

# **SCALE INDICATOR G5102**

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## **USER MANUAL**

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## Used terminology and descriptions

### Terminology

- ADC - Analog-to-digital converter
- „**Weight**” - display for showing weight value
- e* - metrological division value
- F.S. - Full scale – nominal capacity of build weigh scale

### Descriptions



- keyboard button of G5102 unit



- it is necessary to press showed button



- Attention, important notice



- Note

## I. General description

Scale indicator G5102 is a modern microcontroller unit, intended for weigh scales. It is based on 24-bit Analog-to-Digital converter and powerful microcontroller, fully programmable, with different menu level access.






In order to measure weight, it has to be connected to weight platform of some kind, using resistive load cells. Device can be connected to any kind of resistive load cell and then calibrated and set for proper weight measurement.




General look of G5102 is shown on Fig. 1:



Fig. 1. Base look of G5102 unit

On the picture can be seen most important parts and details of G5102:

1. Display – 5-digit seven-segment display with digit height of 25.4mm. Display lights in super-bright red ( $\lambda = 660\text{nm}$ ). For convenience further in this manual it will be called „**Weight**”
2. Keyboard of 16 membrane buttons (metal). Meaning of the buttons is the following:
  -  ...  in client mode used to set discrete output levels and limits.
  -  in client mode serves for function “Tare”, in service mode serves as “Arrow Down”
  -  in client mode serves for function “Zero”, in service mode serves as “Arrow Up”
  -  always serves as „ESCAPE” (step down in menu hierarchy)

-  always used to validate and store a parameter in device memory ("Enter")
-  in client mode serves to send data via RS-232 interface to external device (PC, controller, etc.) („Print“)
-  not used

3. Place for showing metrological parameters if the weigh scale, according to EN 45501:2001 и OIML R76 (EEC 384)
4. Plug for connecting external load cell
5. Plug for connecting external device via RS-232 interface
6. Plug for power supply cable – cable is included in the package
7. Safety fuse
8. Warranty sticker
9. LEDs for showing current weighing status – *Gross/Net, Zero, Stable position*
- 10.\*Button for entering in service mode – accessible only if front ring is removed

G5102 fulfils requirements of precision class III for measuring weight, but can be used also for more precise measurements. Basic sub-devices and functions (according to EN45501:2001 terminology) are:

- initial zero setting device;
- device for determine stable position;
- device for semi-automatic zero setting;
- zero tracking device;
- device for semi-automatic tare (subtractive);
- display auto-test;
- significant error detection;
- serial interface (RS-232);
- setting device – calibration and fine weight correction

In next table are given all important technical parameters and permitted setting values, according to weigh scale measuring standard (described more detailed in III. Functions and Parameters)

Table.1.Characteristics of weigh indicator G5102

<b>Nº</b>	<b>Characteristic</b>	<b>Value</b>
1.	Number of metrological divisions, n	<b>1000, 2000, 2500, 3000, 4000</b>
2.	Sensitivity	<b>1.0uV</b>
3.	Division value, e – g/kg/t	<b>1, 2, 5, 10, 20, 50, 100, 200, 500</b>
4.	Decimal point position	<b>1 ÷ 4</b>
5.	Zero tracking	<b>0.5e/1s</b>
6.	Range of button ZERO, % MAX	<b>±1 %</b>
7.	Initial zero, % MAX	<b>up to ±10 %</b>
8.	Subtractive TARE, % MAX	<b>50 %</b>
9.	Digit height on weight display, mm	<b>25.4 mm</b>
10.	Number of digits on weight display	<b>5</b>
11.	Number of buttons on the keyboard	<b>16</b>
12.	Internal memory	<b>4kB standard, up to 256kB</b>
13.	Maximal visible value for current weight	<b>MAX + 8e</b>
14.	Excitation voltage (for load cells), V	<b>5V DC</b>
15.	Output resistance of load cells, Ω	<b>85 Ω</b>
16.	Length of connecting cable, if 4-wire connection	<b>5m Cable type LIYCY 4x0.5mm<sup>2</sup></b>
17.	Work temperature range, °C	<b>-10 °C ÷ +40 °C</b>
18.	Power supply, V	<b>220V AC +10%/-15%</b>
19.	Power consumed, W	<b>&lt; 1,5 W</b>
20.	Interfaces	<b>RS-232C serial</b>
21.	Precision class	<b>III</b>
22.	Dimensions, LxWxH, mm	<b>170x190x70</b>
23.	Protection class, IP	<b>IP33</b>
24.	Own weight, kg	<b>1.1kg</b>



*If this electronic indicator is used to build weigh scale in metrological certifying means, following parameters should be used:*

