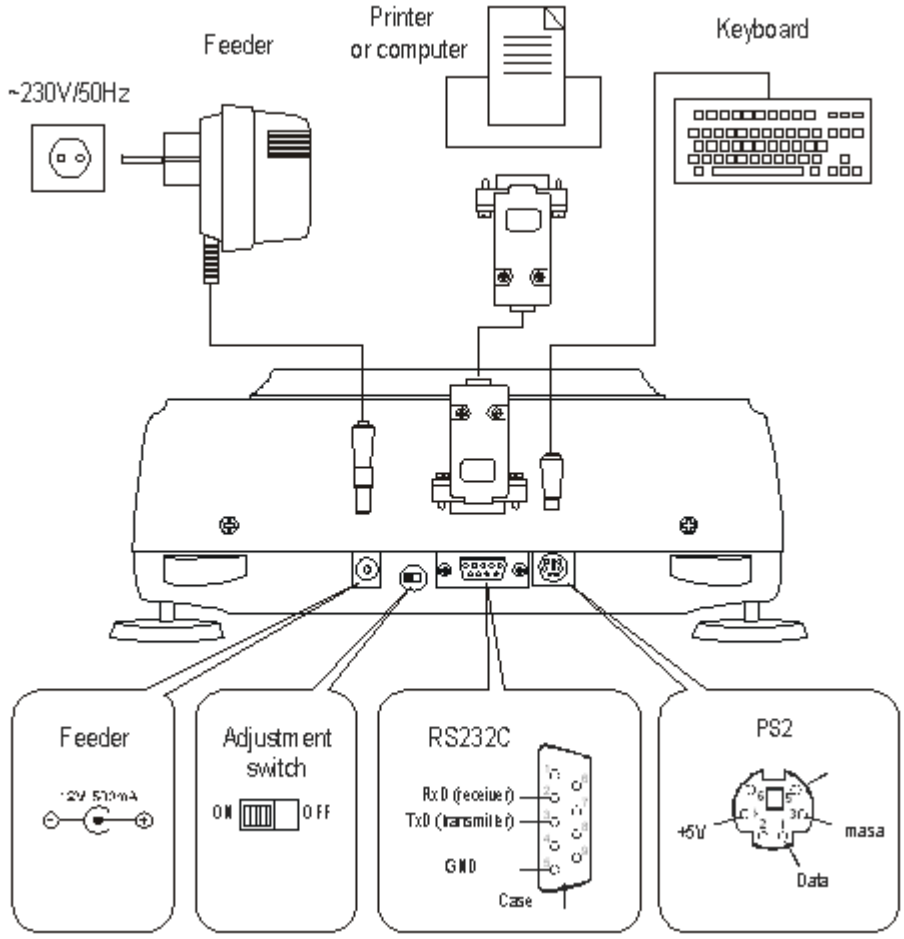
Note:
AG600 does not have the pan ring and the antiblast shield.

Front view (AG1000-AG4000, AG8)

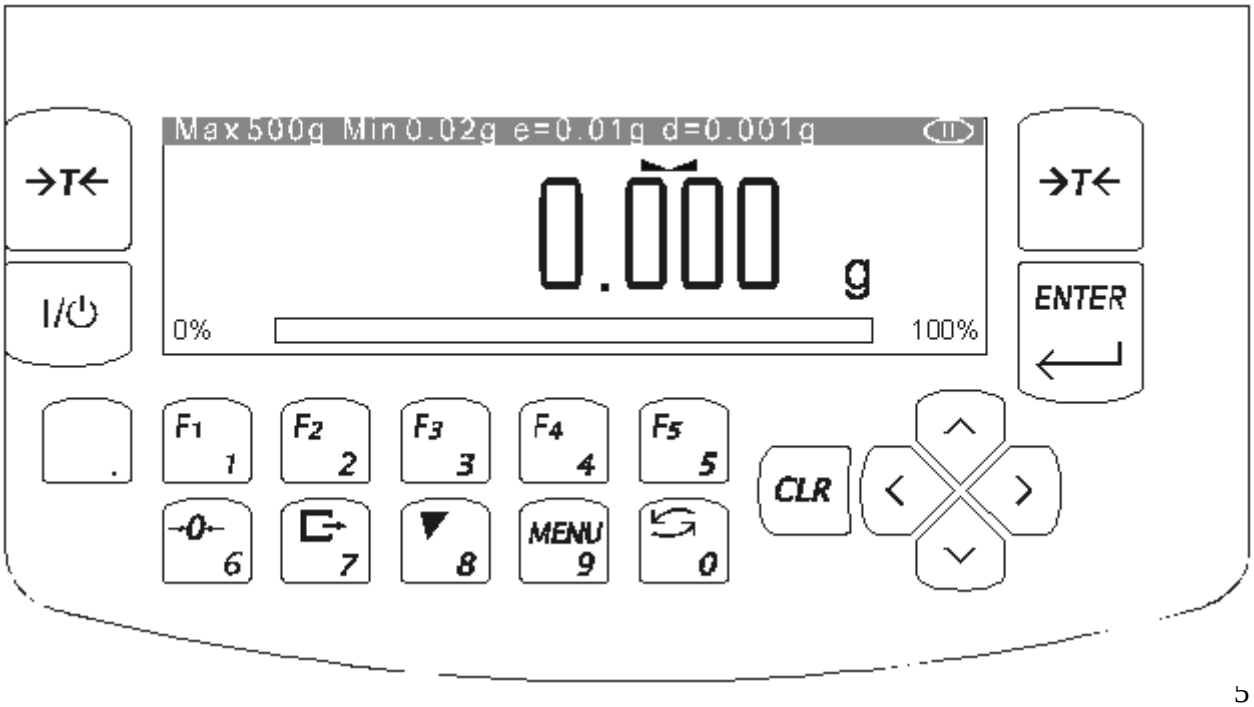


1 – pan
2 – pan supports
4 – LCD display
5 – keys
6 – rotating legs
7 – water level

Rear view:



4.Keys and indicators



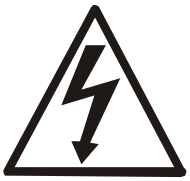
keys	□T□	-	tare (subtract package weight from weighed mass)
key	I/ ⏻	-	switch-off (standby),
key	ENTER	-	confirm
key	.	-	decimal point,
key	1/F1 ... 5/F5	-	numeric / functional keys,
key	6/□0□	-	numeric key / zeroing (balances for direct sale use only),
key	7/	-	numeric key / data output (print / transmission),
key	8/	-	numeric key / internal calibration,
key	9/MENU	-	numeric key / Menu,
key	0/□	-	numeric key / special function,
key	>	-	enter an option,
key	<	-	leave an option,
key	□	-	navigation / move a cursor up,
	□	-	navigation / move a cursor down,
indicator		-	result stabilisation,
indicator	linear	-	tatal load indicator (0-100%),
indicator	OFF	-	stand-by mode,
Max, Min,	d, e, (II)	-	metrologic parameters and accuracy class.

5. Technical data

Type	AG100	AG200	AG300	AG500
Capacity (Max)	100g	200g	300g	500g
Min load (Min)	0,02g	0,02g	0,02g	0,02g
Reading unit (d)	0,001g	0,001g	0,001g	0,001g
Verification unit (e)	0,01g	0,01g	0,01g	0,01g
Tare range	-100g	-200g	-300g	-500g
Accuracy class	II			
Working temperature	+18 ÷ +33°C			
Weighing time	<8s			
Pan dimension	□115mm			
Balance base dim.	215(235)x345x90mm			
Balance weight	5kg			
Power	~230V 50Hz 6VA / =12V 300mA			
Calibration weight (OIML)	100g F2	200g F2	200g F2	500g F1

Type	AG600	AG100	AG200	AG300	AG4000	AG8
Capacity (Max)	600g	1000g	2000g	3000g	4000g	8000g
Min load (Min)	0,5g	0,5g	0,5g	0,5g	0,5g	5g
Reading unit (d)	0,01g	0,01g	0,01g	0,01g	0,01g	0,1g
Verification unit (e)	0,1g	0,1g	0,1g	0,1g	0,1g	1g
Tare range	-600g	-1000g	-2000g	-3000g	-4000g	-8000g
Accuracy class	II					
Working temperature	+18 ÷ +33°C					
Weighing time	<5s					
Pan dimension	□150mm	165x165mm				
Balance base dim.	215(235)x345x90mm					
Balance weight	5kg					
Power	~230V 50Hz 6VA / =12V 300mA					
Calibration weight (OIML)	500g F2	1000g F2	2000g F2			5000g F2

