Measurement · Weighing · Control

WIN5 Weight Indicator

Technical Manual

BLH NOBEL
A VPG Brand

CONTENTS

PRECAUTIONS

READ this manual BEFORE operating or servicing this instrument. FOLLOW these instructions carefully. SAVE this manual for future reference.

WARNING

Only permit qualified personnel to install and service this instrument. Exercise care when making checks, tests and adjustments that must be made with power on. Failing to observe these precautions can result in bodily harm.

DO NOT allow untrained personnel to operate, clean, inspect, maintain, service, or tamper with this instrument.

INTENDED USE

The WIN5 Instrument is a measuring and control device intended for industrial systems. Its basic function is to convert the signals from transducers to useful information. Transducer excitation is included as well as parameter controlled signal processing, indication of output levels, error supervision and operation of optional external equipment. The instrument supports several types of communication interfaces.

Change description

Document revision 0: New manual.

1 Introduction

1.1 General

Weight meter WIN5 is designed for cooperation with load cells (strain gages) in applications not required to be approved. Device is equipped with push-buttons allow easy setting of tare and zero, and also switching between nett and gross indications. Measured weight is displayed on 6-digit readable LED display. The device is equipped with two relay outputs and active current output (current source), which allow to use as controller for simple systems with batching function. A built in analogue output and RS-485 interface enable remote controlling of the device by a host system if required. The device software support two calibration methods: data sheet calibration, or dead weight calibration. All critical states of the device are signalised by proper error messages.

1.2 Maintenance

The unit does not have any internal replaceable or adjustable components available to the user. Pay attention to the ambient temperature in the room where the unit is operating. Excessively high temperatures cause faster ageing of the internal components and shorten the fault-free time of unit operation.

Do not clean the instrument with solvents. For cleaning use warm water with small amount of detergent or in the case of more significant contamination ethyl or isopropyl alcohol.

Using any other agents can cause permanent damage to the housing.

Product marked with this symbol should not be placed in municipal waste. Please check local regulations for disposal and electronic products.

1.3 Safety information

The instrument may only be utilized for the measurement and control functions, described in this Technical Manual. It is especially important to adhere to the load limits of the input/output connectors. We accept no responsibility for any damage arising from improper operation.

Any changes to the instrument, which causes any function changes, may only be carried out by the manufacturer or after discussion with and permission by the manufacturer.

If WIN5 is used in a manner not specified, the protection provided may be impaired.

This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.

1.4 Technical data

POWER SUPPLY	
Nominal Input Voltage	230 AC/DC; 50 – 60 Hz (Isolated)
Input Range	85 – 260 VAC
External fuse (required)	T-type, max. 2 A
Power consumption	Max. 4.5 VA @ 85 – 260V AC/DC
LOAD CELL INPUT	
Type	Strain gauge input.
Range	Programmable 2 mV/V or 4 mV/V.
Load cells power supply	4.6 V ± 10%, I_{max} ~ 60 mA
Load cells connections	6-wire technique, min. resultant impedance of 80 Ω (e.g. 4 load cells 320 Ω)
Max. display divisions	10 000 d
Tare range	100% of selected range
DIGITAL INPUT	
Low level	0V – 1V
High level	10V – 30V (about 5.5 mA @ 24V)
I/O POWER SUPPLY OUTPUT	
Rating	24V +5%, -10% / max. 100 mA, stabilized
ANALOG OUTPUT	
Type	Active current loop output (current source)
Range	0 - 24 mA
Load resistance max.	700 Ω
Display range	-99999 - 999999, plus decimal point
RS485	
Communication parameters	RS 485, 8N1 and 8N2, Modbus RTU (Receive 8N1 and 8N2. Transmit 8N2).
Baud rate	1200 bit/s - 115200 bit/s

RELAY OUTPUTS	
Number of outputs	2
Specification	Normally Open, 1A / 250V AC (cos φ = 1)
INSTRUMENT	
Display	LED, 6 digit, 13 mm height, red
Data memory	Non-volatile memory, EEPROM type
ISOLATION	
Power Supply	Isolated, see environmental for details
Relay Contacts	Isolated, see environmental for details
Common Group	Load Cell Input, Digital Input, I/O Power Supply Output, Analog Output, Communication. Isolated from Power Supply and Relay Contacts. The following terminals are internally connected: 7 (GND / PE), 3 Current loop return 6 I/O Power Supply negative 35 Negative Excitation
OUTER ENCLOSURE	
Protection level	IP 65
Housing type	Wall mount
Housing material	Stainless Steel
Housing dimensions	(H x W x D) 86 x 140 x 141 mm (excluding cable glands)
Back plate size	(H x W) 120 x 140 mm
Mounting hole pattern	(H x W) 106 x 126 mm
Mounting hole size	4 x Ø 6 mm
INSTRUMENT ENCLOSURE	
Protection level	IP 65 (from front) IP 20 (housing and connection clips)
Housing type	Panel mount
Housing material	NORYL - GFN2S E1
Housing dimensions	96 x 48 x 100 mm

Mounting hole	90.5 x 43 mm
Assembly depth	102 mm
Panel thickness	Max. 5 mm
ENVIRONMENTAL	
Operating temperature (depending on version)	0°C to +50°C or -20°C to +50°C
Storage temperature (depending on version)	-10°C to +70°C or -20°C to +70°C
Humidity	5 to 90% no condensation
Altitude	Up to 2000 meters above sea level
Screws tightening max. torque	0.5 Nm
Max. connection leads diameter	2.5 mm^2
Safety requirements	According to: PN-EN 61010-1, installation category: II Pollution degree: 2 Voltage in relation to ground: 300V AC Insulation resistance: >20 MΩ Insulation strength between power supply and input/output terminal: 1min. @ 2300V Insulation strength between relays terminal: 1min. @ 1350V
EMC	According to: PN-EN 61326-1

1.5 Ordering information

Part number: 110 897. Instrument in stainless steel enclosure with 5 cable glands

2 Installation

The unit has been designed and manufactured in a way assuring a high level of user safety and resistance to interference occurring in a typical industrial environment. In order to take full advantage of these characteristics installation of the unit must be conducted correctly and according to the local regulations.

- Read the basic in chapter **1.3 Safety information** prior to starting the installation.

- Ensure that the power supply network voltage corresponds to the nominal voltage stated on the unit's identification label.

- The load must correspond to the requirements listed in the technical data.

- All installation works must be conducted with a disconnected power supply.

- Protecting the power supply clamps against unauthorized persons must be taken into consideration.