Indicator type:	<b>G5102</b>
Precision class:	<b>III</b>
Maximum number of metrological divisions:	<b><math>n \leq 3000</math></b>
Excitation voltage:	<b>5V DC</b>
Maximum signal voltage with „dead load“:	<b>4,0mV</b>
Minimum signal voltage with „dead load“:	<b>0,2mV</b>
Maximum input voltage for one division “e“:	<b>3uV</b>
Minimum input voltage for one division „e“:	<b>1.0uV</b>
Maximum voltage swing for full range:	<b>15mV</b>
Maximum input resistance of used load cell:	<b>1000Ω</b>
Minimum output resistance of used load cell:	<b>85 Ω</b>
Load cells connection type:	<b>4-wire</b>
Work temperature range:	<b>-10°C ÷ +40°C</b>
Power supply:	<b>220V AC</b>
Fractal error part pi:	<b>0,6</b>
Maximum length of connecting cable between Indicator and junction box:	<b>5m, cable LIYCY 4x0,5mm<sup>2</sup></b>
Serial interface:	<b>RS-232</b>
Serial interface maximum cable length:	<b>15m / 3x0,5mm<sup>2</sup></b>



## II. Connections

### 1. Connecting load cell to indicator

User can connect any load cell, which have output voltage in range  $1 \div 3$  mV/V. Usually a load platform is build, laying on such sensors.

This electronic indicator works by 4-wire connection scheme. If the sensor/sensors are with 6 wires it must be set to 4-wire connection – user must shorten (connect together) signals  $Se+$  with  $Ex+$  and  $Se-$  with  $Ex-$ .

Generally sensors have following wires and signs:

- $Ex+$  - positive supply voltage for load cell (Excitation+);
- $Ex-$  - negative supply voltage for load cell (Excitation-);
- $Signal+$  - output signal
- $Signal-$  - output signal
- $Se+$  - feedback, if 6-wire connection, for  $Ex+$  terminal
- $Se-$  - feedback, if 6-wire connection for  $Ex-$  terminal

Load cell plug in G5102 is Canon DB9 type, female. Correct pin connection is as follows:



### **Cannon 9 G5102, female**

<b>1 pin</b>	- <b>Ex+</b>
<b>2 pin</b>	- <b>Signal+</b>
<b>3 pin</b>	- <b>Signal-</b>
<b>4 pin</b>	- <b>Ex-</b>
<b>5 pin</b>	- <b>Shield sensor cable</b>
<b>6 pin</b>	- <b>Se+</b>
<b>9 pin</b>	- <b>Se-</b>

### 2. Connecting power supply

Every G5102 comes with power supply cable for 220V AC, suited for indicator. From the one side this cable should be plugged in G5102 (connector 6 from I. General description), from the other – in power supply network. It can not be plugged wrong. Cable is a two-pole – phase and zero. Since indicator has a plastic enclosure – grounding is not necessary.

As an option G5102 can be offered to work on DC voltage with external adapter or accumulator, but this can be specially noted when ordered.

Above power cable is placed safety fuse. If scale indicator is not working at all (i.e. – display is not showing anything) most probably the fuse is gone and must be replaced with proper one. For information about fuse and its change refer to p.**VIII**.

## **Troubleshooting**

### 3. Turning on G5102, initial checking

Turning on G5102 is simply plug power cable to power supply network 220VAC. If everything with G5102 is in order it will start working.

First display test is accomplished which includes following sequence:

All digits are lit for 1s. Then all digits are turned off for 1s.

Through display „**Weight**” passes a sign “Gineers”. The sign moves from right to left, moving through digits in every 0.3 seconds. After the sign passes all digits serial number of G5102 is showed for 1 second, then firmware version.

Then G5102 shows scale type and capacity – on display „**Weight**” will be written „**G xxxx**”, where xxxx is a number showing scale nominal capacity.

Indicator starts checks for initial zero position – compares saved zero position from calibration with current measured zero position. If difference between two values is in correct range indicator enters in normal mode of operation, showing measured weight. If current measured zero position is out of range ( $\pm 10\%$  from full capacity), on display „**Weight**” will be written error – “**-Hi-**” (initial value bigger with above 10% from range) or “**-Lo-**” (initial value smaller with below 10% from range).

If everything is normal scale enters in normal mode of operation. Now on display „**Weight**” user sees value of measured items/products in units g/kg/t – according to front panel label.

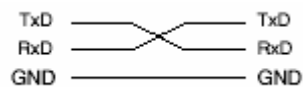
Loads on the platform are normal to be put on it gracefully, if user does not want to replace sensors often. For G5102 this does not have significant matter, just stable position will be achieved for higher period of time.

#### 4. Connecting serial interface RS-232

Electronic unit G5102 is equipped with standard serial interface, type RS-232C. This interface can be used for sending weigh values to external cash register or personal computer. If working with PC special software from Gineers can be used or we can supply data protocol to who is interested in reading weight from G5102 with its own software.