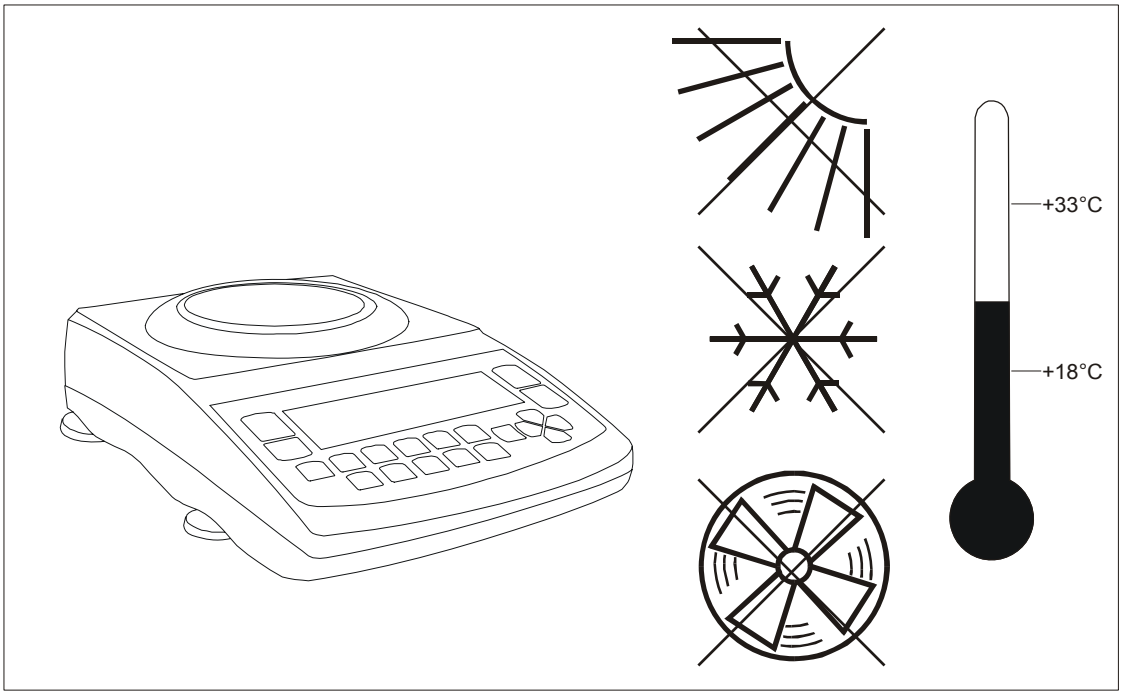
6. Security rules

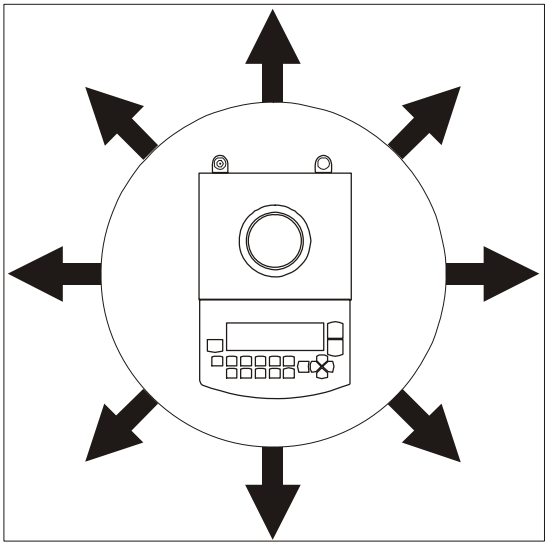


To avoid electrical shock or damage of the balance or connected peripheral devices, it is necessary to follow the security rules below.

- 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.

7. Preparations – working environment



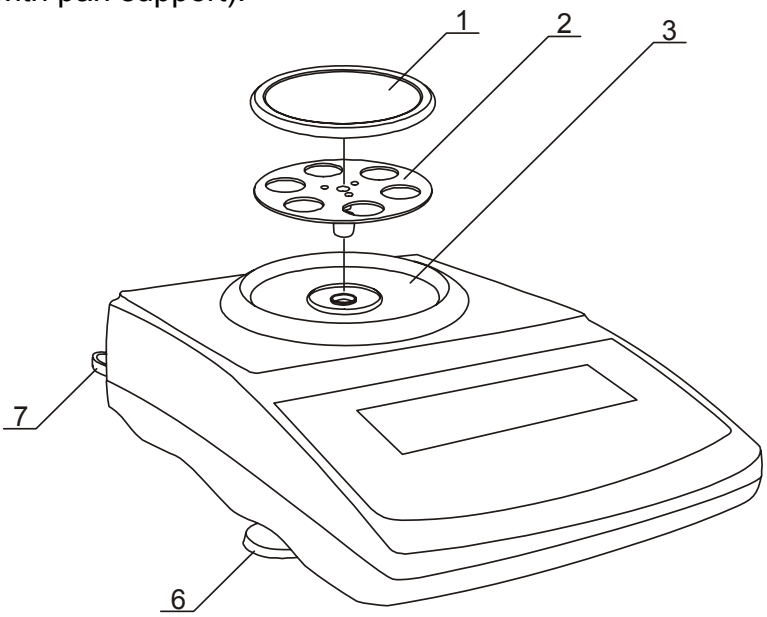


When choosing a location to set up the balance, remember the following rules to ensure proper working conditions and user-friendly operating:

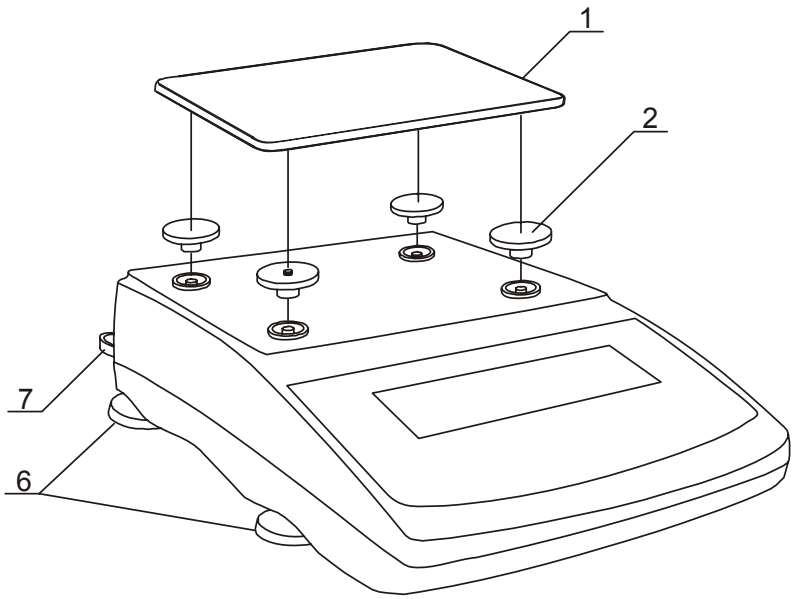
- setup the balance on an even, flat surface leaving neccesary room for easy acces,
- maintain proper working temperature,
- avoid strong air drafts, vibrations, dust, big temperature changes and humidity over 90%,
- avoid locations with extreme heat radiation and electromagnetic or magnetic fields.

8. Preparations – the balance

1. Take the balance and supplied accessories (a feeder, pan elements) out of the box.
2. Place the balance on a stable ground not affected by mechanical vibrations and airflows.
3. Level the balance with rotating rear legs 6 so that the air bubble in water-level 7 at the back of the balance is in the middle.
4. (for AG100-AG600) Gently insert the mandrel of pan support 2 into pan socket through the pan ring 3. Put the decorative pan 1 on (AG600 balances have decorative pan joined with pan support).



5. (for AG1000-AG8) Place supports 2 on mandrels visible in balance cover hole put pan 1 on supports.



6. Plug a feeder to the power socket at the back of the balance.

Moisture in the air may condense on the surface of the balance when transferred to the warmer environment. In this case leave the balance for at least 4 hours unplugged from the mains for conditioning to avoid wrong operating or damage of the balance.

Leave the pan empty and plug the feeder to the mains. At the end of self-tests, the balance displays zero indication and is now ready to work.

9. Operation principles

1. To ensure proper weighing accuracy the balance is equipped with internal calibration system. The system automatically calibrates the balance every 2 hours and with temperature changes (more than 1°C) without user ingerence. Nevertheless, it is advised to check balance accuracy with weight standard (or other object with known weight) before and after each series of measurements.
2. Weighed sample should be placed in the centre of the pan.
3. In direct sale use (d=e), make sure that zero indicator is displayed. If not, press *0* key and wait until zero indication and zero indicator appears. In other balances the key does not operate.
4. The balance is equipped with a tare equal to its range. To tare the balance press →*T*← key. Storing a tare value does not extend measuring range, but only subtracts it from a load placed on a pan. To make weight control easier and to avoid range overdrawing, the balance is equipped with a load indicator (graduated in percentages).
5. Weighing result should be read when the indicator "◣◢" lights, which signalises stabilisation of a result.
6. When the balance is not used but it is necessary to be ready to work immediately, it can be switched off by pressing I/⏻ key. The balance reading system is then switched off to "standby" mode (signalled by the indicator "OFF"). To switch the balance on press I/⏻ key. The balance is immediately ready to operate maximum accuracy (after self tests).

7. The mechanism of the balance is a precise device, sensitive to mechanical strokes and shocks.

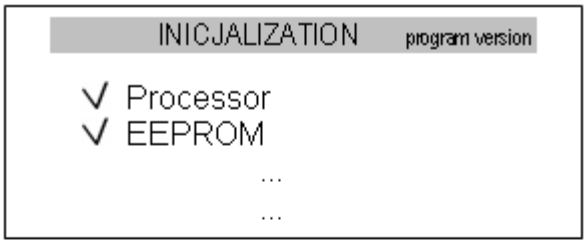
   Before transportation take off the pan (move it slightly and lift it up) and the pan base and preserve from any damages.

   Do not overload the balance more then 20% of maximum load (Max).

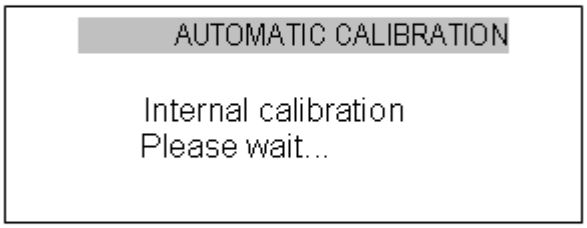
   Do not press a pan with a hand.

8. The balance should not be used to weigh ferromagnetic materials due to accuracy decrease.
9. When the balance is moved to another localisation remember to level the balance and proceed with internal calibration.

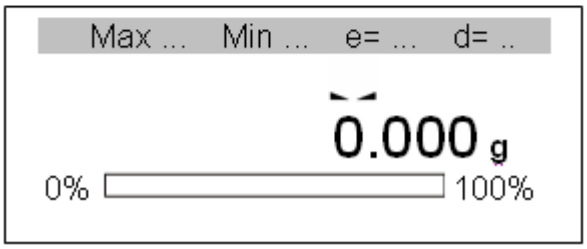
10. Start-up



After switching-on, the balance performs automatic self-test. Each test must be accepted and confirmed with √ mark.