2.1 Unpacking

After removing the unit from the protective packaging, check for transportation damage. Any transportation damage must be immediately reported to the carrier. Also, write down the unit serial number on the housing and report the damage to the manufacturer.

Attached with the unit please find:

- User's manual,
- Warranty,
- Assembly brackets - 2 pieces.

2.2 Assembly

- The unit is designed for mounting inside housings (control panel, switchboard) insuring appropriate protection against surges and interference. Metal housings must be connected to ground in a way that complies with the governing regulations.

- Disconnect the power supply prior to starting assembly.

- Check the connections are wired correctly prior to switching the unit on.

In order to install the unit, a 90.5 x 43 mm mounting hole must be prepared. The thickness of the material of which the panel is made must not exceed 5mm. When preparing the mounting hole take the grooves for catches located on both sides of the

housing into consideration. Place the unit in the mounting hole inserting it from the front side of the panel, and then fix it using the brackets. The minimum distances between the centre points of multiple units - due to the thermal and mechanical conditions of operation - are 115 mm x 67mm.

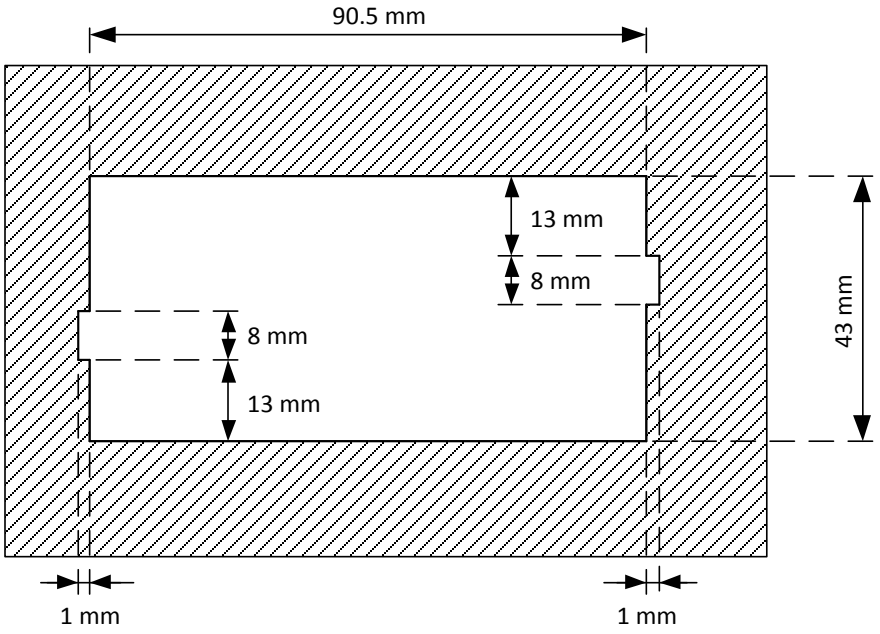


Figure 2.1 Recommended mounting hole dimensions

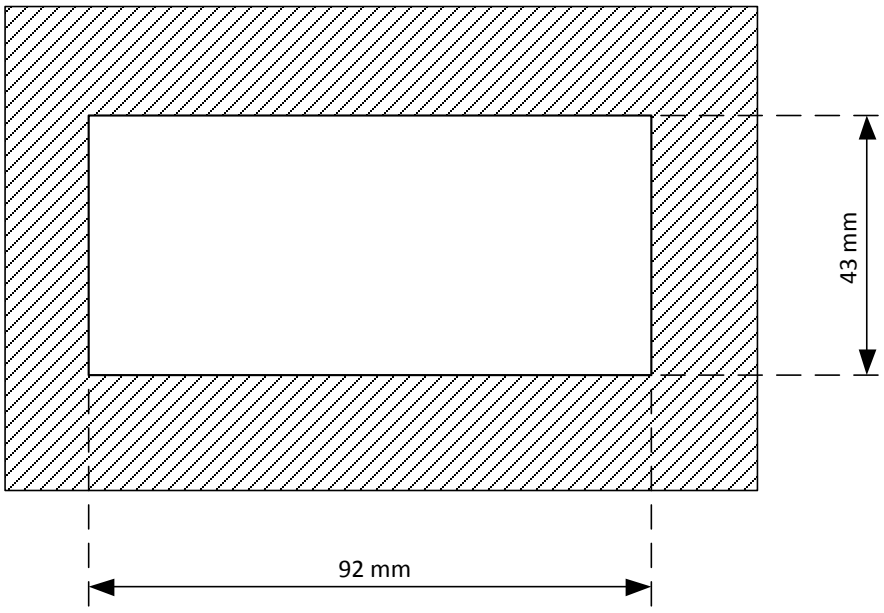


Figure 2.2 Allowable mounting hole dimensions

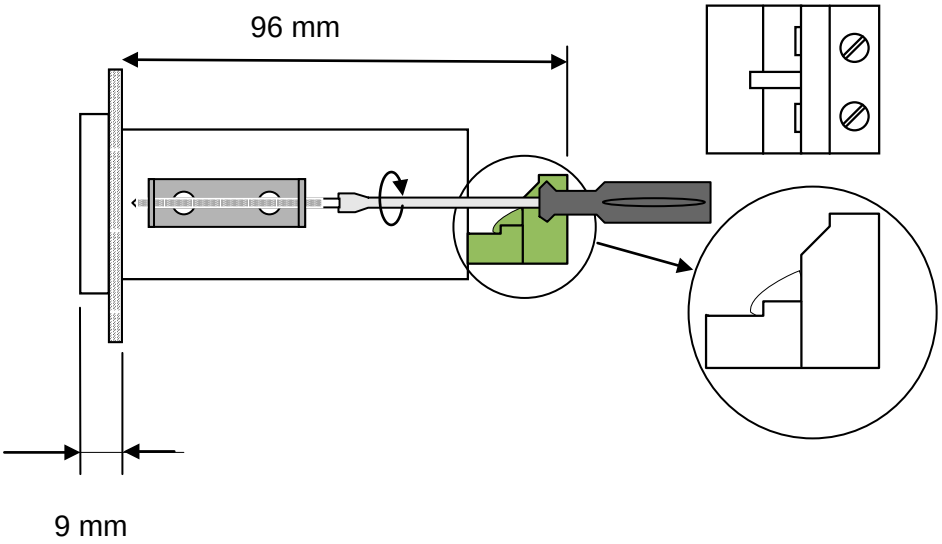


Figure 2.3 Installing of brackets, and dimensions.

