

## SPECIAL FUNCTIONS DESCRIPTION

BTA and BDM scales

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## 1. *Special functions availability rules*

All scales, besides the basic metrological functions: weighting and tare settings, have a set of user special function.

Standard balance is equipped with a basic set of special functions:

- automatic tare (*AutotAt*),
- pieces counting (*PCS*),
- unit selection (*UnIt*),
- percentage recalculations (*PErCEnt*),
- making recipes (*rECIPE*),
- calibration with external standard weight (*CALibr*),
- selection of label number (*LABEL*)
- RS232C settings (*Port-1*),
- print settings (*Print*)
- accumulator charging settings (*bAttErY*),
- setting of backlight (*b-LIGht*),
- automatic scale switching off (*Auto OFF*),
- indication resolution setting (*rESOLUt*),
- activation of indication resolution setting (*ACtIV*),
- return to default settings (*dEFAULt*).

Besides, the scale on demand may be equipped with a set of additional functions:

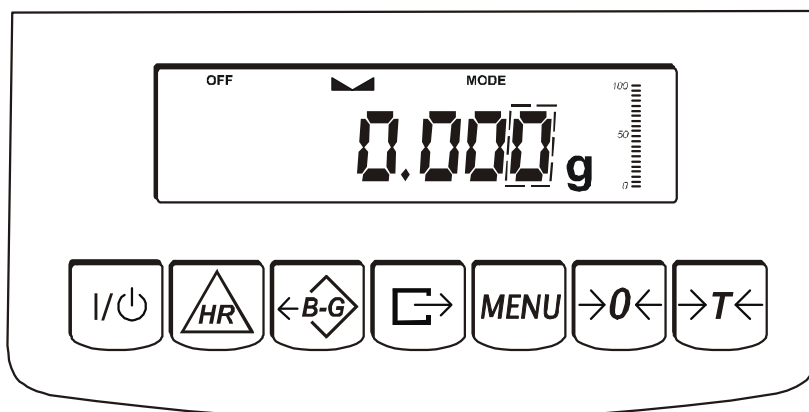
- animals weighting (*LOC*)
- anty-disturbance filter (*FILtEr*)
- maximum value indication (*UP*)
- memorizing tare value (*tArE*)

Moreover, together with additional equipment the following functions are supplied:

- with clock:
  - date and time setting (*dAtE*)
  - total weight summation (*totAL*)
- with *PROGI* connection:
  - comparing with preset treshold values (*trESh*)
- with printer:
  - statistic calculations (*StAt*).

Below all special functions are described, which haven't been described in the manual (exceeding the basic set).

## 2. Balance keys and indicators description



key	I/O	- ON/OFF switch (standby),
key	→T←	- Tare set (entering mass subtracted from weighed mass),
key	B/G	- Gross Weigh indicator switch (option),
key	→0←	- Scale zeroing while the scale is unbiased (option),
key	MENU	- Special function menu,
key	→	- Result print,
key	HR	- Increased indication resolution (option),
indicator	→0←	- Zeroing indication (while the scale is unbiased),
indicator	—	- Result stabilization signalling,
indicator	NET	- Net weight indicator (after using →T← key),
indicator	MODE	- Special function mode indicator,
indicator	BAR	- Total load indicator (0-100%).
indicator	OFF	- Switching off with I/O key (standby),
indicator	B/G	- Gross weigh indicator (after using B/G key),
indicator	pcs	- Number of pieces

To enter numeric values use the following keys:

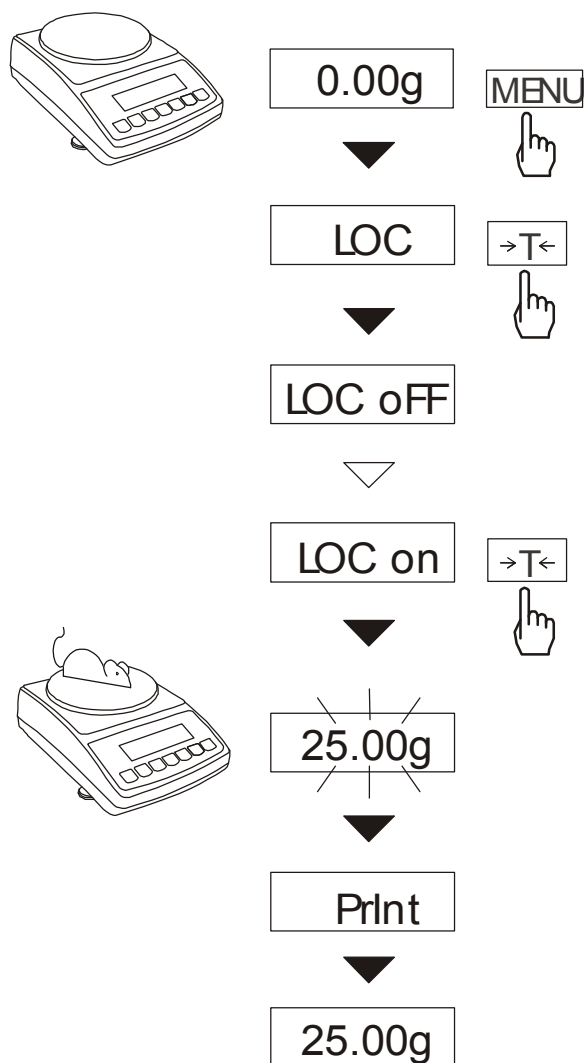
- 0← - digit increase,
- - decimal point,
- T← - next digit,
- MENU - end of entering numeric values.