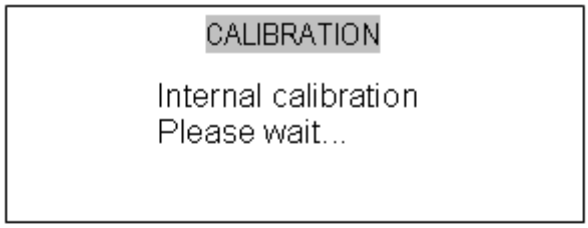
After self-test the balance proceeds with internal calibration mode as described in chapter 11.



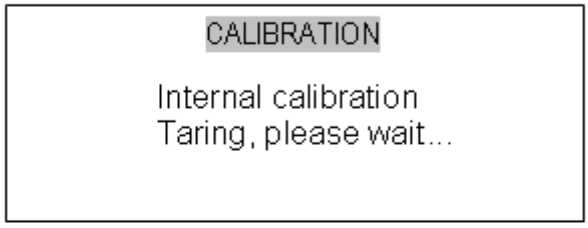
When internal calibration is finished, the balance is in normal weighing mode.

11. Internal calibration

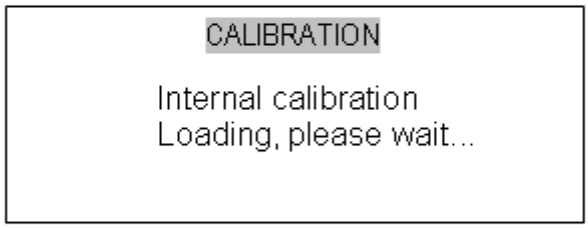
Internal calibration is performed automatically after each start-up, also every 2 hours and with temperature changes more than 1°C.
To calibrate the balance with internal weight, simply empty the pan and press ▼ key twice.

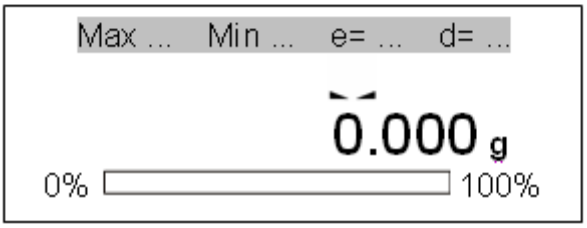


Press ▼ key twice.



Until calibration process is finished do not perform any operation, as any vibrations and shocks may affect the process of calibration and delay the calibration or deteriorate the result.





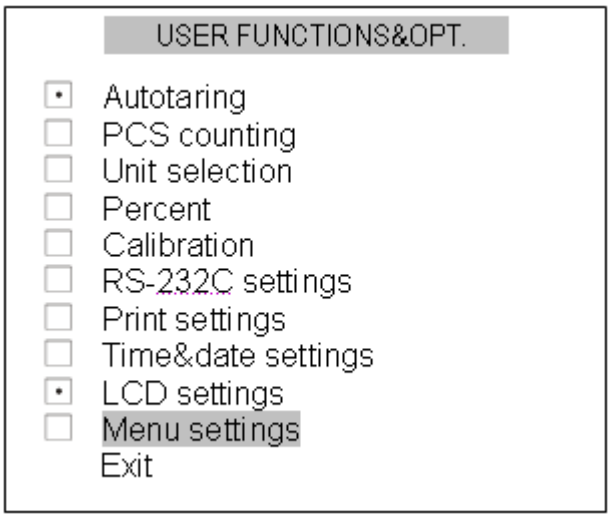
The calibration weight is placed on the pan three times to avoid inaccurate calibration result. In case any problems during calibration, the error is signalised on the display and calibration process is stopped. The result of correct calibration is zero indication.

In case internal calibration does not ensure proper accuracy of the balance (e.g. results of weighing object of known weight are wrong), please contact the nearest service centre.

12. User functions menu

All balances, beside basic functions like weighing and tare, are equipped with additional functions. Basic set of special functions is shown below. In respect of metrology calibration with external weight is important special function.

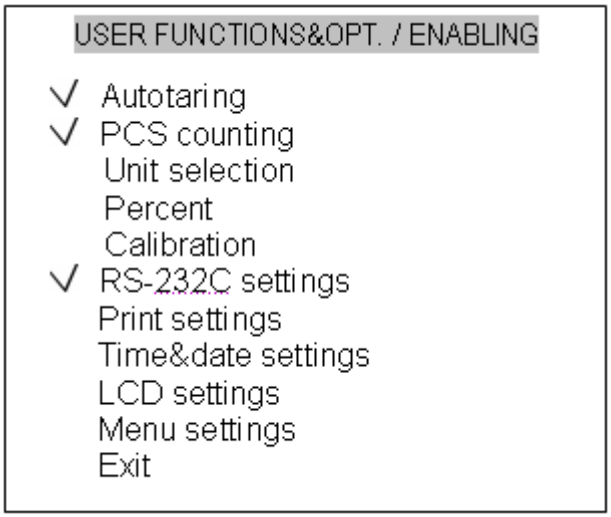
Other functions: recipe ingredients summing, density calculation etc. can be enabled as an option on customer request (described in additional brochure when ordered).



To enter the user menu press *Menu* key. The cursor (dark background) is placed at the top.
To move the cursor, use the navigation keys: ▼ and ▲.

☑ - function activated
☐ - function deactivated
To enter chosen function and open the menu of the function press *ENTER* key.

To return to the previous window press < key. To leave the user menu and return to weighing mode choose *Exit* option.

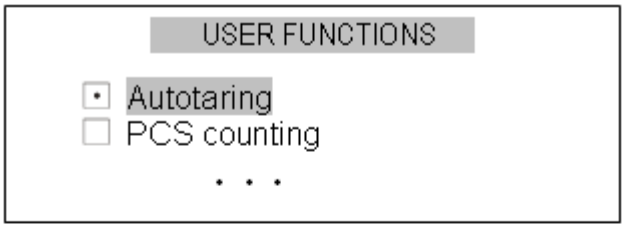


Easy access to the most useful functions will shorten operation time and make work more comfortable. To remove a function from the function menu, use *Menu settings* option.
Select function by cursor and press *ENTER* key. Chosen functions should be signified with √ mark.

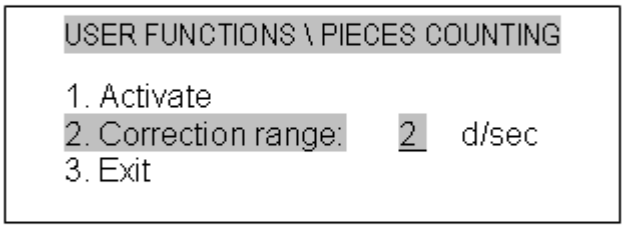
To quickly go from functions menu to Menu settings press . key.

12.1 Autotaring

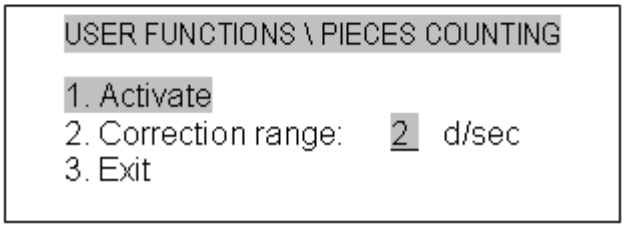
This function automatically keeps zero indication when a pan is empty or zero indication was forced with →*T*← key.



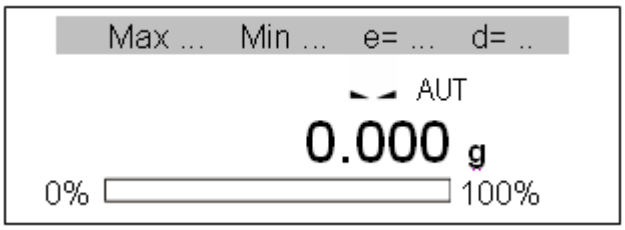
Press *Menu* key to enter the user function menu, choose *Autotaring* and press *ENTER* key.



Choose *Correction range* using ∨ and ∧ keys and press *ENTER* key.
Enter maximum zero flow to be automatically corrected (choose between 0.5 ÷ 5 verification unit(s) per second).



Choose *Activate* option and press *ENTER.*

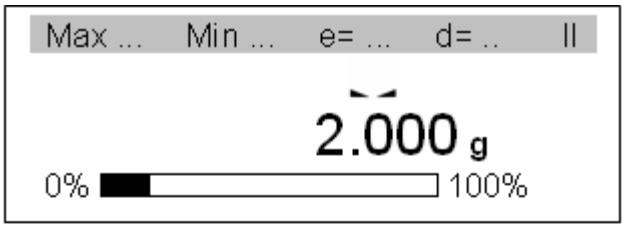


Any changes off the zero readout that are equal to a defined fraction of digits per second are automatically tared, independently of changing environment conditions (temperature, humidity, etc.).

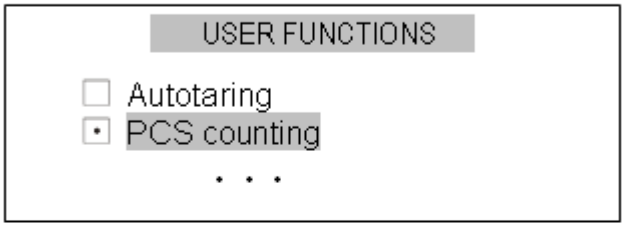
To leave the function press *Menu* key, choose *Autotaring* function and then choose *Deactivate* option.