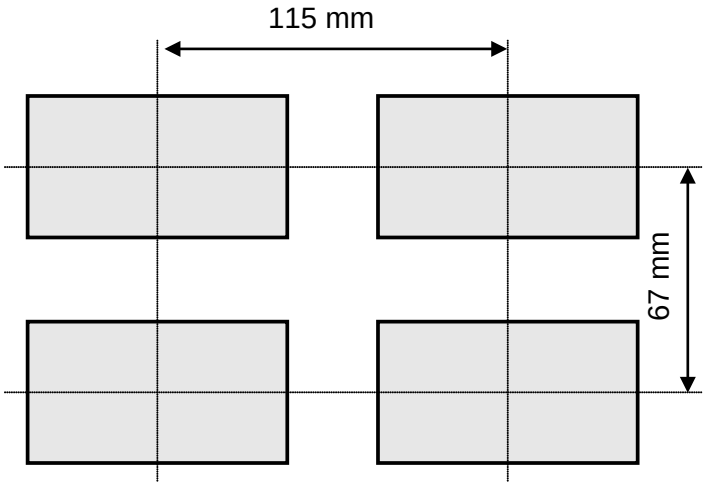


Figure 2.4 Minimum distances when assembly of a number of units

2.3 Electrical Connections

2.3.1 General Remarks

- Installation should be conducted by qualified personnel. During installation all available safety requirements should be considered. The fitter is responsible for executing the installation according to this manual, local safety and EMC regulations.

- The unit is not equipped with an internal fuse or power supply circuit breaker. Because of this an external time-delay cut-out fuse with minimal possible nominal current value must be used (recommended bipolar, max. 2A) and a power supply circuit-breaker located near the unit. In the case of using a monopolar fuse it must be mounted on the phase cable (L).

- The power supply network cable diameter must be selected in such a way that in the case of a short circuit of the cable from the side of the unit the cable shall be protected against destruction with an electrical installation fuse.

- Wiring must meet appropriate standards and local regulations and laws.

- In order to secure against accidental short circuit the connection cables must be terminated with appropriate insulated cable tips.

- Tighten the clamping screws. The recommended tightening torque is 0.5 Nm. Loose screws can cause fire or defective operation. Over tightening can lead to damaging the connections inside the units and breaking the thread.

- In the case of the unit being fitted with separable clamps they should be inserted into appropriate connectors in the unit, even if they are not used for any connections.

- Unused clamps (marked as n.c.) must not be used for connecting any connecting cables (e.g. as bridges), because this can cause damage to the equipment or electric shock.

- If the unit is equipped with housing, covers and sealing packing, protecting against water intrusion, pay special attention to their correct tightening or clamping. In the case of any doubt consider using additional preventive measures (covers, roofing, seals, etc.). Carelessly executed assembly can increase the risk of electric shock.

- After the installation is completed do not touch the unit's connections when it is switched on, because it carries the risk of electrical shock.

Due to possible significant interference in industrial installations appropriate measures assuring correct operation of the unit must be applied. To avoid the unit of improper indications keep recommendations listed below.

- Avoid common (parallel) leading of signal cables and transmission cables together with power supply cables and cables controlling induction loads (e.g. contactors). Such cables should cross at a right angle.

- Contactor coils and induction loads should be equipped with anti-interference protection systems, e.g. RC-type.
- Use of shielded signal cables is recommended. Signal cable shields should be connected to the earth only at one of the end of the cable.
- In the case of magnetically induced interference the use of twisted couples of signal cables (so-called “spirals”) is recommended. The spiral (best if shielded) must be used with RS-485 serial transmission connections.
- In the case of load cell or control cables are longer than 30m or go outside of the building then additional safety circuits are required.
- In the case of interference from the power supply side the use of appropriate anti-interference filters is recommended. Bear in mind that the connection between the filter and the unit should be as short as possible and the metal housing of the filter must be connected to the earth with largest possible surface. The cables connected to the filter output must not run in parallel with cables with interference (e.g. circuits controlling relays or contactors).

Connections of power supply voltage and load cell cables are done using the screw terminals on the back of the unit’s housing.