A standard cross null-modem cable is used, which in this case means:

<b>CANNON DB9 male G5102</b>		<b>CANNON DB9 male PC</b>
2 pin	→	3 pin
3 pin	→	2 pin
5 pin	→	5 pin



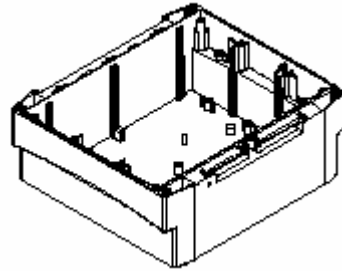
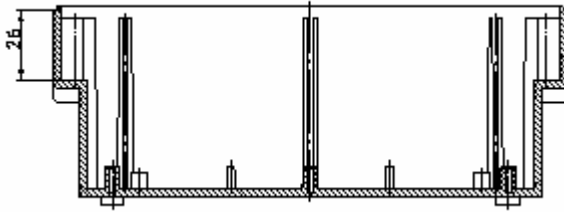
*If physical connection layer is for RS-485 protocol, unit G5102 can control RTS line of connected 485<->232 converter - pin 7 of DB9 male connector.*

#### 5. Mounting

Normally there are two ways to position G5102 unit:

- On a horizontal surface without any additional efforts;
- Vertical mounting on a wall

On a horizontal surface there is not mounting whatsoever – unit is directly placed carefully on the surface.



For a wall mounting 4 mounting holes are provided on the back of G5102 indicator. They are placed on 4 corners of the device and are visible when front ring is removed. Through these holes device can be mounted with the help of screws to the wall (not included in the package). We recommend using at least 2 screws, minimum size M5x16mm.

### III. Functions and parameters

Since this unit is intended for specialists, who want to build their own professional scale, a service mode is provided in which some metrological parameters can be set and also some auxiliary functions, related to basic scale functions (like zeroing, zero tracking, etc.).



For this purpose user must enter in service mode. To do that, following steps should be followed:

- Remove front ring of G5102 – this is done by hand
- If G5102 is powered and working – turn it off
- Press button „**K**“, which position is in the middle of right side of G5102, beneath removed ring (and where warranty and anti-setting stickers should be placed)
- Turn back on G5102 – button "**K**" still pressed
- Wait initial indication test to pass (moving sign "Gineers"), then button „**K**“ may be released

If the steps are made correctly in front of the user should be sign "Giner" on display "**Weight**":



Fig. 2. Service mode

In this moment the only button from keyboard that will work, will be button . Pressing button  will change signs on the display – for 1 second use will see „code“, after that G5102 will wait for the user to enter valid code for entering service menu:

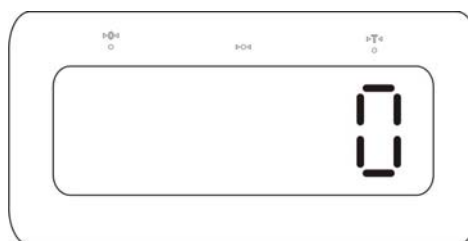






Fig. 3. Entering service code

User now should enter 4-digit code for entering service menus. The code is entered from the keyboard with buttons ... and confirm with button . If error while entering code user can clear input with button  anytime and enter the code again from scratch.



Code for entering service menu can be **1342 or 9386**

If code is entered and confirmed correctly user will see sign „**PARAS**” on display **“Weight”**, which is first of the service menus.

### Button functions in service mode

For all setting total of 4 buttons are used (except weight calibration):



- used as **“Arrow Down”** to switch through different parameters or changing parameter value;



- used as **“Arrow Up”** to switch through different parameters or changing parameter value;



- used to confirm a choice (**“Enter”**) – entering sub-menu or store parameter value;



- used to exit from current menu, sub-menu or parameter change (**“Esc”**). Generally this is always a step back in menu hierarchy.

G5102 is offered with two types of firmware – basic and extended. Here we will make full description of basic type and brief show of extended type.

In service mode (basic version) there are 4 menus:

#### „**PARAS**”

- Number of scale divisions,  $n$ ;
- Weight for one division,  $e$ ;

#### „**Adc**”

- ADC conversion time,  $t-me$ ;
- Number of bits that result from ADC can be shifted right before further processing,  $Shr$ ;
- Amplifying value for embedded ADC amplifier,  $Adc A$

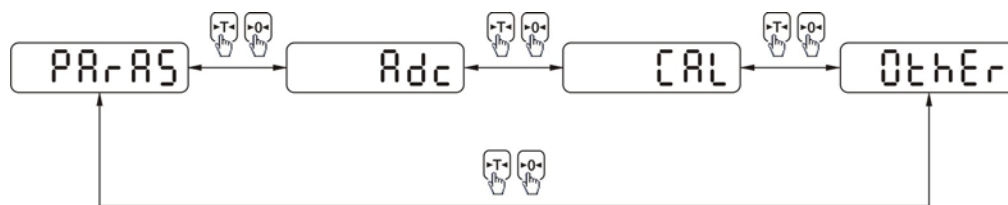
#### “**Cal**”

- Calibration of the scale with real weight in two points – *Cal 0, Cal n*;
- Fine tuning after calibration, if needed, *Corr+* and *Corr-*


### "Other"

- *Factory default* параметри – clear memory and load factory default settings

On fig. 4 is showed graphically how to pass through menus and what signs on "Weight" user should see:



Фиг. 4. Selection of particular menu





To enter in currently selected menu press button . Next we will explain in details menu parameters, what they mean and how to set them. This is valid both for basic and advanced firmware type, but in advanced parameter values are wider range. Here user should presume basic firmware version is used.