### Attention:

Keys →0←, HR and indicators →0←, NET don't work in BTA210D and BTA2100D balances.

### 3. Animal weighting function (LOC)


This function enables weighting moving animals.



Press *MENU* key.

When *LOC* is displayed press →T← key.

On display will appear in order :

- *LOC oFF* – leave the function,
- *LOC on* – automatic weighting after loading the balance,
- *LOC Prn* – the measurement initiated manually with  key.


When the *LOC on* is displayed push the →T← key.

Tare the balance when necessary with →T← key and then put the animal on scale.

Wait until the weighting result is averaged – the display will “blink”. Next the balance will show final result and send it via serial port to a printer or computer.

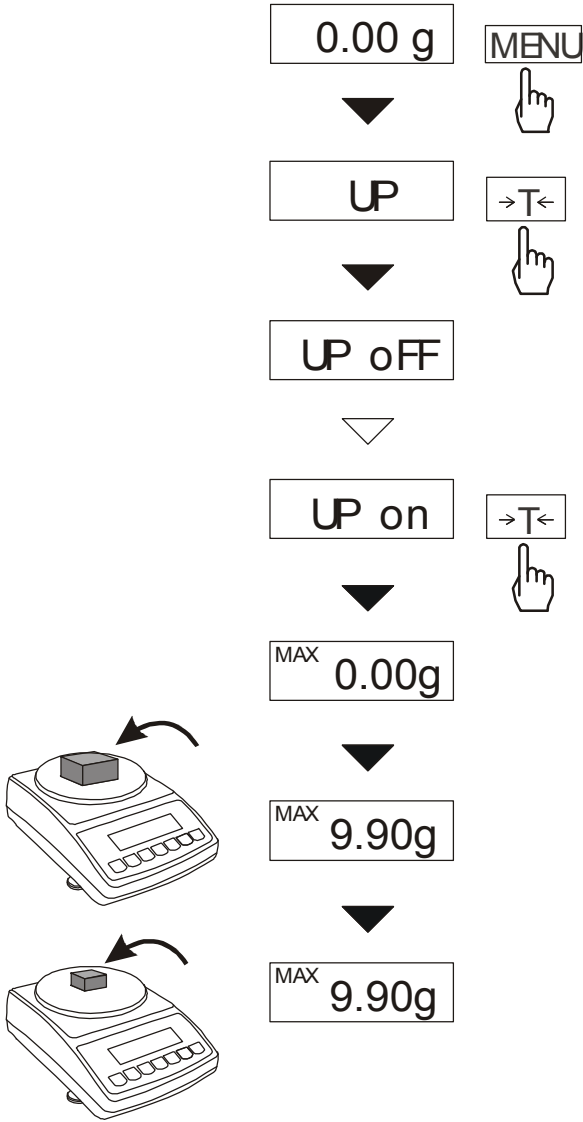
The result is displayed for about 30 seconds. In this time remove the animal from the pan.

#### **Attention:**

1. The load smaller than the minimal is not averaged
2. In case placing the animal takes more than 5s, it is advised to use *LOC Prn* option and then after each loading pressing  key.

#### 4. Maximum value indication function (UP)

This function enables to display the maximum value from actual weighing series.



Make sure the balance displays zero indication before starting measurements (tare).

Press *MENU* key. Using **→T←** key choose *UP* function, and then *UP on*.

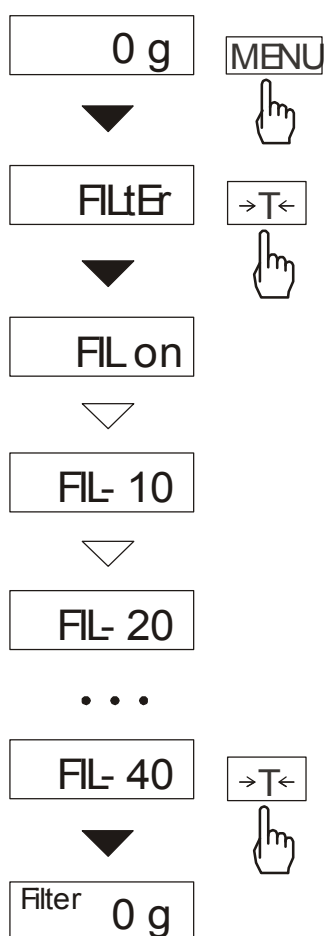
Put on successively weighted objects, scale display will show the maximum weight result.