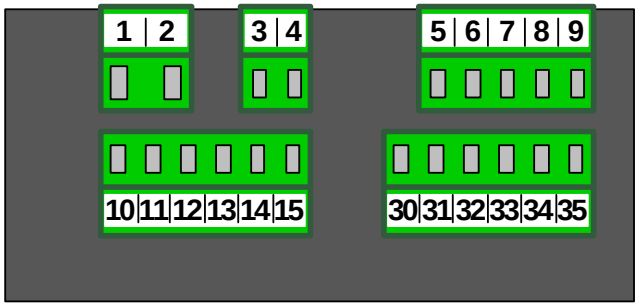


Figure 2.4 Instrument Screw Terminals at Rear Side

2.3.2 Power Supply Connection

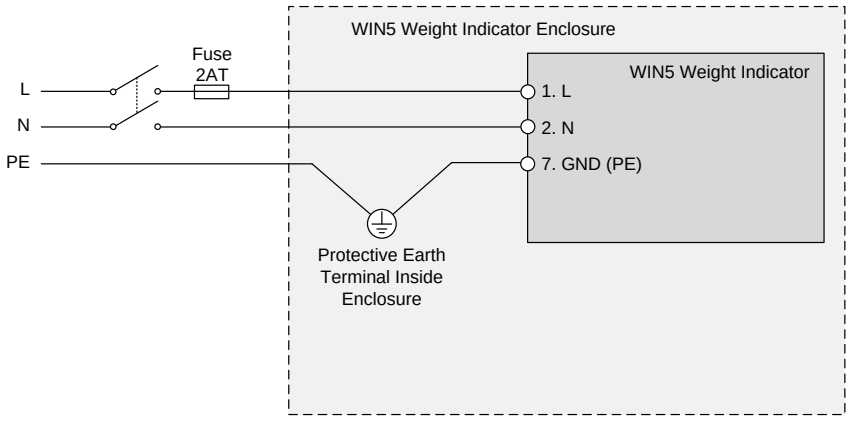


Figure 2.5 Connection of Power Supply and Protective Earth

2.3.3 I/O Connections

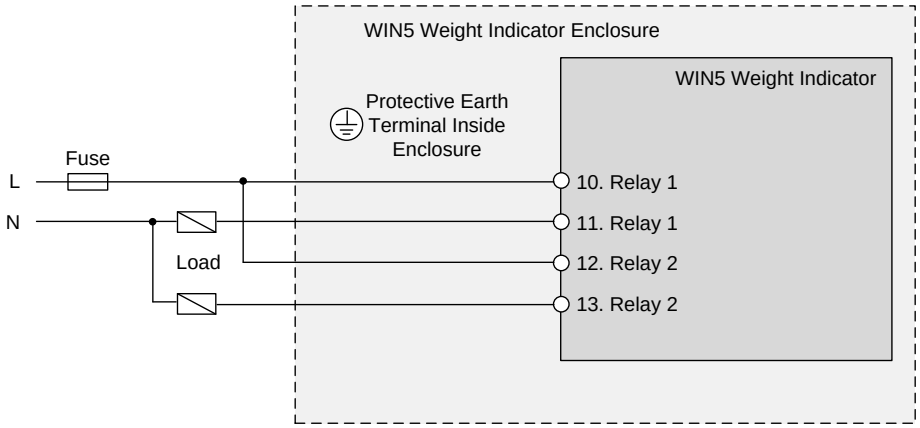


Figure 2.6 Connection of Relay Outputs, PE wires should be connected to the PE Terminal inside the enclosure.

Contacts of relay outputs are not equipped with spark suppressors. While use the relay outputs for switching of inductive loads (coils, contactors, power relays, electromagnets, motors etc.) it is required to use additional suppression circuit (typically capacitor 47nF/ min. 250VAC in series with 100R/5W resistor), connected in parallel to relay terminals or (better) directly on the load. In consequence of using the suppression circuit, the level of generated electromagnetic disturbances is lower, and the life of relay contacts rises

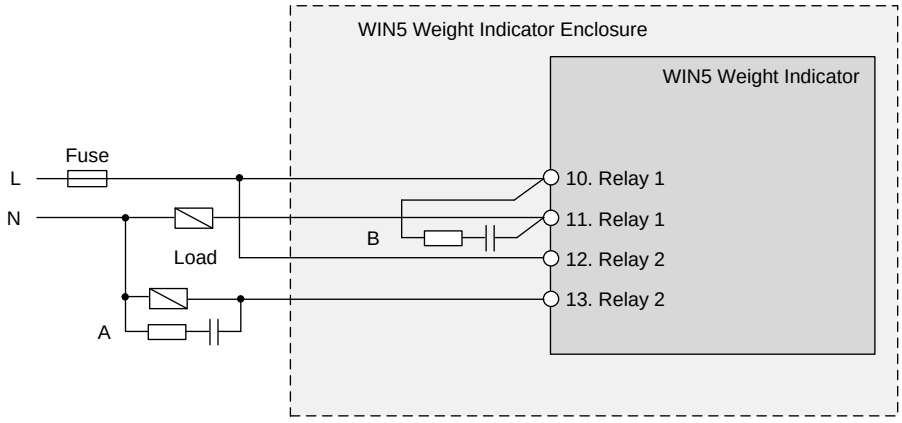


Figure 2.7 Examples of suppression circuit connection: A) To the inductive load, B) to the relay terminals.

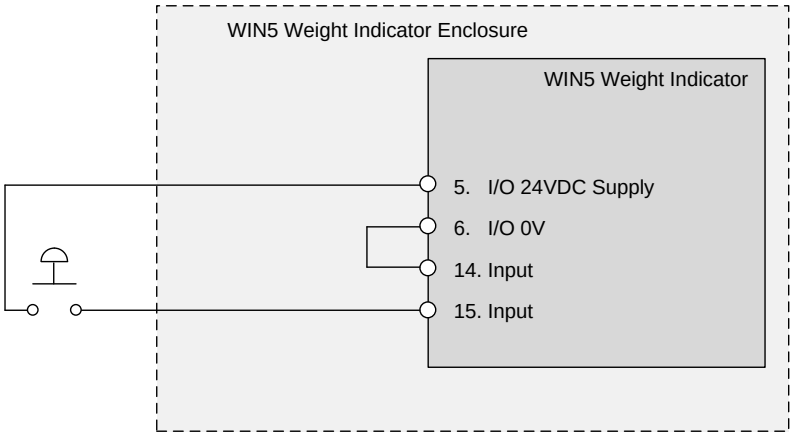


Figure 2.8 Connection of Digital Input.

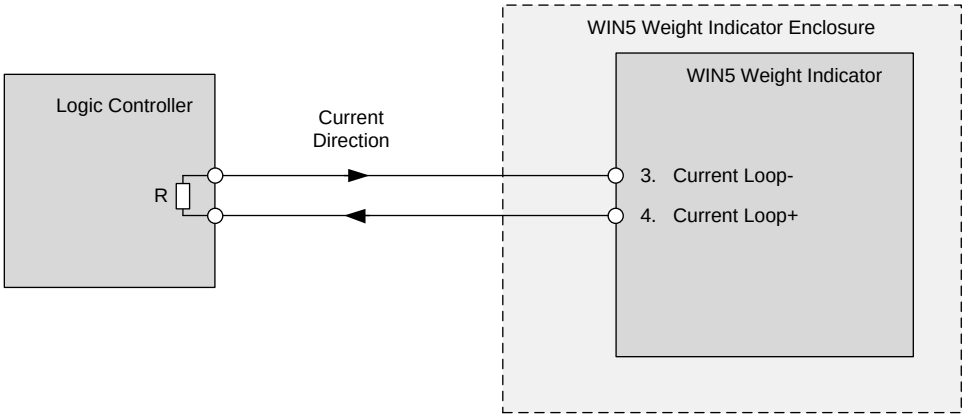


Figure 2.9 Connection of Current Loop Output

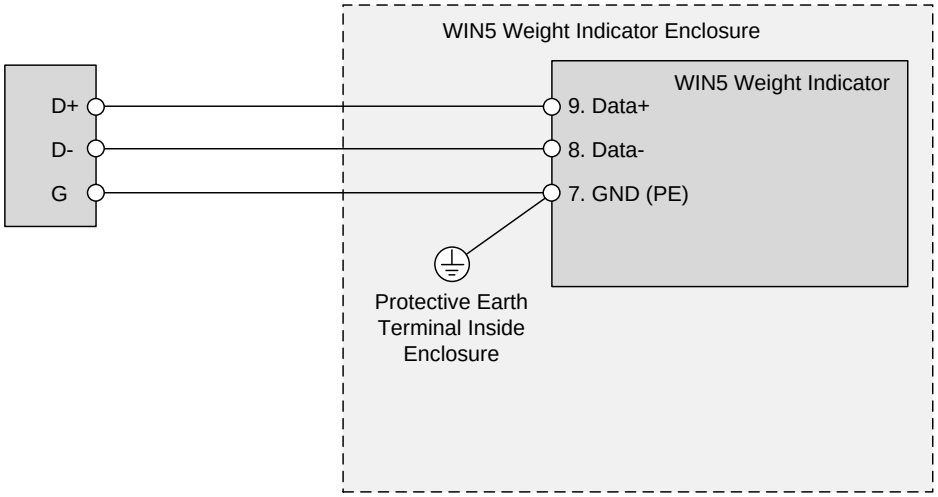


Figure 2.9 Connection of RS485 (TIA-485)

2.3.4 Connection of Strain Gauge Bridges

Installation should be made according to local safety and electromagnetic compatibility regulations. While installation pay special attention to:

- Use of shielded wires,

- Shield of wires should be connected with metal housing using a conductive glands or metal clamp to ensure proper electrical contact.