#### 1. Menu „PARAS“

With help of keyboard buttons, described before, user can set following parameter values:

- Number of weight divisions – 1000, 2000, 2500, 3000, 4000 – "n"
- Weight value for one division – 1,2,5,10,20,50,100,200,500 – "d=E"

Enter the menu by pressing button  while you see sign "PARAS" on display.

After that with buttons  and  ("Arrow Down"/"Arrow Up") user can switch to different parameters. To change parameter value user should press button , while parameter is visualized. To exit from parameter value change, respectively menu „PARAS“ user should press button .

If user wants to change parameter value, he can do that with buttons  and  while he is in mode of changing parameter. Parameter value is automatically changes with every "Arrow Down" or "Arrow Up" press with pre-defined values. Indication that user is in parameter value change mode are LEDs for "Tare" and "Zero" position – they both are lit.

Graphically process of setting parameters in menu „PARAS“ is showed on Fig. 5:

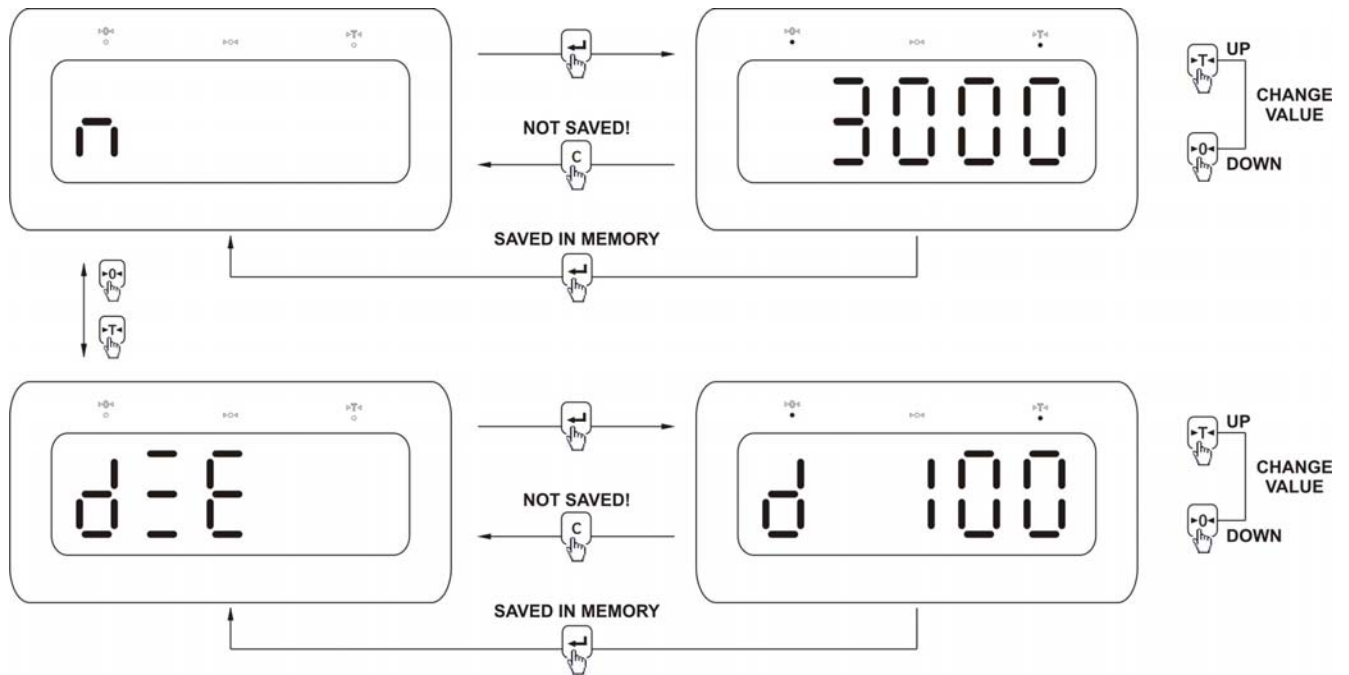


Fig.5. Algorithm to change parameter values in menu „PARAS”

To exit this menu use button **C**.

## 2. Menu „Adc”

With help of keyboard buttons, described before, user can set following parameter values:

- ADC signal amplifying – from 1 to 3, step 1 - **“Adc A”**
- Acquisition time for one sample (ms) – 25 ÷ 200, step 25ms - **“t-me”**
- Number of bits to shift right ADC sampling result before further processing – 1 ÷ 9, step 1 - **“Shr”**

All these parameters are related to stable measurement. Bigger amplifying gives more ADC divisions for measuring range, but decrease stability. Also note that faster measure means also more noise in measurement signal. Changes here should only be made from engineers, which know what means ADC, how sigma-delta ADC works and what means to shift right bits of a binary value.

Enter the menu by pressing button **↩** while you see sign **“Adc”** on display. After that with buttons **▶T◀** and **▶0◀** (**“Arrow Down”/“Arrow Up”**) user can switch to different parameters. To change parameter value user should press button **↩**, while parameter is visualized. To exit from parameter value change, respectively menu **„Adc”** user should press button **C**.

If user wants to change parameter value, he can do that with buttons **▶T◀** and **▶0◀** while he is in mode of changing parameter. Parameter value is automatically

changes with every "Arrow Down" or "Arrow Up" press with pre-defined values. Indication that user is in parameter value change mode are LEDs for "Tare" and "Zero" position – they both are lit.