Pressing the key will set the result to zero.

**Attention:**

*Autozero function and the stabilisation indicator are deactivated when UP function is active. The indication is the result of continuous averaging of 5 measurements.*

## 5. Anty-disturbance filter option (*FILtEr*)



This function enables using digital filter of chosen intensity during weighting. The filter reduces influence of mechanical vibrations (base vibrations, air blast) on measurement result.

Press *MENU* key and using **>T<** key choose *FILtEr* option.

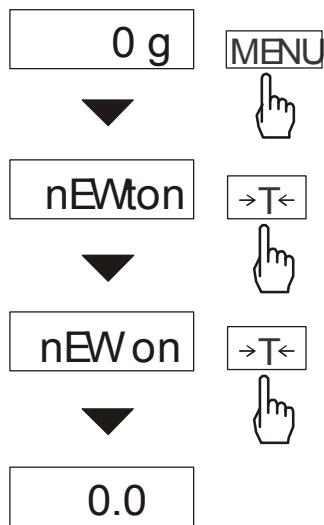
The following options will show successively on the display:

- *FIL OFF* – filter off,
- *FIL on* – filter on.

Choosing option *FIL on* will display following intensity values of the filter. After choosing intensity the weighting starts with the filter turned on.

In order to go back to normal work use *MENU* key and choose *FIL OFF*.

## 6. Force measuring function (nEWton)



Function activation will cause displaying results in force units (mN). Press MENU key.

Using  $\rightarrow T \leftarrow$  key choose Newton function and then nEW on.

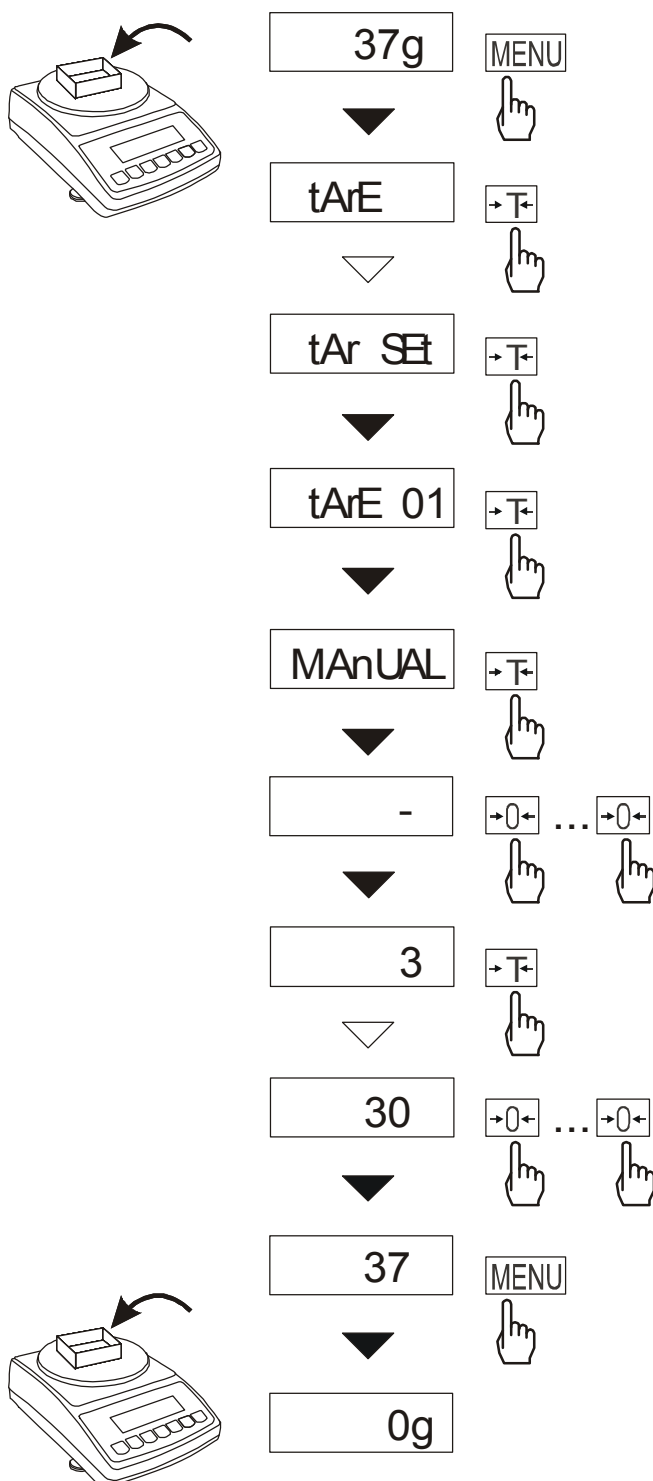
*Attention:*  $1\text{mN} \approx 0,1019\text{g}$



## 7. Memorizing tare function (tArE)

This function enables gross weight measurement of goods located in a container (we know the container weight) and then readout evaluated net weight of the goods. For this purpose first the tare value must be inserted to one of the ten scale memory cells. The inserted tare value can be displayed by pressing  $\rightarrow T \leftarrow$  key or  $\rightarrow 0 \leftarrow$  when the scale pan is unbiased. Inserting tare value may be done by using balance keys or from „nature” when locating empty container on pan is possible.