12.2 Pieces counting function

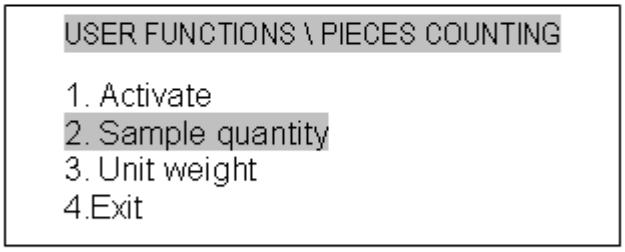
1. Counting with a reference sample



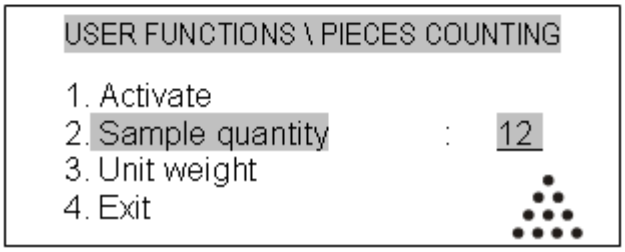
Place a reference sample with known number of pieces on the pan.



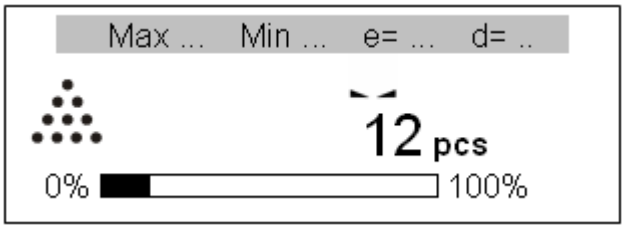
Press *Menu* key to enter the user function menu, choose *Counting* with the cursor and press *ENTER* key.



Chose *Pieces quantity* option and press *ENTER* key.



Using numeric keys enter the quantity of the sample and press *ENTER* key.

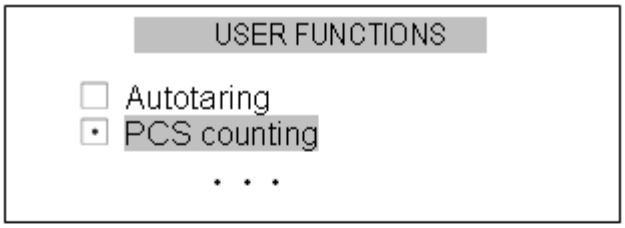


The balance calculates unit weight basing on given number of pieces and reference sample weight and then shows number of pieces on the display.

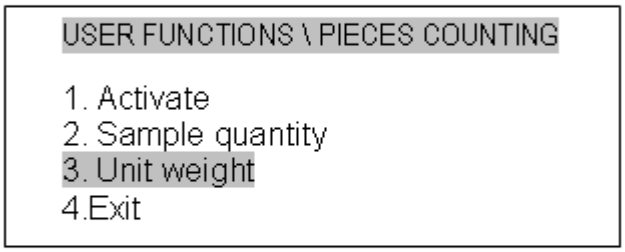
Reference sample parameters may be used in series of weighing. To recall previously used sample parameters start Counting function with *Activate* option.
To leave the function press *Menu* key, choose *Counting* function and then choose *Deactivate* option.

Note:
To switch between weighing mode and pieces counting mode press ⇄ key.

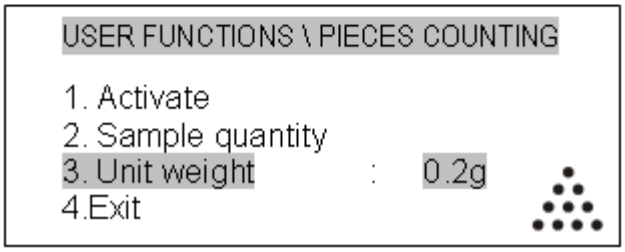
2.Counting with unit weight.



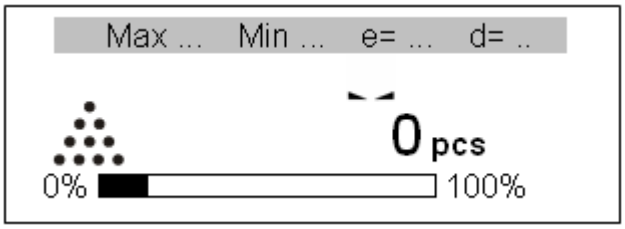
Press *Menu* key to enter the user function menu, chose *Counting* and press *ENTER* key.



Chose *Unit weight* option and press *ENTER* key



Enter unit weight value using numeric keys and press *ENTER* to accept. The unit weigh value is stored in balance memory until switched off.



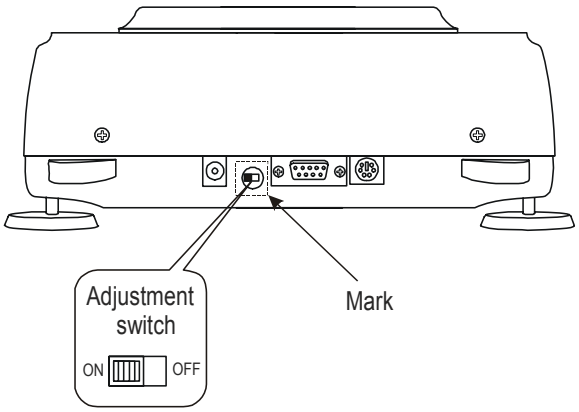
The balance displays pieces amount.

Note: *To correct wrong digits when entering unit weight, press < key to delete the last number or CLR to leave the function and proceed from the beginning.*

12.3 External calibration / calibration options

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) with valid calibration certificate.

Calibration of EC verified balance requires to destroy a mark for protecting an access to adjustment switch and results in loosing its EC verification. To renew EC verification of a balance, contact with service or notified body is necessary.



In EC verified balances executing a calibration requires to change adjustment switch position, which is placed behind the mark (sticker) of a notified body. An access to the switch is possible only after the mark is removed, which causes loosing EC verification of the scale. To renew EC verification of a balance, contact with service or notified body is necessary.

In order to store results of calibration with external weight it is possible to print calibration report (see Calibration options). For this purpose a printer or a computer with testing program is necessary.
The report printout example

Date : ... Time: ...

Calibration report

Date of production: ...

Serial number: ...

Program version: ...

Adjustment no.: ...

Factory external weight:
...

Factory internal weight:
...

Current external weight:
...

Current internal weight:
...

Weight difference: ...

- external weight value registered during factory calibration

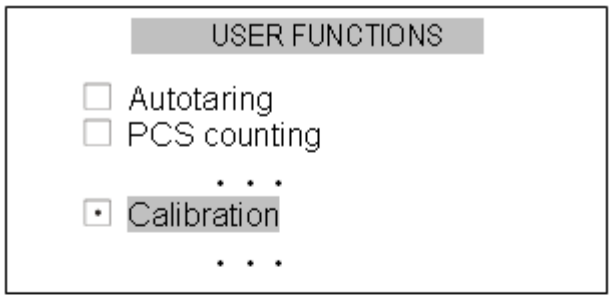
- internal weight value registered during factory calibration

- external weight value registered during last calibration

- internal weight value registered during last external calibration

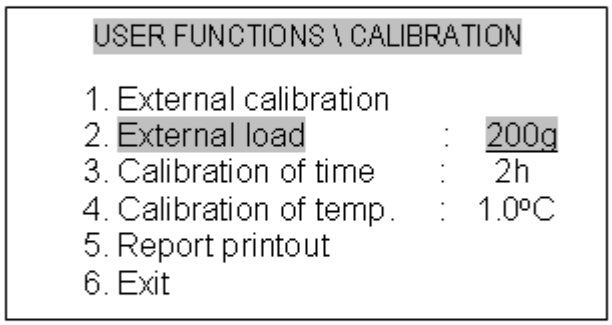
- difference between internal weight values: factory value–current value

Calibration options:

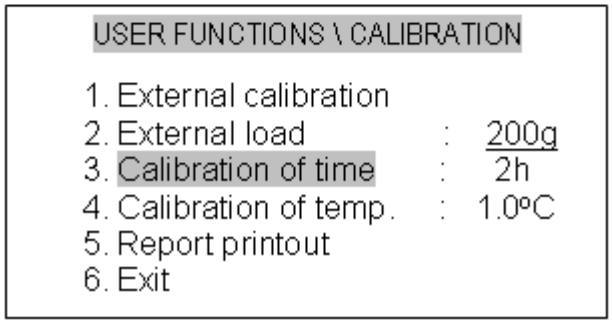


If an access to adjustment switch is not protected with the mark, with a thin screwdriver set adjustment switch to ON position (balance displays the message *Calibration switch ON* and makes a sound).

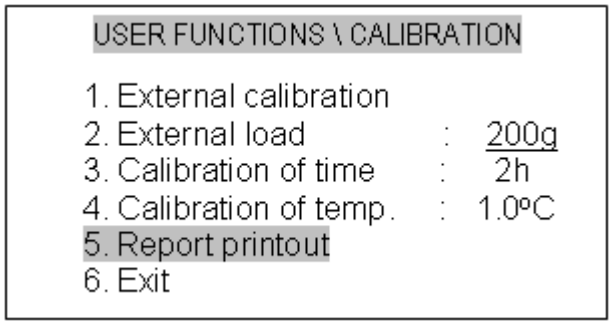
Press MENU key choose *Calibration* option and press ENTER.



Option *External weight* enables to enter the value of used calibration weight. Choose *External weight* option, press ENTER and use > and < keys to select desired value. It is advised to use as great weight value as possible.

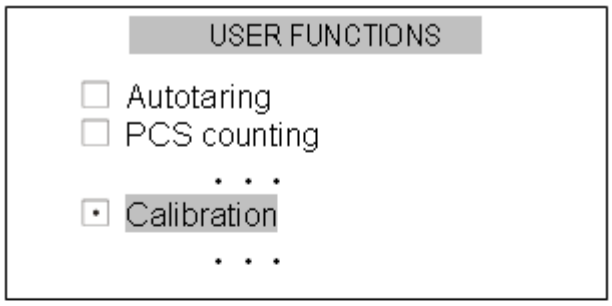


Calibration of time and *Calibration of temperature* option is related with internal calibration.