**With these parameters sensitivity and measurement capabilities of G5102 unit can be changed! Have this in mind when setting and calibrating device!**

Graphically process of setting parameters in menu „*Adc*“ is showed on Fig. 6:

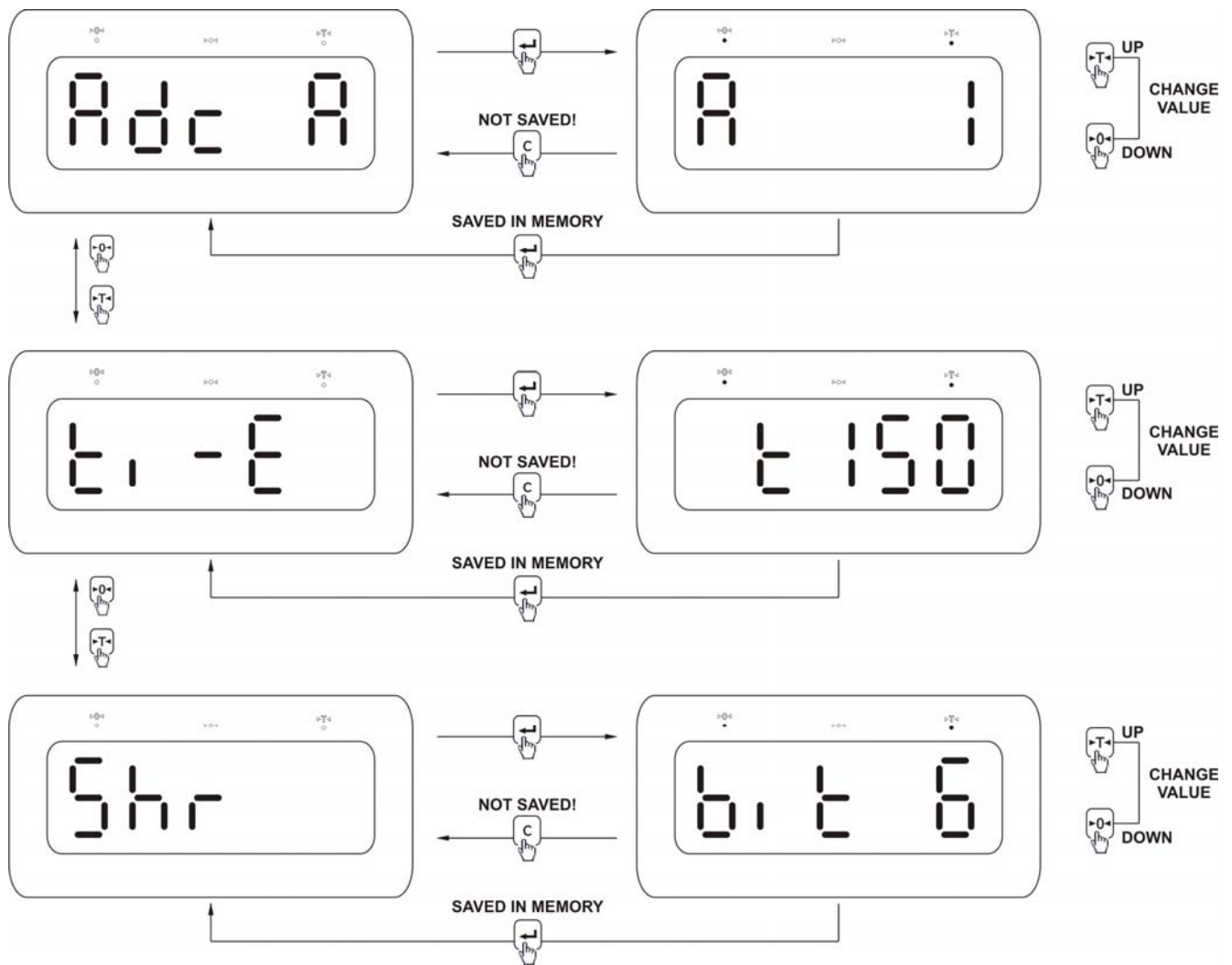


Fig. 6. Algorithm to change parameter values in menu „*Adc*“

### 3. Menu „*Cal*“

In this menu real weight calibrating is carried out. Here user can set the scale to measure with desired precision in selected measurement range (nominal capacity of the scale) in order to comply with metrological and user requirements.



Weight calibration can be done with any known mass – what is put on scale platform is entered during the process by G5102 keyboard. Calibration is carried in two











points – zero position and some known exact weight. Calibration is carried out in two steps:

- Store value for empty platform (zero position);
- Store value for some known weight/mass;

When these two steps are made, electronic unit calculates value for a single ADC division and this in normal mode is converted in real weight (grams, kilograms or tons). Of course, while calculating, G5102 checks if measurement range is suitable are there enough voltage swing, etc. If not – user will see an error and should re-calibrate with different parameters to achieve better performance.