### Insertion of tare values using keys:



After pressing *MENU* key and choosing tArE function the  $\rightarrow T \leftarrow$  key will display the following options:

- *tAr OFF* – function off,
- *tAr on* – function on (with tare value inserted previously),
- *tAr . .* – bringing back tare value from memory,
- *tAr SEt* – writing tare value to memory,
- *out* – exit from function.

Press  $\rightarrow T \leftarrow$  key while *tAr Set* is displayed.

By pressing  $\rightarrow T \leftarrow$  key choose memory cell to save tare:

*tAr 01, 02, ... , 10.*

Choose writing option:

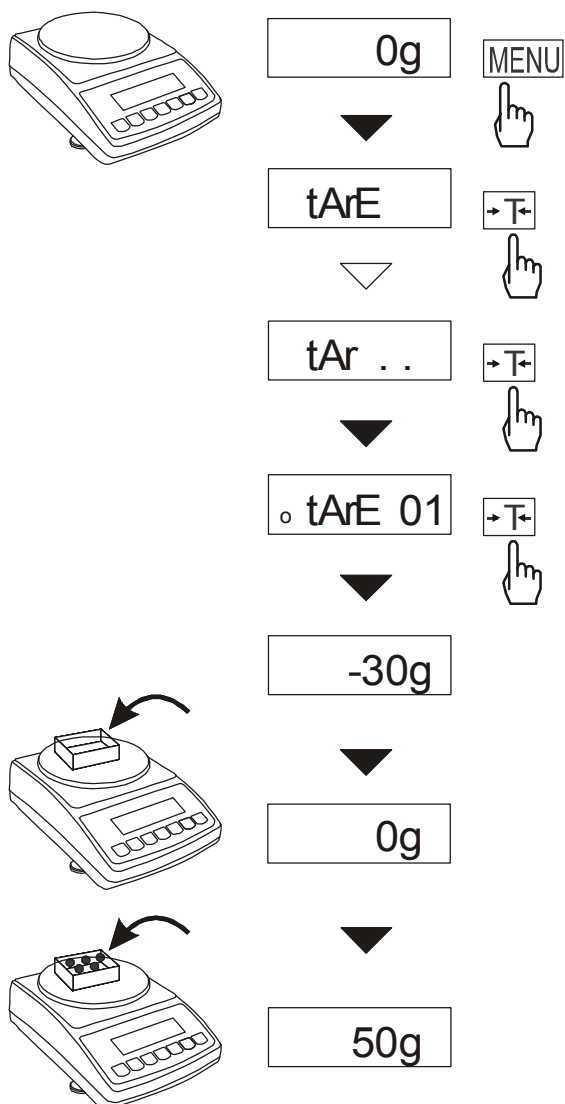
- *MAnUAL* – using keys :  $\rightarrow 0 \leftarrow$ ,  $\rightarrow T \leftarrow$  and *MENU*,
- *Pan* – writing actual weight value.

After writing to memory the scale starts working with inserted tare value.

*Attention:*

Tare values are also memorized when the scale isn't powered.

**Measurement with tare value imported from memory**



In order to use tare value saved in memory, first choose from menu *tArE* function and then *tAr . .* option.

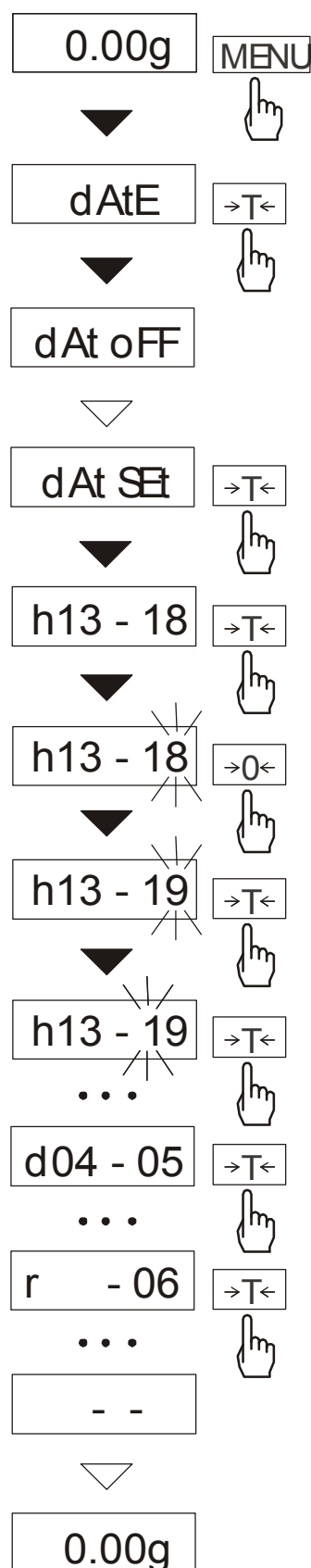
A list of memory cells will show: *tAr 01, 02, ... , 10*.