- Shielded wires should be mounted as close metal case of the device (e.g. connection box) as possible, and as far from disturbing wires (e.g. powering motors) as possible.

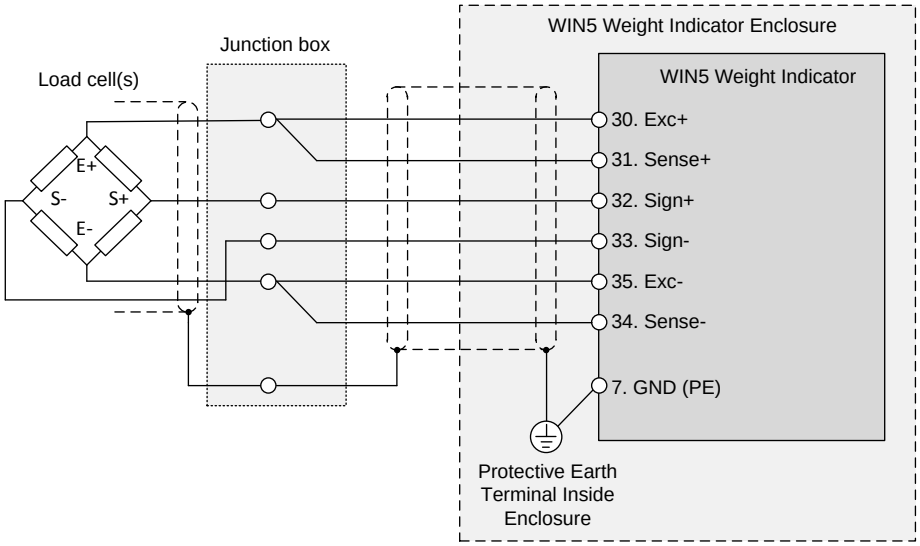


Figure 2.11 Connection of Load cell(s) with Junction Box.

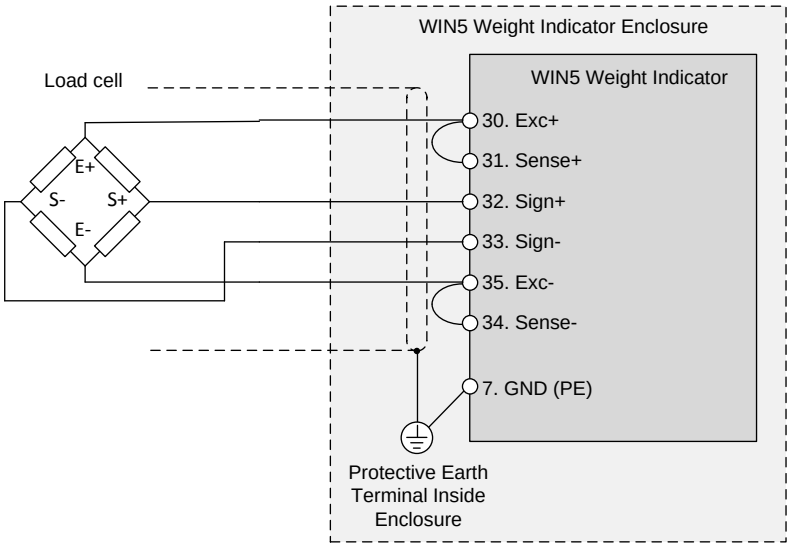
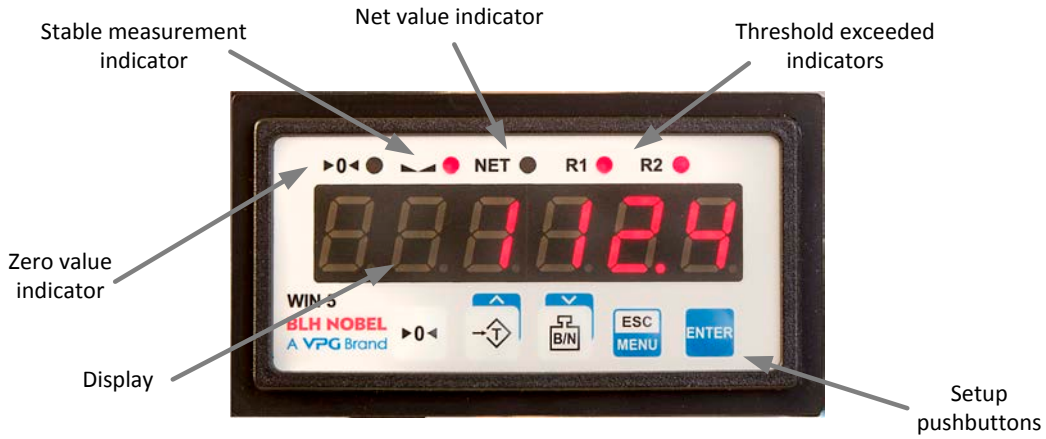


Figure 2.12 Connection of Load cell without Junction Box.

3 Front Panel



3.1 Symbols and functions of push-buttons:

ESC MENU	Symbol used in the manual: **[ESC/MENU]** Functions: Enter to main menu (press and hold by at least 2 sec.) Exit the current level and Enter to previous menu (or measure mode) Cancel the changes made in parameter being edited
ENTER	Symbol used in the manual: **[ENTER]** Functions: Start to edit the parameter Enter to the sub-menu, Confirmation of changes made in parameter being edited.
T	Symbol used in the manual: **[^]** or **[T]** Functions: Tare Change of the present menu, Modification of the parameter value, Change of the display mode.
B/N	Symbol used in the manual: **[v]** or **[B/N]** Functions: Switch between gross/nett value Change of the present menu, Modification of the parameter value, Change of the display mode.
▶0◀	Symbol used in the manual: **[>0<]** Functions: Zeroing displayed value.