After calibration there is an option for fine tuning of measurement. With this option user can set additionally measurement with step of 0.1e with buttons  and  (respectively adding or subtracting from measurement). This is a linear correction simply changing angle of measurement line. This, in simple words, means that if we add to weight of 10kg lets say, 0.050 kg with correction, at 20kg this correction will automatically be 0.100 kg, on 50kg it will be 0.250kg and so on. This also means that correction will be successful only if load cell is in its linear characteristic part (i.e. – correct load cells is used and load cell is in order). That is why to build 100kg scale usually load cell with capacity of 300kg is used.

To enter in menu press button . After that with button  user can switch between two steps of the calibration – „**Cal 0**” or „**Cal n**”. First zero calibration (e.g. „**Cal 0**”) should be made. Enter in this menu by pressing button . LED *Zero* will light up and user will see result of ADC conversion – a number between 200 and 10 000. Of course, scale should be unloaded of any weights or additional loads. In order to save measured value for a zero position user must press button , when showed number is relatively stable. When the calibrating step is step 2 - „**Cal n**”, after confirm entering user will see “ 0” on display. G5102 now expects user to enter real weight that is put on load platform. Enter correct weight with keyboard buttons ... (if error in entered number – clear it with button  and enter again), then when ready press button . User knows that he is mode „**Cal n**” again seeing LEDs state – LED *Tare* is lighting and LED *Zero* is not lighting. When in fine correction sub-menu both diodes will light simultaneously.

User can exit menu „**Cal**” anytime by pressing button .



### **Example calibration with weight**

Go with help of buttons „*Tare*” and „*Zero*” to menu „**CAL**”, visualized on display. Press button „Enter” to enter calibration menu. Display will show „**CAL 0**”. Press button „Enter” again. On display user shall see some numbers – this is directly result of input voltage to decimal value by analog-to-digital converter. LED „*Zero*” will light on to show that we are in sub-menu „**CAL 0**”. Unload platform of the scale to basic position. Wait numbers on display to be relatively stable – watch LED „*Stable*” or just look last digits to change no more than 1-4. Save this value as a zero weight position by pressing button „Enter”. Normally valid value for a zero position is a number between 200 and 10 000

ADC divisions. When button „Enter” is pressed for a short period of time on display user will see sign “Saved”, then again „**CAL 0**”. Press button „Tare” to go to next step - sub-menu “**CAL n**”. Press button „Enter” to go inside sub-menu. The display will clear, last digit will become “0”, LED „Tare” will light up to show user he is in sub-menu „**Cal n**”. Now G5102 expects user to enter calibration weight. This in fact should be the load that is intended to calibrate scale with. With buttons 0..9 from the keyboard user must enter correct weight. Entered weight automatically is converted in desired format, determined by what is selected for decimal point position and weight division value in menu “**PArAS**”. After correct weight is entered, confirm it with button „Enter”. If error is made while entering load value – button “C” clears display and weight value can be entered again. Now display gain shows some number, get from ADC conversion. Put on scale platform weight, equal to what is entered before that. Wait scale to stabilize measurement. If load cell is connected properly, the new value user will see on G5102 display must be bigger than value for zero position. Save this value with button „Enter”. For short period user will see sign „Saved” on display, then again „**Cal n**”.

**Unload scale platform.** Press button „Tare” or “Zero”, until you see on display sign „**Corr**”.

Press button „Enter”. Now on display user should see sign “null”. In this moment G5102 is calculating measurement swing from 0 to MAX and needed coefficients for measuring real weight. Also zero position is checked (that is why scale should be unloaded) and vibrations (stable position). If everything is normal user will see for 1 second calculated measurement swing in divisions, after that scale will go fine tuning mode. Here result is shown in metrological divisions, with precision of 0.1 divisions. This is **NOT** weight in kilograms, these are values between 0 and maximum number of divisions (normally 3000 – but in any case what is selected in menu “**PArAS**” for parameter **n**). Now user can put some weight and do fine tuning with buttons “Tare” or „Zero”. Remember that changing up or down showed value with 1.0 means that you will change this value with one real measurement step (i.e. 0.200 kg or 0.100 kg – what is selected for “**d=E**” in “**PArAS**”).

Pressing button “Enter” will save correction and put G5102 in mode of measuring real weight. Now result will be in kilograms. With buttons “Tare” or “Zero” user can go again in fine correction mode.

Graphically process of weight calibration is shown on Fig.7:








Generally output characteristic of any load cell has non-linear parts in the beginning and in the end. That is why it is good to use sensor with bigger capacity than scale capacity. Optimal is to use a load cell with 2 to 3 times higher capacity. That way its guaranteed that these non-linear stages will not be part of measurement range.

#### 4. Menu „Other“



In menu „Other“ are placed parameters which rarely should be set or changed, even from service engineers. These parameters:

- Fact - set all parameters and calibrations to factory default values

Enter this menu by pressing button . Since here is only one parameter the only buttons that work, are buttons  and , respectively confirm or Exit.



##### 4.1. Parameter „Fact“

With this option entire non-volatile memory of G5102 can be erased and all parameters will be set to factory default values. It should not be used often – only when the person setting the scale is in “dead end” and is wondering what to do with G5102.