Cells with written value are marked with a sign *o* on they left side and cell with active value with ▼ sign.

Choose the proper cell using →T← key.

*tArE* function stays active with chosen tare value. The scale will indicate net weight ( the weight on scale pan minus tare value). Using →T← key (or →0←, when the scale pan is empty) will cause zeroing and subtraction of the tare value. In this case a negative (minus) indication will show up.

## 8. Date and time setting (dAtE)



This function enables to set current date and time of internal balance clock and course of his use. Function has the following options:

- *dAt oFF* – deactivate date and time printout,
- *dAt on* – activate date and time printout (↵ key),
- *dAt SET* – change actual date and time,
- *dAt PIn* – acces code insertion,
- *dAt For* – date print format selection *EU* or *USA*.

The example at the left presents how to use *dAt SET* option.

In order to write actual time and date →T← key should be pressed while *dAt Set* is displayed.

Confirm numbers displayed successively using →T← key to get the right time and date.

→0← key pressed repeatedly enables speeding up the process.

Time format: *h gg – mm*  
(*gg* - hour, *m* - minute).

Date format: *d mm – dd*  
(*m* - month, *d* - day).

Year format: *r - rr*  
(*r* - two last digits of a year).

## 9. Total weight function (totAL)

The function enables to calculate total weight of series of measurements greater than the balance capacity.

The diagram illustrates the sequence of operations for the total weight function. It shows a balance scale with a sample being added and removed. The display shows the following sequence: 0.00 g, MENU, totAL, >T<, tot □, >T<, 150.01g, □, 0.00g, □, 120.00g, □, ..., □, 0.00 g, □, 2700.0g TOTAL, □, 20<sup>n</sup>, □, ^135.00g, □, 0.00g.

To enter the function, press *MENU* key and choose *totAL* option with  $\rightarrow T \leftarrow$  key.

The following options are displayed:

- *tot Prn* - report printout without clearing the adding register,
- *tot oFF* - report printout with clearing the adding register,
- *tot □* - report printout after each measurement,
- *tot -* - report printout disabled.

Press the  $\rightarrow T \leftarrow$  key when *tot □* is displayed.

Place successively samples on the pan and press  $\square$  after each measurement to store the value in the adding register

The storing is confirmed by - - on the display.

To display current results enter *totAL* function menu and choose *tot Prn* option.

The results are display in the following order:

- total weight (*TOTAL*)
- number of registered measurements (*n*),
- average value from measurements ( $\bar{=}$ ).

To clear the register and start the new series of measurements press  $\square$  key for the third time.

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To leave the function with clearing the adding register choose *tot oFF* option. When connected to a printer, the balance prints the communicate informing about clearing the register.

The sample check for each measurement (depends on the settings of *PrInt* functions):

DATE:	...
TIME:	...
NETTO:	mass

Report printout sample:

TOTAL	=
NUMBER OF MEAS.	=
AVERAGE VALUE	=

***Attention:***

*Maximum number of measurements 99 999.*

*Maximum total load 99 999 000d.*

*The weighing unit of the aggregated value from the register (total) is the same as the weighing unit stated on the keypad or is 1000 times greater (signalled with “o” indicator at the left of the display).*

*If the registered value is too big to be displayed, “E” communicate appears on the display.*

*If the number of series is too high to be displayed, “Err1” communicate appears on the display.*

## 10. Function of comparing with preset threshold values (*trESh*)

This function compares weighing result with two reference values: lower and upper threshold. The balance signals comparison result with MIN, OK and MAX indicators and sound signal generated when threshold values are exceeded.

If comparison result is:

- smaller than lower threshold – the balance displays MIN,
- between threshold values - the balance displays OK with the sound signal when exceeding the threshold,
- greater than upper threshold - the balance displays MAX with the sound signal when exceeding the threshold,