4 Principle of Operation

After turning the power supply on, device ID and software version are showed on the display, next the controller goes to the measurement mode.

4.1 Measurement Mode

While device is in measurement mode LED display shows gross or net weight. Net weight presentation mode is signalized by LED marked „**NET**". If the weight is constant during 10 successive measurements then it is signalized by LED marked „**><**" (stable measurement). LED diode marked „**>0<**" signalizes that result of measurement is zero.

Zeroing of the scale is possible by pressing [**>0<**] button, but only when current weight do not exceeds 2% of full range, and measurement is stable (LED „**><**" is lighted). Pressing of [**T**] button causes storing of current value as tare weight, after that device goes to displaying net weight. Pressing of [**B/N**] button causes alternative change of presentation mode (gross - net weight).

Device recalculates measurement results according to calibration factors entered by a user using „**CALibr**" menu. ***Nominal measurement range*** is 2 mV/V or 4 mV/V (depend on value of **„rAnGE"** parameter in „**CALibr**" menu).

If the result of measurement exceeds the ***nominal measurement range***, a warning **" Hi "** or **" Lo "** is displayed in place of measurement value, depends on exceeded value. All other warnings are displayed in numerical or text form (see chapter ***SIGNALISATION OF ERRORS***).

If the measurement value do not exceeds nominal measurement range but displayed value exceeds range -99999 ÷ 999999, the warning "**-OvEr-**" is displayed rather than the calculated result.

In the measurement mode user can check main thresholds values. After pressing **[ENTER]** button, name of the threshold **"rELPr1"** and his value will be displayed on the display in alternating mode. If **[^]** or **[v]** will be pressed in 5 sec again, the next threshold will be displayed, else the device comes back to the measurement mode. If a ***free access*** is enabled (see description of ***"SECur" menu***), user can change the value of particular threshold pressing button **[ENTER]** once again (see: ***PARAMETERS EDITION***).

All accessible parameters can be changed by entering the menu (see: ***DEVICE PROGRAMMING***). Use the local keyboard or the remote controller to do it. (Note: all parameters can be remote changed via RS-485 interface).

Configuration of the device (via menu or RS-485 interface) **will not stop the measuring**.

4.2 Detection of the Peak Values

The **WIN5** weighting instrument is equipped with peak detection function. It can detect peaks of the input signal and display their values. Presets connected with this function are placed in **”HOLd”** menu (see description of ***”HOLd” menu***). The detection of the peak can be done if the measured signal raises and drops of value at least equal to parameter **”PEA”**. Detected peaks are displayed during the time defined by parameter **”timE”**. If a new peak will be detected while one is displayed, this new peak will be displayed and display time counter will be cleared (**Figure 4.1**). If no peaks are detected while time **”timE”** elapses**,** device starts to show the current value of input signal again. If „**H diSP**”=”**HOLD**” then setting parameter **"timE"**=**0.0** causes holding peak value until **[ESC]** button is pressed. If „**H diSP**”=”**rEAL**” then value **"timE"**=**0.0** means no holding. Displaying peak value is signalized by flashing most right decimal point.

The relays/LEDscan be controlled depending on the current value of input signal or the peak value (see ***”HOLd” menu***).

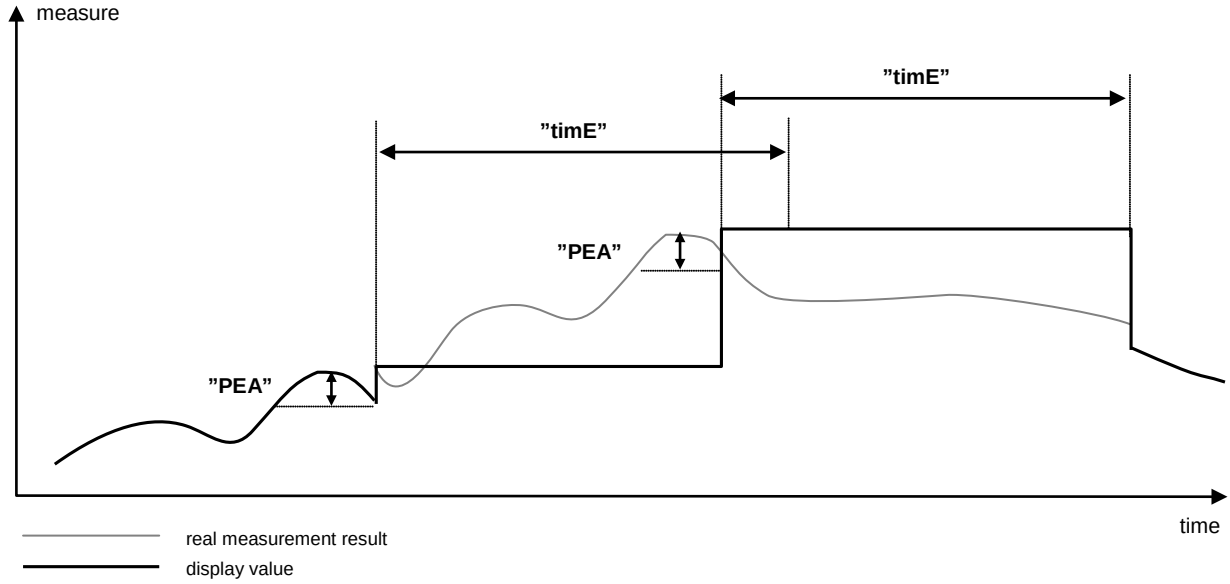


Figure 4.1 Process of peaks detection

4.3 Control of the Relay Outputs

The control of the object (measured signal) is done due to gross or nett value (depending on **“SourCE”** parameter), and is realized via relay outputs. Front panel LEDs named „**R**” indicates the state of particular relay output.

Modes of the control can be changed depend on the values of parameters **“SourCE”**, **“SEt P”**, **“SEt P2”, “HYSt”**, **“modE”**, **“t on”**, **“t oFF”**, **“unit”** and **“ALArmS”.** Depend on **“modE”** parameter, relays can be not used or controlled over one or two thresholds values.