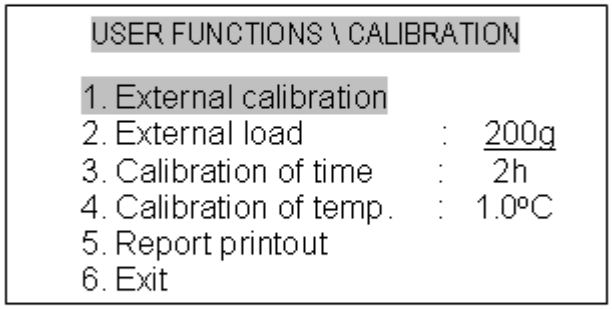


To print a calibration report, connect a printer and use *Report printout* option. Calibration report is a proof of correct calibration process and may be useful for balance diagnostics.

Calibration sequence:

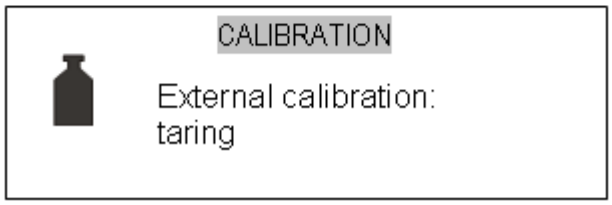


Press *Menu* key, choose *Calibration* option and press *ENTER to accept* (calibration must be enabled).

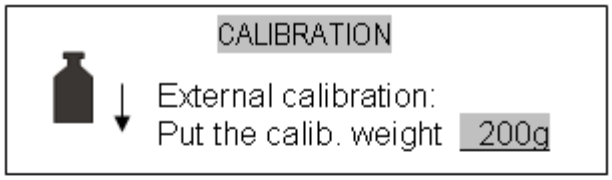


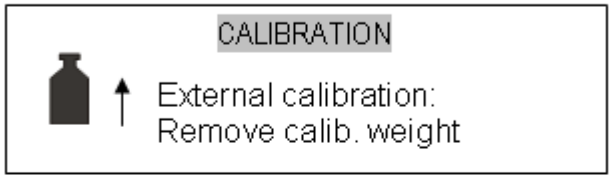
Check if *External weight* value is equal to external weight value used for calibration. If not, choose *External weight* option and enter correct value.

Choose *External calibration* option and press *ENTER* to accept.

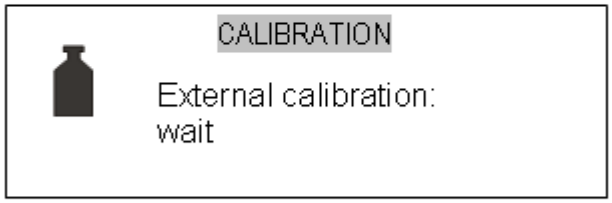


Wait until taring process is finished and load the pan with the calibration weight of correct value.

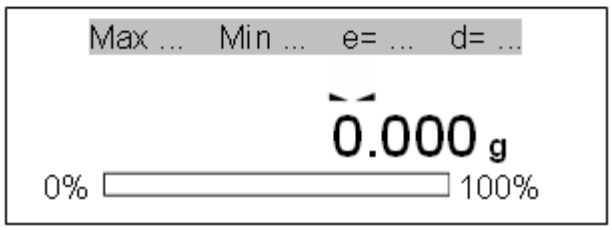




Take off the calibration weight.



Wait until external calibration is finished.

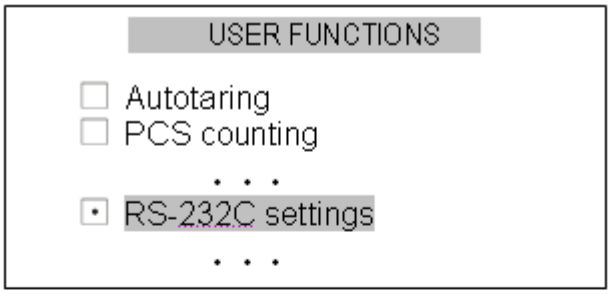


After external calibration the balance switches to the weighing mode.

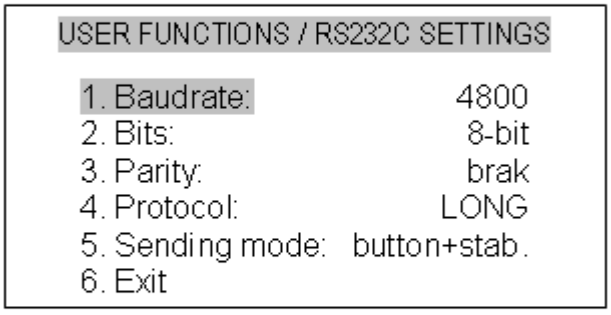
12.4 RS-232C interface setting

To enable cooperation with a printer (or a computer), transmission parameters must be equal in both devices.
This function enables the following transmission parameters:

- send and receive speed (1 200 ÷ 115 200bps),
- number of bits (7 or 8 Bytes),
- parity control (none, even, odd),
- protocole type (default protocole - LONG),
- transmission mode (after ⮆ / *PRINT* key pressing with stable indication, directly after ⮆ / *PRINT* key pressing without stable indication, automatically after stabilisation of each weighing result, continuous transmission in 0,1s periods).

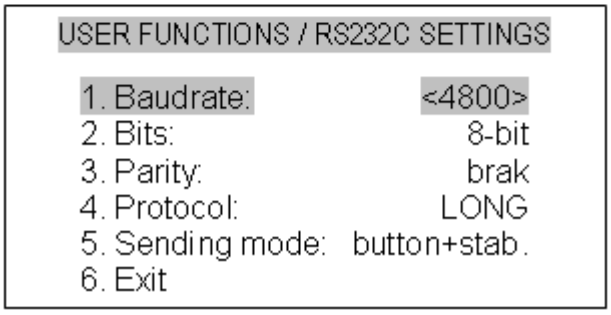


Press *MENU* key to enter the user function menu, choose RS*232C settings* and press *ENTER* key.



Check if balance RS232C interface transmission parameters are compliant with connected external device parameters.

To enter correct parameters values select desired parameter using ∨ and ∧ keys and press *ENTER* key.



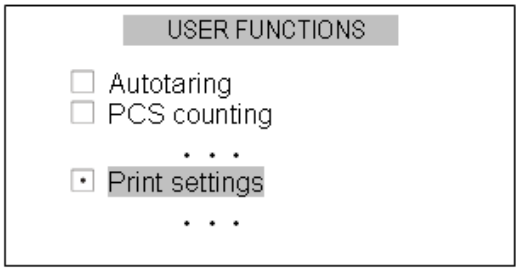
Set correct parameter value using < and > keys and press *ENTER* to accept.

To leave the function press MENU key or use *Exit* option.

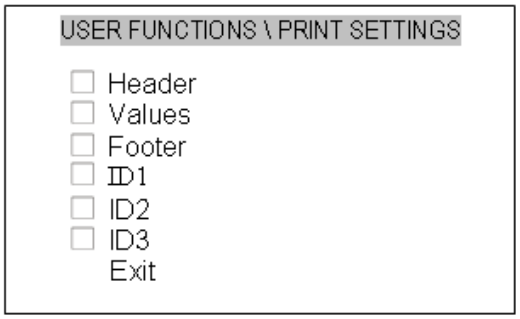
12.5 Print-out settings

This function enables to select desired information, which will be used on print-outs:

- numeration of succesive measurements,
- date and time of each measurement,
- custom information (optional) – additional text entered with a computer keyboard.



Press *MENU* key to enter the user function menu, choose *Print settings* and press *ENTER* key.



Select desired parameter using ∨ and ∧ keys and press *ENTER* key to change setting.

Header - the entrance to the printout header definition menu; the checkbox sign indicates if at least one option in the header definition menu is marked.

Header definition menu

Relevant element is marked/unmarked if *ENTER* key is pressed. The marked element will appear in a printout header if the *Header* element in values definition menu is marked.

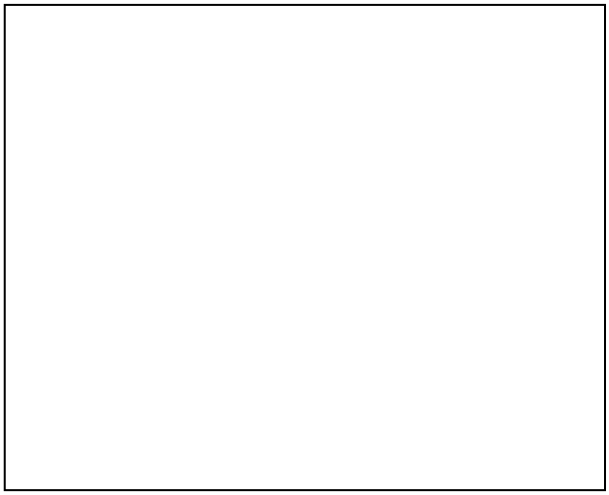
An example of a full printout header:

	← blank line
---------- WEIGHING ----------	← mode name
Date : 2000-04-25 Time : 22:32	← date and time
Scale type : AGNZ200	← balance type
Serial number : 123456	← serial number
ID1 string	← ID1
ID2 string	← ID2
ID3 string	← ID3

Signature	← signature

Values - the entrance to printout values definition menu; the checkbox sign indicates if at least one option in values definition menu is marked.