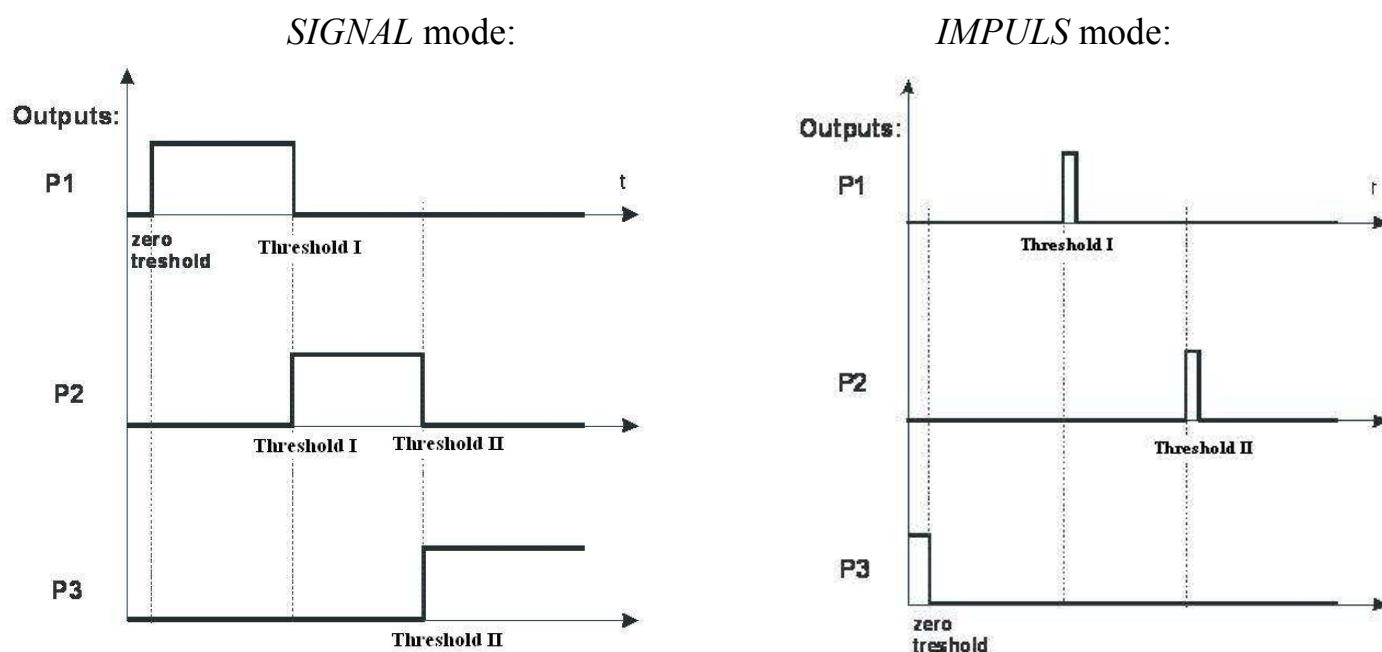
If the balance is equipped with *THRESHOLDS* control connection, the comparison result may be used to control:

- optical signalling devices (*SIGNAL* mode),
- batching devices (*IMPULS* mode).

In standard configuration the scale is set up to cooperate with optical signalling device.

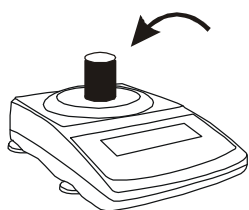
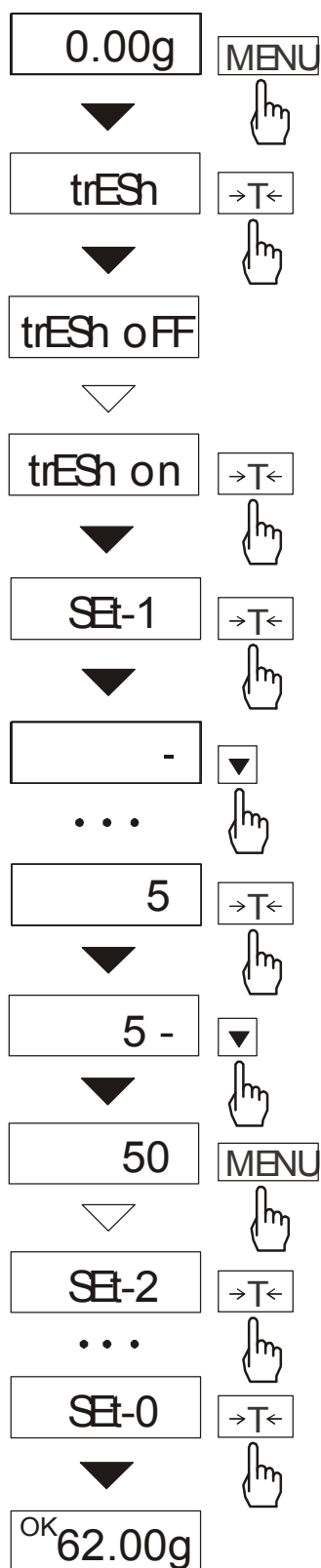
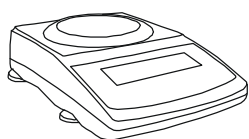
On the outputs *P1* and *P2* the short-circuit states appear, which depend on comparison results of balance indications with threshold values.

*THRESHOLDS* outputs states chart (with increasing balance load) for both modes:



In *IMPULS* mode on outputs *P1* (threshold I) and *P2* (threshold II) short-circuit impulses appear for about 0,5s. On output *P3* (zero) short-circuit state appears with the zero threshold indication.