Confirmation of erasing memory is on two levels - first button  should be pressed to enter in this function. Then user will see blinking sign “*Attent*”, which means „Attention! You are going to delete all settings!“. If user presses again button , actual erasing of whole non-volatile memory will begin. On display user will see sign „-hold-“, which means that the user should wait process to finish and not turn off G5102 from power grid until all is done.



Factory default settings for all important parameters are:

- |   |                                  |
|---|----------------------------------|
| ▪ Number of metrological divisions  | - <b>n = 3000</b>                |
| ▪ Weight division value   | - <b>e = 1</b>                   |
| ▪ Decimal point position  | - <b>dPP = 1</b>                 |
| ▪ Zero track speed  | - <b>Ztrac = 0.5e/1s</b>         |
| ▪ Range of button  | - <b>ZPerc = ±2% F.S</b>         |
| ▪ Range of button  | - <b>tPerc = 50% F.S</b>         |
| ▪ Overload  | - <b>oL = MAX + 8e</b>           |
| ▪ ADC amplifying  | - <b>Adc A = 1</b>               |
| ▪ Sampling rate for 1 measurement   | - <b>t-me = 150ms</b>            |
| ▪ Bits for shifting right the result  | - <b>Shr = 6 bit-a</b>           |
| ▪ Zero position   | - <b>3000 divisions of ADC</b>   |
| ▪ Full range swing in divisions   | - <b>20 000 divisions of ADC</b> |
| ▪ Fine correction   | - <b>0e in Full scale</b>        |
| ▪ Serial interface speed  | - <b>baud = 9600bps, None</b>    |

Scale serial number and firmware version of the scale, of course, are not deleted.

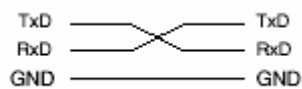
## IV. Serial interface

### *Physical connection*

Microcontroller unit G5102 is equipped with standard serial interface RS-232C. It can be used to transfer data to cash register or personal computer.

Standard null-modem cross cable is used, which in this case means:

<b>CANNON DB9 male PC</b>			<b>CANNON DB9 male PC</b>	
2 pin	→		3 pin	
3 pin	→		2 pin	
5 pin	→		5 pin	




*If physical connection layer is for RS-485 protocol, unit G5102 can control RTS line of connected 485<->232 converter - pin 7 of DB9 male connector.*

The unit has particular data protocol, which is not related to specific device, but if client wants – additional protocols or change in the existing can be made.

Communication parameters are hard-coded and are:

- Speed: 9600 bps
- Start bit: 1
- Stop bit: 1
- Data bits: 8
- Parity check: None

When a PC is connected to G5102, serial data transmission can occur in two modes:

- Weight data is transmitted always after a command is received from PC/external device;
- Data is transmitted when button  is pressed.

If second mode is used weight is transmitted only ONCE to the external device and weight should be stable. For a new transmission scale should be unloaded (must have initial zero position first).

Basic commands are for reading weight, tarring and zeroing the scale. Of course, tare and zero are working in their nominal range, no matter that command is through interface and not by pressing a button. Service parameters can not be changed through serial interface.

If command is wrong then the scale does not answer to the external device.

If command is correct G5102 respond according to data protocol, which is described below.

It is possible to send several commands at a time without waiting for answer, because G5102 has a 16-byte input buffer. Commands are served "first in-first served".



*Maximum cable length of serial connection must not exceed 15m with shielded 0.5mm<sup>2</sup> copper cables!*

### **Description of communication protocol**

Technical characteristics:

Speed: 9600bps;

Start bits: 1;

Stop bits: 1;

Data bits: 8;

Parity: None;


#### **Data protocol:**

PC reading weight:           W

Respond:                        sign (ASCII '+' or '-')  
                                      XX (MSB byte weight, HEX)  
                                      XX  
                                      XX (LSB byte weight, HEX)  
                                      CRC (checksum, sum of 'W' and 3 bytes weight)  
                                      0x0D (CR – STOP byte)

where XX are three bytes current weight in grams, in hexadecimal format (MSB first), CRC is control checksum – 'W'+Weight.



If button  is pressed scale sends data to external device in the same way as it responds to a command.

## V. Advanced options

Advanced firmware comes with more flexible possibilities to build a scale. Main difference is in menu "PArAS", where some parameters have extended range and several new are added.








These are:

Parameter (sub-menu)	Display	Limits	Value due to EN45501
Number of divisions	n	500-40 000	< 3001
Decimal point position	dPP	1.000-1000	-
Division value	e, gr/kg	1,2,5,10,20,50,100,200,500	-
Tare range	tP, %	10 - 100	100 %
Zero range	ZP, %	0 - 20	2%
Zero tracking speed	ZTrack, e/1s	0,1 - 0,9	0,5e
Initial zero position	ZInit,%	1 - 10	5%
Serial interface speed	Baud, bps	4800/9600	9600
Overload	oL, e	1 - 100e	8e
ADC amplifying	A	1 - 4	1
Measurement time	t-me	25 - 250	150
ADC bits	Shiftr	15 - 24	
Correction for altitude	Alt	0 - 24	
Correction for latitude	Lat	0 - 12	
Counting function	Cnt	On/Off	Off
Measure in percents function	Perc	On/Off	Off
Avoid zero before sending data serial	Bel	On/Off	Off
Working with label printer	Pr-LP	On/Off	-

## VI. Setting discrete Output levels in normal weighing mode

Using the 16-button keyboard user can set up to two output levels, on which discrete output of G5102 will change its state. These are levels on which a relay switch will be closed, giving signal to further automation process to take action. It is an option for G5102 and must be ordered separately. If so, in G5102 are embedded two reed-relay switches, which go ON when particular weight is reached. To go OFF again current weight should be below this level plus additional hysteresis value.