Values definition menu



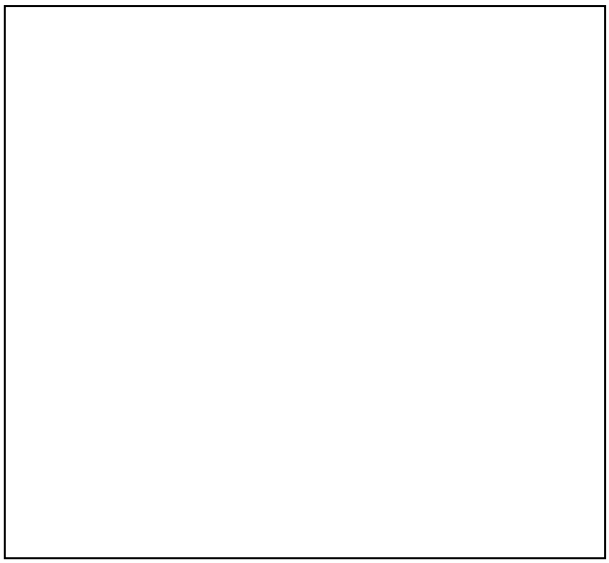
Relevant element is marked/unmarked if *ENTER* key is pressed. The values *Tare*, *Net* and *Gross* are always expressed in grams. The value *LCD result* always indicates display state with an active unit.

An example of a full printout header (without header):

	← blank line
ID1 string	← ID1
ID2 string	← ID2
ID3 string	← ID3
Measurement number : 1	← measurement number
T 0.0000 g	← tare
N 66.7425 g	← net
B 66.7425 g	← gross
LCD 333.7125 ct	← LCD result

Footer - the entrance to the printout footer definition menu; the checkbox sign indicates if at least one option in footer definition menu is marked.

Footer definition menu



Relevant element is marked/unmarked if *ENTER* key is pressed.

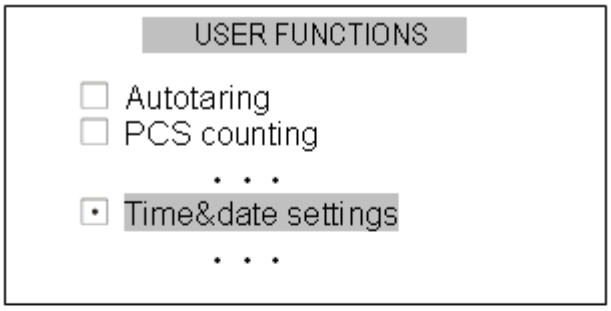
An example of a full printout footer :

	← blank line
---------- PCS COUNTING ----------	← mode name
Date : 2000-04-25 Time : 23:05	← date and time
Scale type : AGNZ200	← balance type
Serial number : 123456	← serial number
ID1 string	← ID1
ID2 string	← ID2
ID3 string	← ID3
Signature	← signature
.....	
----------	← separating line
	← 3 empty lines

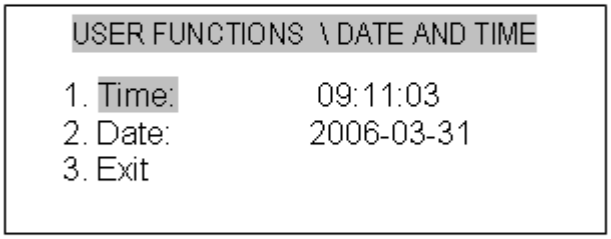
ID1, ID2, ID2 - strings (max. 20 characters) defined by PS2 keyboard or by a scale numeric keypad, which works similarly to mobile keyboard (characters coupled with relevant key appear in a display first line after the key is pressed); inscribed string is approved with ENTER key.

12.6 Date and time setting

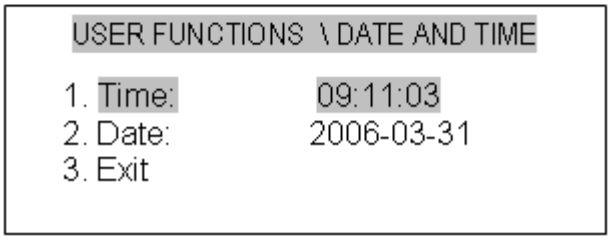
Use this function to set current date and time, used in print-outs:



Press *MENU* key to enter the user function menu, choose *Time&date settings* and press *ENTER* key.



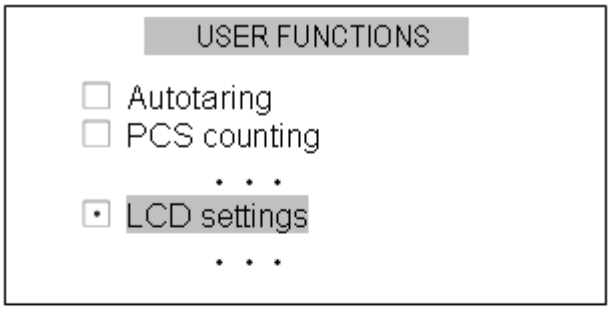
Select desired parameter using ∨ and ∧ keys and press *ENTER*.



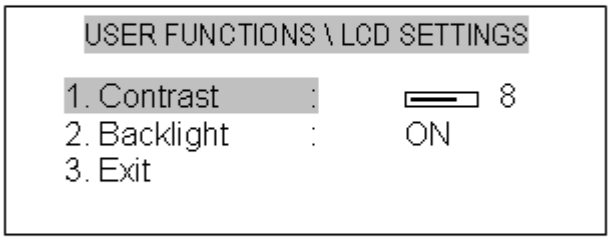
Enter correct values using numeric keys and press *ENTER* to accept.

12.6 LCD settings

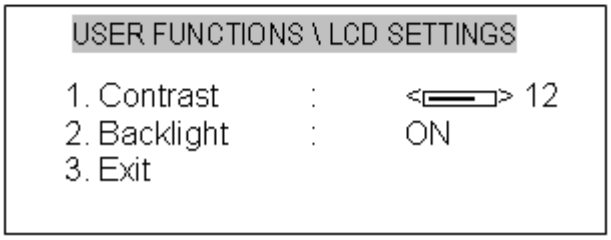
This function enables to set contrast and back-light illumination of the LCD display:



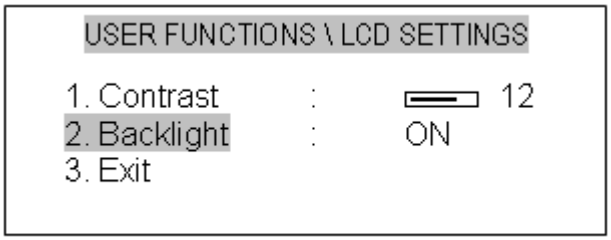
Press *MENU* key to enter the user function menu, choose *LCD settings* and press *ENTER* key.



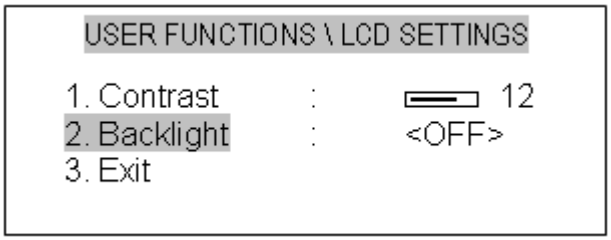
Choose *Contrast* option using ∨ and ∧ keys and press *ENTER* to key.



Select desired Contrast value using < and > keys and press *ENTER* accept.



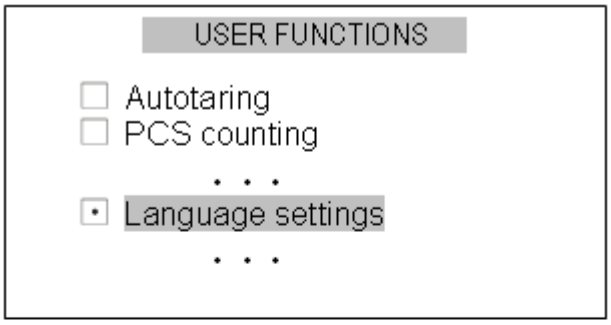
Choose *Backlight* option using ∨ and ∧ keys and press *ENTER* key.



Turn LCD *Backlight* on or off and press *ENTER* to accept.

12.8 Language setting (option)

This function enables to select a language used for displayed commends and printouts:

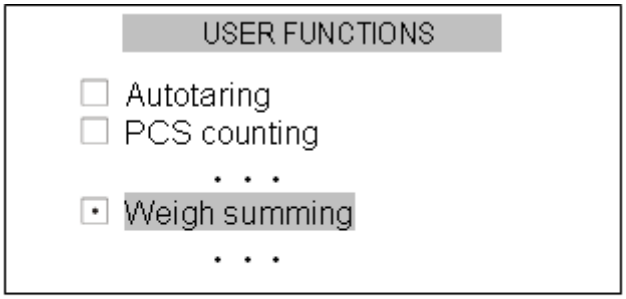


Press *MENU* key to enter the user function menu, choose *Language settings* and press *ENTER* key.

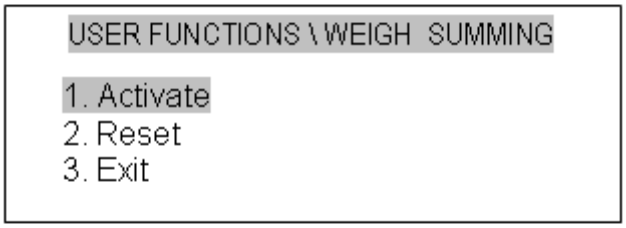
Select desired language using ∧ and ∨ keys and press *ENTER* key to accept

12.9 Weigh summing (option)

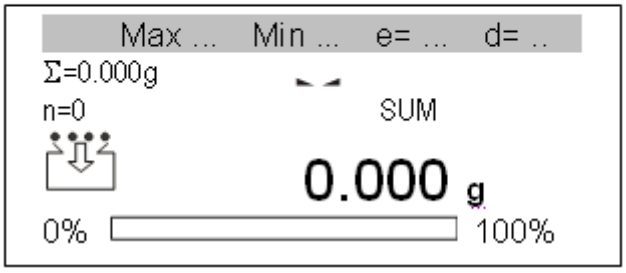
This function allows separate weighing of several ingredients in one container with a possibility to control aggregated sum of all weighed components.