**Order of operations:**



Press *MENU* key and choose *trESh* function with  $\rightarrow T \leftarrow$  key.

The following options are displayed:

- *trESh oFF* – deactivate the function,
- *trESh on* - activate the function,
- *trESh Prn* - check current threshold values (use  $\square \rightarrow$  to display successive values).

- *trESh CFG* - mode selection for connection *THRESHOLDS: IMPULS* or *SIGNAL*.

Choose *trESh on* option with  $\rightarrow T \leftarrow$  key. Following threshold options are displayed:

- *SEt-0* - start the function with the excess signalisation,
- *SEt-1* - set lower threshold value,
- *SEt-2* - set upper threshold value,
- *SEt-3* - set zero excess signalisation,

Using  $\rightarrow T \leftarrow$  key choose option *SEt-1*. Set the lower and the upper threshold values with the following keys:

- $\blacktriangledown$  - digit increase,
- $\square \rightarrow$  - decimal point,
- $\rightarrow T \leftarrow$  - next digit,
- MENU* - end.

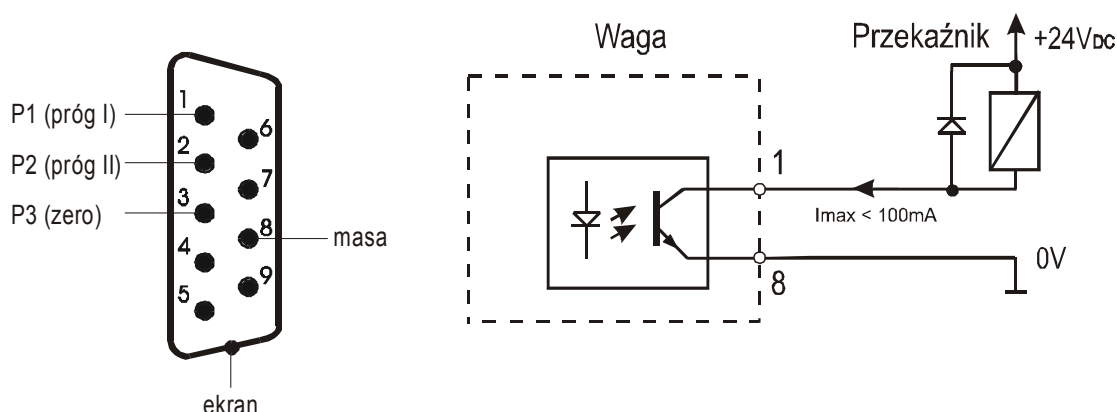
Next choose option *SEt-2* and write upper threshold value.

When necessary, use *SEt-3* option to set the value underneath which the sign MIN isn't displayed.

Choosing *SEt-0* option will make the scale work with both zero and threshold exceeding signalization.

To finish work with this function press *MENU* key and choose *trESh* and *trESh oFF*.

Scheme for connecting the single relay to *THRESHOLDS* connection output:



The *THRESHOLDS* connection contains transistor outputs of open collector type, with load capacity 50mA / 24V.

The relays inputs must be protected with diodes, e.g. 1N4148.

The balance producer offers ready electronic PCB MS3K/P, which contains RM96P relays with input voltage DC24V and output: AC 250V, 3A.

**Important notes:**

1. After switching the balance on, both thresholds are set as maximum values.
2. When selecting upper threshold value, pay attention that its value is not lower than the lower threshold value.
3. Selecting lower and upper threshold value is also possible by sending proper commands from computer (for more information look into scale manual)



## 11. Statistical calculations function (StAt)

This function evaluates from series of measurements (max 100) statistical parameters of weighting process.

Adding successively measurements to register is automatic and it occur after the scale is loaded and its indications stabilize.

After each loading printout is made with: number of measurements, result, date and time.

For the obtained measurements series the scale evaluates:

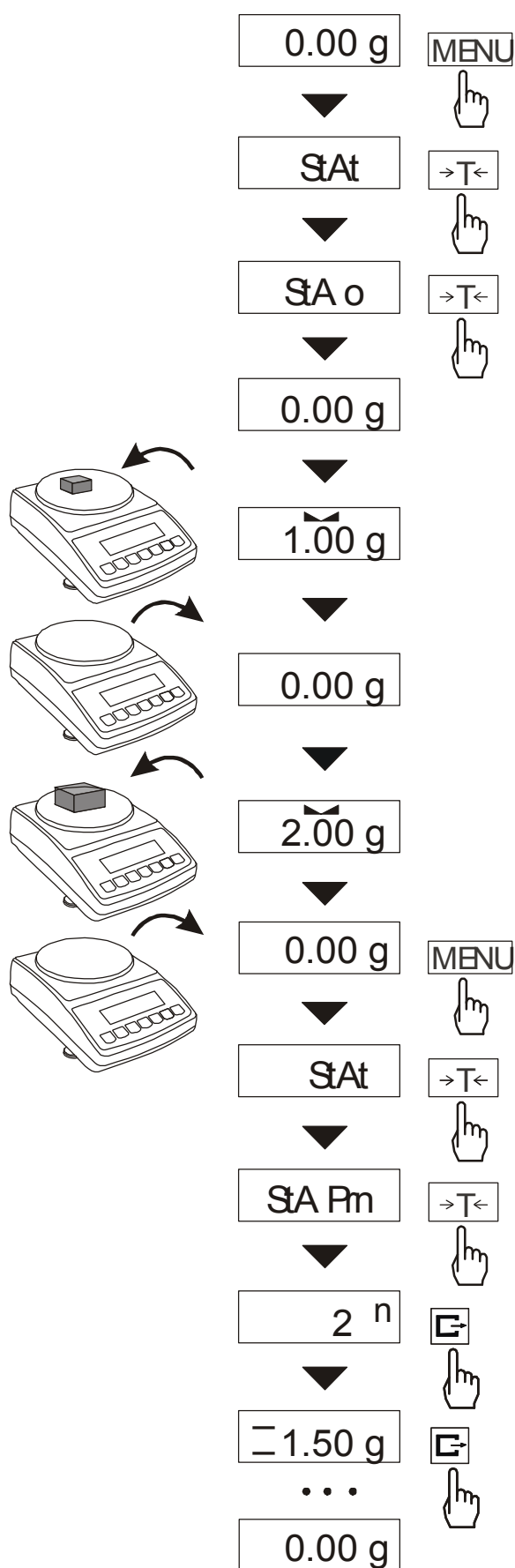
- n                      -number of samples
- sum x                -sum of all samples  $sum\_x = \sum x_n$
- $\bar{x}$                     -average value (sum x)/n
- min                    -minimal value from n samples
- max                    -maximal value from n samples
- R = max-min        -maximal value minus minima value

- S                      -standard deviation         $S = \sqrt{\frac{1}{(n-1)} \sum_n (x_n - \bar{x})^2}$

- srel                    -variance factor         $srel = \frac{S}{x}$

Statistical calculations results can be printed.

**Order of operations:**



Press MENU key.

When *StAt* is displayed press →T← key.

The following options are displayed:

- *StA Prn* – monitoring and printout of statistical data,
- *StA oFF* – deactivate function,
- *StA o* – activate function, work with printout of chosen weighting results,
- *StA -* – activate function, work without printout,
- *StA n* – maximal
- *StA CFG* – function configuration:
  - *Auto* – Automatic work (samples are confirmed after loading the scale and indication stabilization.),
  - *ManuAL* – manual work (confirmation is made by pressing key).
- *out* – exit from function.

Push →T← key when *StA o* is displayed.

Put on successively objects on the pan (remove after indication stabilization) in order to add them to measurements register.

In order to obtain statistical results from measurements series press MENU key and →T← key when *StAt.* and later *StA Prn* is displayed.

Successive results are displayed after key is displayed:

- n – number of samples.
- = - average value,
- ≡ - standard deviation,
- ≡% - relative standard deviation,
- MIN – minimal mass,
- MAX – maximal mass,

To finish displaying press →T← key when *StA End* is displayed.

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*Printout look:*

Pressing  key printouts estimated values and histogram:

Nominal - nominal value,  
Tolerance - accepted value in percentage,

N - number of samples

IN TOL. - number of samples in tolerance

-TOL - amount of measurements under  
allowable lower value

+TOL - amount of measurements above  
allowable upper value

TOTAL - sum of weights of all n samples

AVERAGE - average weight as (Total)/n

MIN - minimum weight in n samples

MAX- maximum weight in n samples

ST. DEV. - standard deviation

ST. DEV.% - standard deviation  
percentage

```

----- STATISTICS -----
NOMINAL : 50.000 g
TOLERANCE: 100 %
MAX. N : 500
    
```

NO.	SAMPLE	TOL-	NOM	TOL+
1	10.007 g	!	*	!
2	20.125 g	!	*	!
3	20.126 g	!	*	!
4	30.205 g	!	*	!
5	30.204 g	!	*	!
6	30.201 g	!	*	!
7	40.557 g	!	*	!

...

```

N : 25
IN TOL. : 25
< TOL- : 0
> TOL+ : 0
TOTAL : 1264.664 g
AVERAGE : 50.587 g
MAX : 91.131 g
MIN : 10.007 g
MAX-MIN : 81.124 g
ST.DEV. : 20.6480 g
ST.DEV.% : 40.82 %
    
```

```

----- HISTOGRAM -----
<TOL- 0 |
      0 |
      1 |██
      2 |███
      3 |████
      4 |█████
      5 |██████
      4 |█████
      3 |████
      2 |███
      0 |
      1 |██
>TOL+ 0 |
    
```

To finish work with this function and zeroing result register press *MENU* key and then when *Stat.* and *Sta oFF* is displayed press  $\rightarrow T \leftarrow$  button. This will activate printing announcement about register zeroing.

***Notes***