If one threshold is used (**Figure 4.2**) the relay can be turned on (**“modE”** = **”on”**) or off (**“modE”** = **”oFF”**) when the input signal value is contained in ***zone A.*** If two thresholds are used (**Figure 4.3**) the relay will be turned on when value of input signal is contained in ***zone A*** (**“modE”** = **”in”**) or ***zone B*** (**“modE”** = **”out”**) and turned off if the signal is contained in the second one.

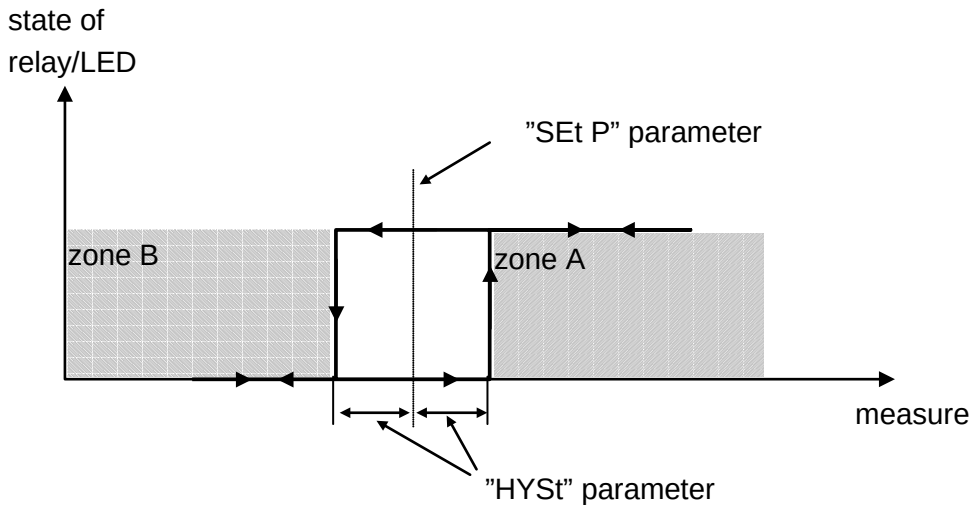


Figure 4.2 One threshold control of the relay/LED outputs

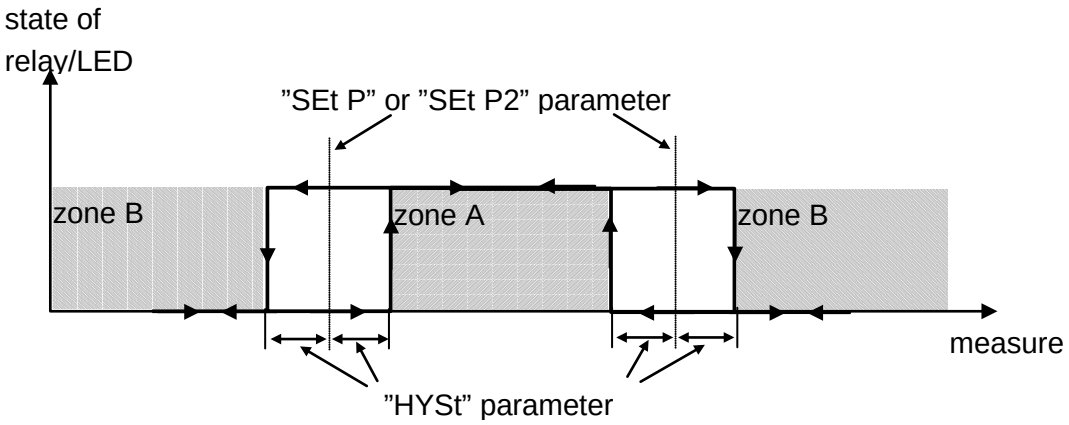
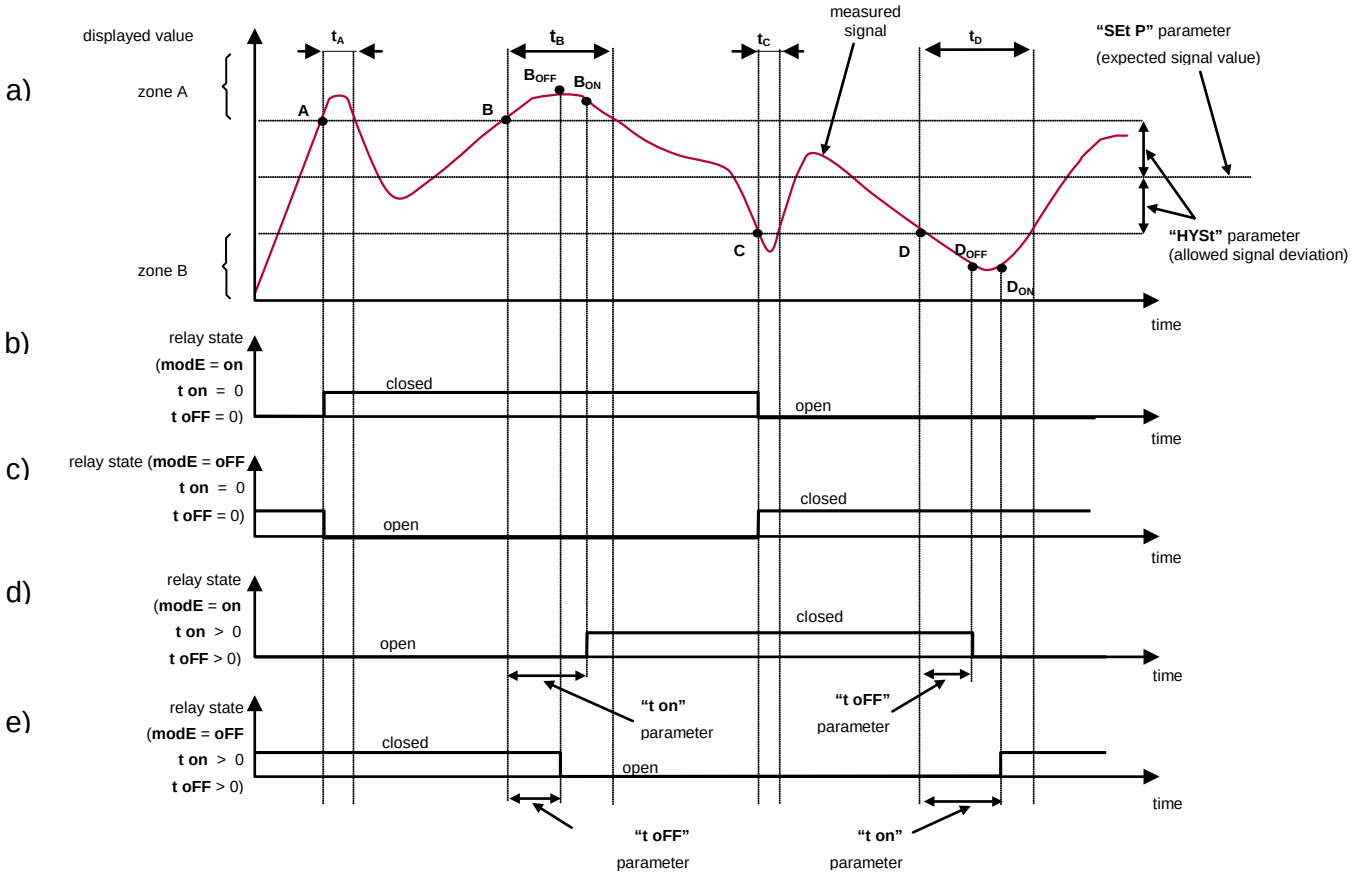