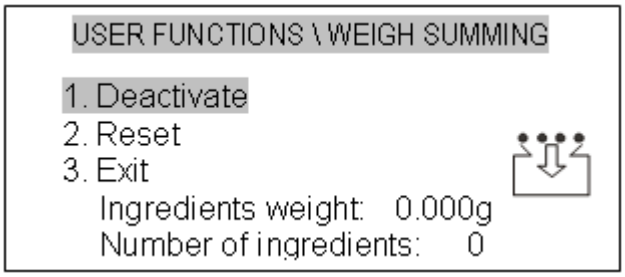
Press Menu key, choose *Weighs summing* and press *ENTER* to accept.



Chose *Activate* option using ∨ and ∧ keys and press *ENTER.*



The balance is now ready for successive ingredients weighing.
Before weighing each ingredient press →*T*← key to zero the indication.
During series weighing total weight (Σ) and number of series (n) are shown at the left of the display.

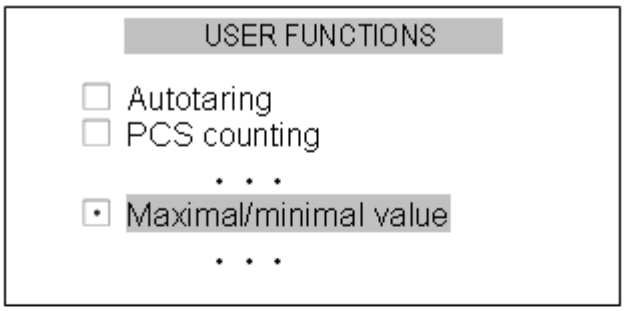


For instant return to weighing mode and display total weight of all ingredients press ↻ key. To return to series summation press the key again.

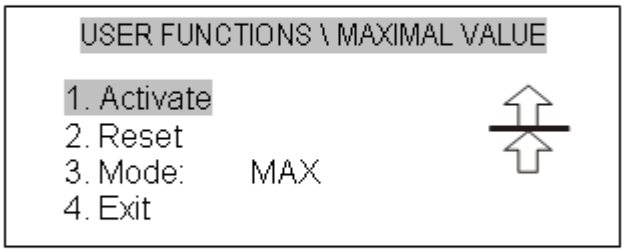
To leave the function press *Menu* key, chose *Weigh summing* function and then chose *Deactivate* option.

12.10 Maximal /minimal value (option)

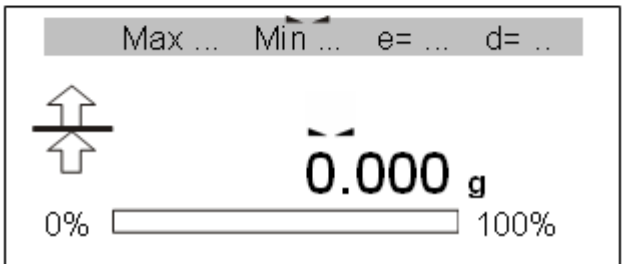
This function enables to display a maximal or minimal value of series of weighing.



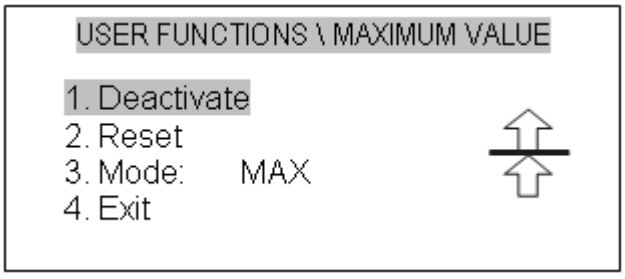
Press Menu key, choose *Maximal/minimal value* and press *ENTER* to accept.



Choose *Activate* option using ∨ and ∧ keys and press *ENTER.*



The function is now active – the balance displays only maximum value from successive series of weighing (starting from the function activation or using *Reset* option).



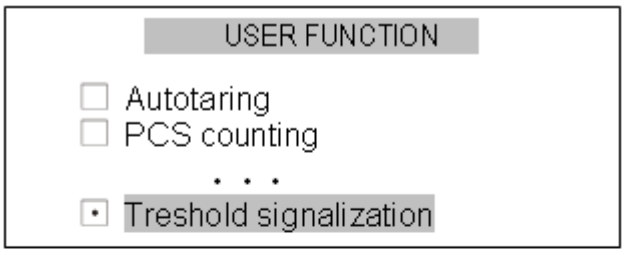
To display weigh value of a current sample press ⟲ key. To return to Maximum value function press the key again.

To leave the function press *MENU* key, choose *Maximal/minimal value* function and then chose *Deactivate* option.

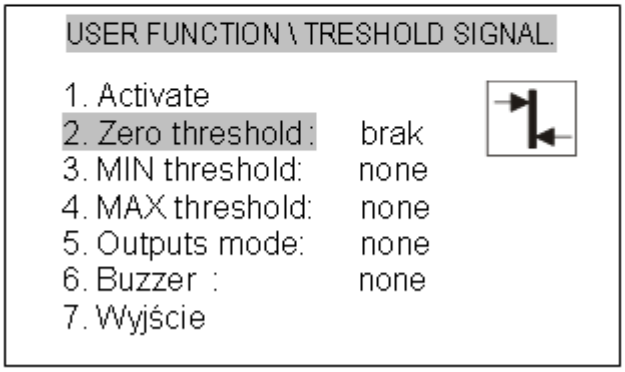
12.11 Treshold signalization (option)

This function compares weighing result with two reference values: lower and upper threshold. The balance signalises comparison result with MIN, OK and MAX indicators and sound signal.
If comparison result is:
- smaller than lower threshold – the balance displays MIN,
- between threshold values - the balance displays OK,
- bigger than upper threshold - the balance displays MAX
- lower than zero threshold (no load) – none of the indicators appears

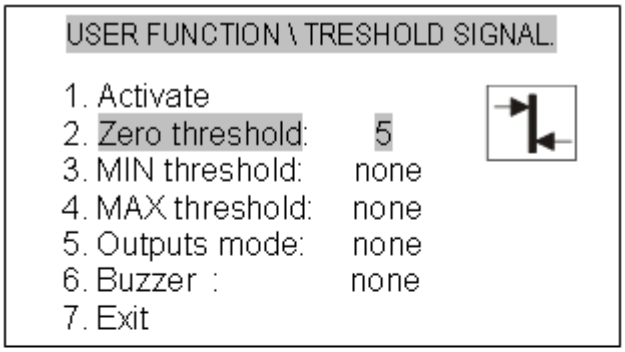
Operation sequence:



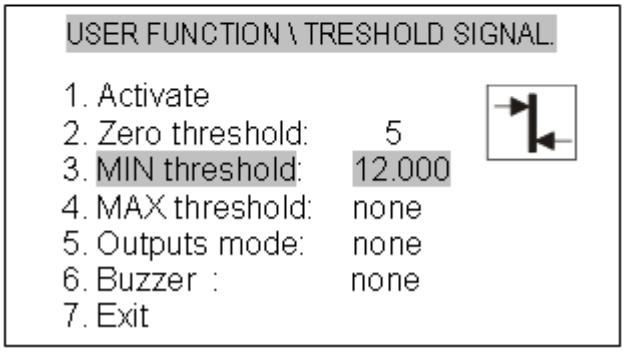
Press *MENU* key, choose *Treshold signalization* option and press *ENTER* to accept.



Chose *Zero threshold* option using ∨ and ∧ keys and press *ENTER.*

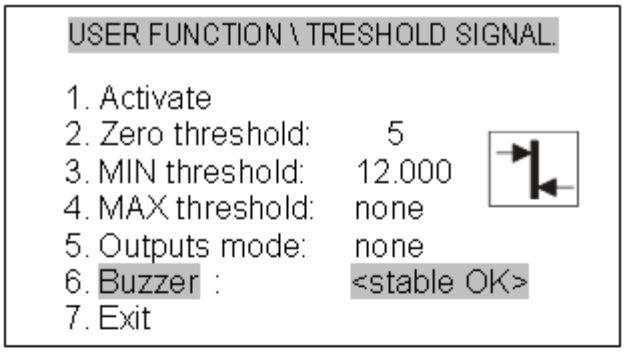


Enter *Zero threshold* value using decimal keys and press *ENTER* key – indications below this value are regarded as unloaded balance (threshold indicators does not appear).

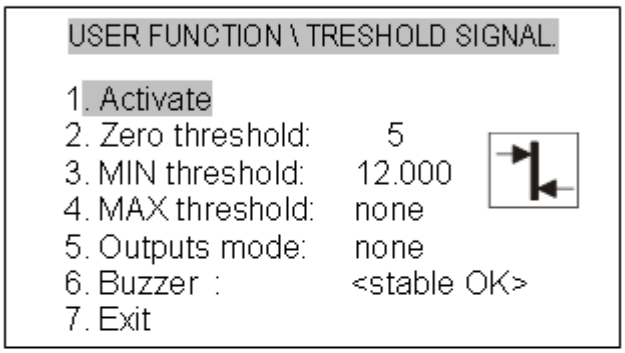


Enter *MIN threshold* and *MAX threshold* values.

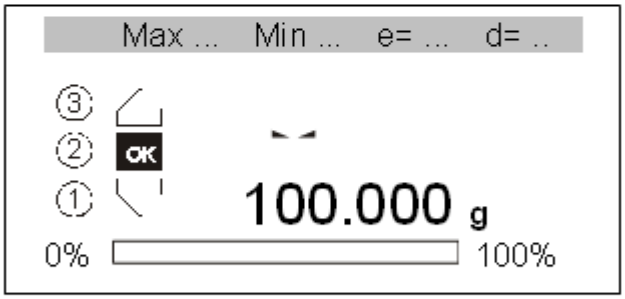
Outputs mode enables to set *THRESHOLD* output working mode (described further). To choose appropriate working mode use < and > keys and press *ENTER* key to accept.