To set desired level user must do the following steps (G5102 should be in its normal measuring mode of work):

- If user wants to set Output 1 level – press keyboard button „1”; if he wants to set Output 2 level – press keyboard button „2”;
- For 2 seconds user will see on **“Weight”** sign **„doSE1”** or **“doSE2”** depending which button is pressed;
- Each Output has two settings – switch state level and hysteresis level for switching back to initial state. With buttons  and  user can select which parameter to set. Output level is parameter **„LEvEI”**, while hysteresis is parameter **„HySt”**. To enter setting one of the parameters user should press button .
- When entering to set one of the parameters initially user will see current value of this parameter (for instance 10.0 kg) in kilograms. If user does not want to change parameter value he can exit with button „Print”. If he desires to change the value this is done via keyboard buttons  ... . To clear current value press button . To confirm new value press button . If this parameter value is valid, a sign **„Saved”** will be written for 1 second, after that G5102 will go back one step in menu hierarchy. Exit without saving/changing parameter is made by pressing button „Print”.
- Consequently set two output levels, if two are desired.

Once levels are set and scale is in normal mode of operation (measuring weight) each of the outputs will go ON (closing relay contact) when its level is reached. Two outputs work independently from each other. Output signal will return to its initial state after current weight goes below (switching level-hysteresis value). This is done to prevent multiple switching, if scale is unstable near switching weight.

Output level can not exceed 655.35 kg, when working with nominal scale capacity up to 1t, and 65535 kg, when capacity is higher.

Hysteresis level can not exceed 250 measurement divisions (example: for 300kg scale with 0.100 kg division this means 25.0 kg).

If limits are exceeded – user will see error code on display “Weight”, then scale will return to weigh measure mode.



## VII. Troubleshooting

During scale work, it is possible to see the following error codes on "Weight" display:

Error	Possible reason	Actions to take place
<b>Err 1</b>	Data could not be stored in EEPROM	Repeat process, if error continues contact Gineers
<b>Err 2</b>	Wrong data from PC	
<b>Err 3</b>	Significant error in measurement (EMC noise, etc.)	
<b>Err 4</b>	ADC overrange	Load cell cables are connected wrong, ADC is damaged
<b>Err 5</b>	Error in calibration	Calibrate correctly
<b>Err 6</b>	Error in swing while calibrating	Calibrate correctly
<b>Err 7</b>	Dose level is incorrect	Correct the level
<b>Err 8</b>	Dose deviation range is incorrect	Correct the level
<b>G 00</b>	Main metrological parameters of the scale are not set – "n" and "d=E"	Look p. III.
<b>Err 10</b>	Free running counter is not saved in EEPROM memory	If it is continues, contact manufacturer
<b>noSet</b>	Main metrological parameters are not set	Set service parameters
<b>noCAL</b>	Calibration is not done correctly or at all	Calibrate scale
<b>-Hi-</b>	There is initial load >10% MAX, compared to 0, when switching ON the scale	Remove the load
<b>-Lo-</b>	There is initial load <10% MAX, compared to 0, when switching ON the scale	Put load (may be upper plate is missing)
<b>FuLL</b>	Measurement is above nominal scale capacity	

### **Power problems**

If the scale doesn't light at all when powered check the following:

- Check if power supply from the grid is present;
- Check if power cable is placed good in G5102 plug
- Check the fuse. If it is blown – replaced it, parameters are (0.5 ÷ 1.25A)/220V

## **VIII. Safety measures when working with G5102**

In normal conditions electronic unit G5102 is not dangerous and fulfils basic safety requirements. However, user should have several things in mind, when working with G5102:

- Mounting and setting should be done from qualified personal
- When cable connections are made it is good to watch for dirt and moisture to enter in G5102
- Power supply of G5102 is 220V AC
- Use shielded cables for load cell and interface connections
- Internally in the unit GND of load cell connection and RS-232 interface are tied together. If external device has a different ground potential – measures for galvanic isolation should be taken in order to avoid damage to G5102 measurement circuit
- Front panel is made from high quality materials; buttons are metallic inside and very durable. However, buttons should be pressed only by hand and with sharp objects or instruments
- If G5102 should be cleaned outside be sure first to remove power supply cable! Cleaning is made with soft towel, (not wet). Do not use detergents with benzyl or acetone components

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All principal schemes, board layouts, firmware and software are developed by "**Gineers**" Ltd. Changes are possible only from Gineers, and are negotiable.

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