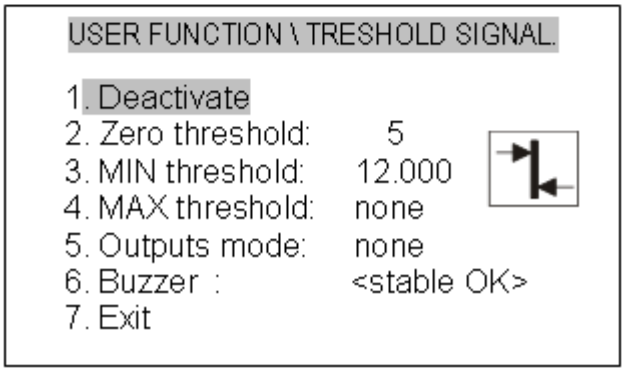
Buzzer option enables to select sound signal mode. When *Stable OK* option is set, sound signal occurs after weighing result stabilisation within OK range. Other possible options:
- sound signal occurs when threshold values (MIN and MAX) are exceeded,
- no sound signal



To start function choose *Activate* option and press *ENTER* key.



After each measurement the balance displays comparison result.

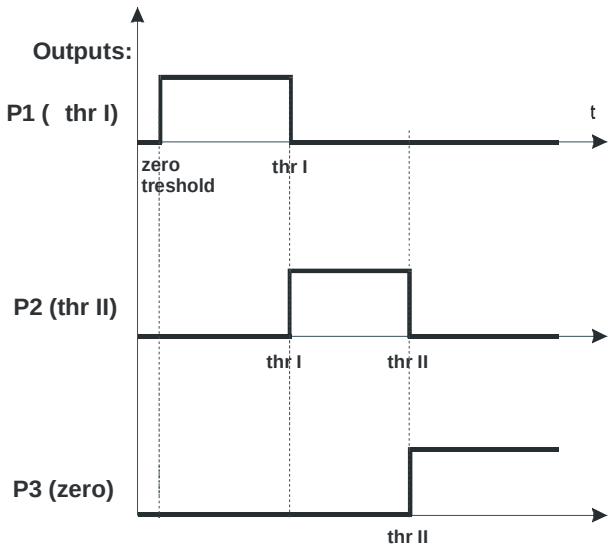


To leave the function press *MENU* key, choose *Treshold signalization* function and then choose *Deactivate* option.

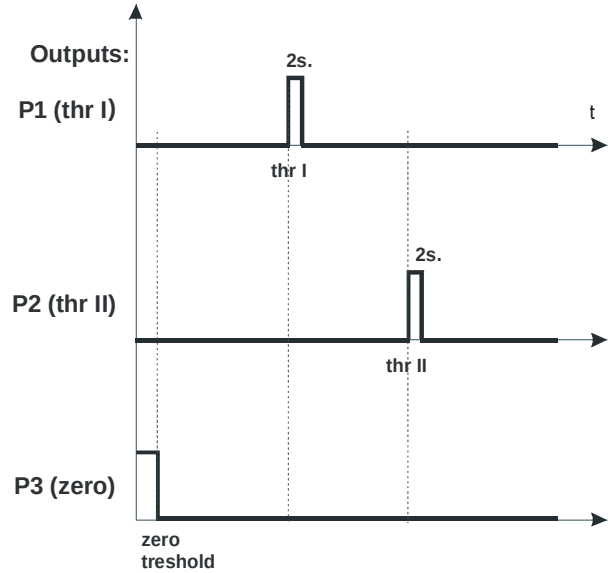
In balances equipped with *THRESHOLD* output, comparison result may be used to control external optical indicator or other external devices.
Threshold comparison results appear on *Thr I* and *Thr II* output pins as a shortcircuit state. Control output working modes are presented on the state charts below.

THRESHOLD output state charts (increasing load):

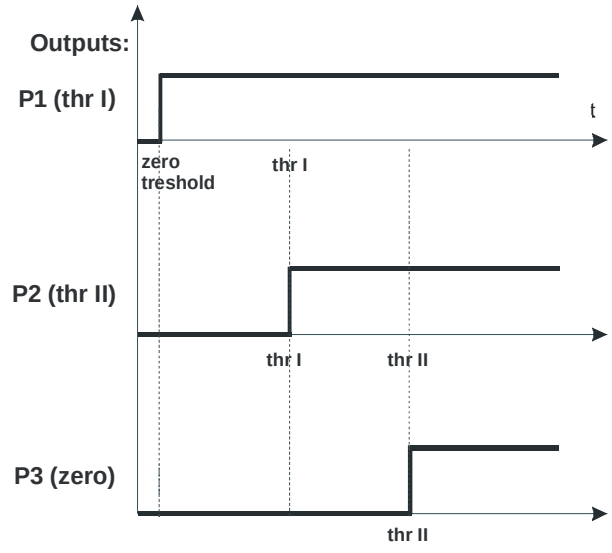
1. *Indicator* mode:



2. *Pulse* mode:

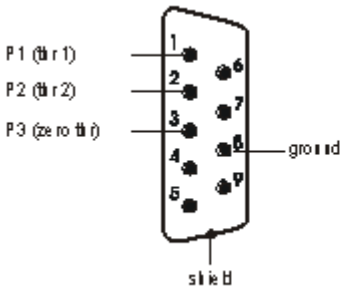


3. *Level* mode:

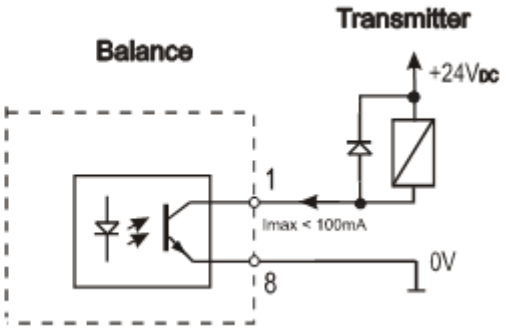


THRESHOLD output is a open collector transoptor output with load capacity 100mA / 24V. Additional transmitters require separate 24V feeder, transmitter input must be protected with diodes, e.g. 1N4148.

PROGI output

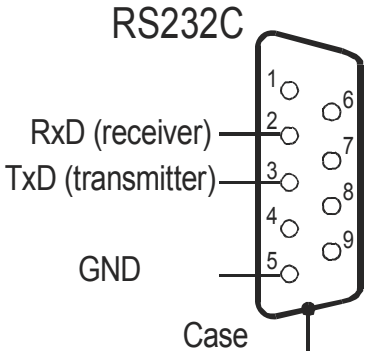


Single transmitter connection



13. Connecting the balance to computer or printer

The balance may send data to a computer or a printer via RS232C interfacee.



When cooperating with a computer, the balance sends weighing result after initialising signal from a computer or after pressing ⊏→ key.
When cooperating with the balance, a computer should be equipped with a program that enables receiving and processing data from the balance.

(16Bytes, LONG protocol - 8bits, 1stop, no parity, 4800bps)

Bytes description:

1 - „-„ mark or space
2 - space
3 4 - digit or space
5÷9 - digit, decimal point or space
10 - digit
11 - space
12 - k, l, c, p or space
13 - g, b, t, c or %
14 - space
15 - CR
16 - LF

14. Troubleshooting and maintenance

Display indication	Possible cause	Remedy
"Test ..."	Auto-tests are being performed / electronic unit damage	wait for 1 minute
" - - - - "	The balance is during zeroing / mechanical damage	wait for 1 minute check if the balance is placed on stable ground, not affected by vibrations
"Internal calibration: load error"	To small zero load or overloading of balance mechanism / mechanical damage	Check if there are all necessary pan elements or if the balance is not loaded
„Tare range exceeded”	Tare key pressed during zero indication	Balance indications must be different than zero
„Zeroing range exceeded”	Permissible zeroing range was exceeded	Remove the load from the pan
„Weighing range exceeded”	Permissible weighing range (Max +9e) was exceeded	Reduce the load
„Measuring range exceeded (+)”	Upper limit of analog-digital transducer measuring range was exceeded	Remove the load from the pan
„Measuring range exceeded (+)”	Lower limit of analog-digital transducer measuring range was exceeded	Check if there are all necessary pan elements
„Unit weigh is too small”	Entered unit weigh is too small	Unit weight is too small or entered number of pieces is too big

If a remedy does not have any effect and the communicate is still displayed, contact your dealer or service centre.

1. A balance should be kept clean.
2. Take care that no dirt gets between the casing and the pan. If found any, remove a pan (lift it up), remove the dirt and then replace a pan.
3. In case of improper operation caused by a short-lasting power supply decay, unplug the balance from the mains and then plug it in again after few seconds.
4. It is forbidden to make any repairs by unauthorised persons.
5. To repair a balance, please contact our nearest service centre.

Declaration of Conformity

PCE-GROUP Europe

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Internet: www.pce-group-europe.com

Konformitätserklärung

Declaration of conformity for apparatus with CE mark
Konformitätserklärung für Geräte mit CE-Zeichen
Déclaration de conformité pour appareils portant la marque CE
Declaración de conformidad para aparatos con disitintivo CE

Dichiarazione di coformitá per apparecchi contrassegnati con la marcatura CE

PCE-LS

1. EN 55022 standard *Limits and methods of measurement of radio disturbance characteristics of information technology equipment* and IEC 61000-4-3 *Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test* harmonized with the Council Directive 89/336/EEC (Electromagnetic compatibility directive).

Additional information:
Conformity evaluation for the Council Directive 89/336/EEC was carried out by Research

Laboratory of Electrotechnology Institute.

Date: 01.03.2006

Signature:

PCE-GROUP Europe OHG

Management

In this direction will find a vision of the measurement technique:
http://www.industrial-needs.com/measuring-instruments.htm

NOTE: "This instrument doesn't have ATEX protection, so it should not be used in potentially explosive atmospheres (powder, flammable gases)."