Figure 4.3 Two threshold control of the relay/LED outputs

4.3.1 One threshold mode

Figure 4.4 presents the principle of relay outputs operation for one threshold mode, and example values of other parameters.



Description:

A, B, C, D - points where measured signal exceeds border values (expected value ± allowed deviation)

B_{ON} ,B_{OFF} ,D_{ON} ,D_{OFF}- relays state changes moments: (for **"t on"** > 0, **"t oFF"** > 0)

t_A , t_B , t_C , t_D - time periods while input signal is in zone A or zone B

Figure 4.4 Principle of LED/relay output operation for one threshold mode

"SEt P" parameter sets a **threshold** of the relay, and parameter **"HYSt"** sets a **hysteresis** of the relay (graph: a). The relay can change his state when input value is equal to or greater than (over or under) ***border value*** (means values equal to ***threshold+hysteresis*** and ***threshold-hysteresis*** respectively) and t_A ,t_B ,t_C ,t_D times are bigger than the time defined by parameters **"t on"**, **"t oFF"** and **"unit"**. If **"t on"** and **"t oFF"** parameters are set to "0", then the relay state will be changed **as soon** as input value exceeds any of the ***border values*** (see points A and C, graphs: a, b, c).

If values of **"t on"** or/and **"t oFF"** are positive, then relay state will be turned on if the input value is equal to or greater than the ***border values*** and stays like that during at least **"t on"** (see points B_{ON}, D_{ON}, graph a, d, e). Similarly, the relay will be turned off if time **"t oFF"** elapse since the input signal value is equal to or greater than the ***border values*** (see points B_{OFF}, D_{OFF}, graph: a, d, e).

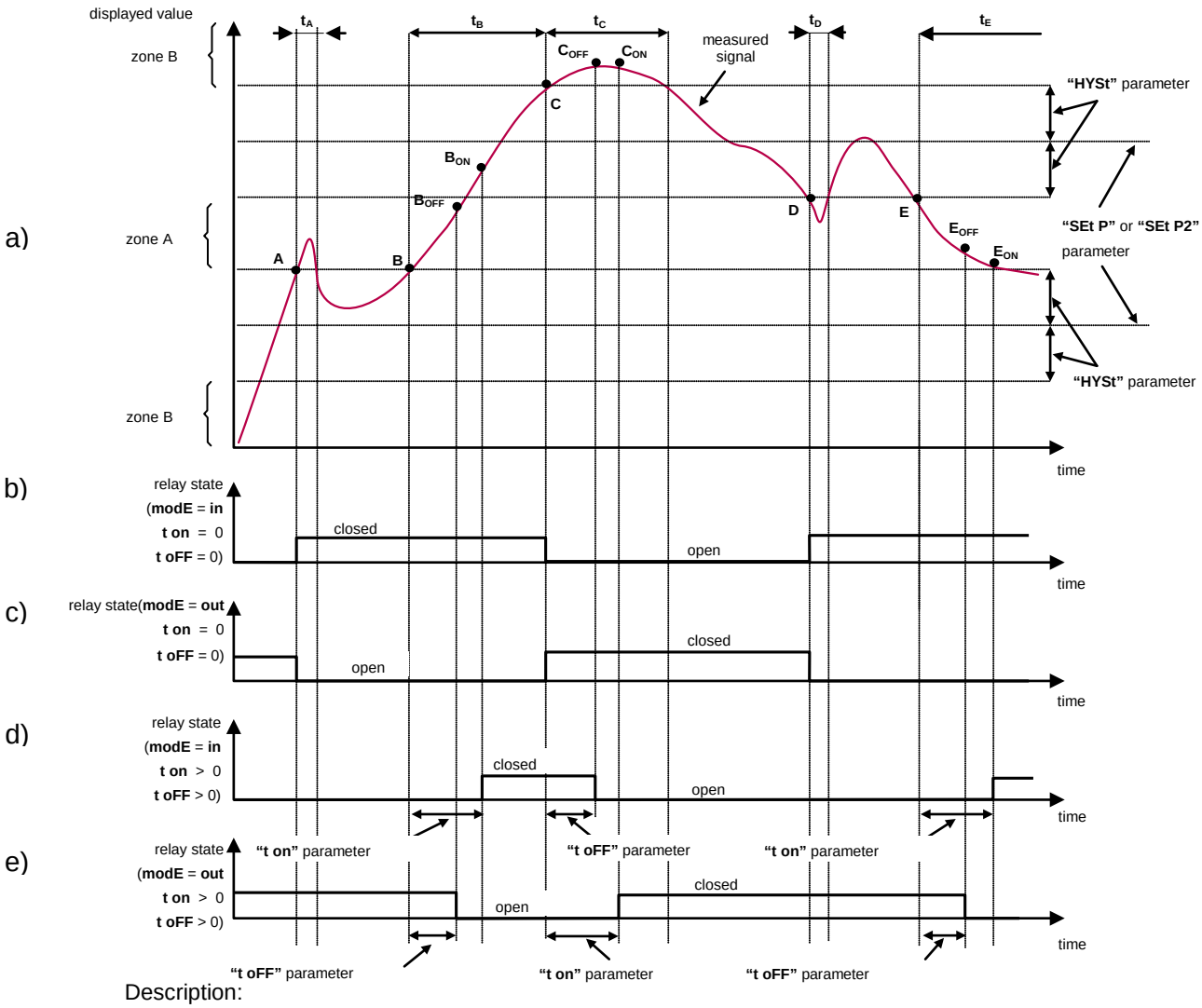
If t_A ,t_B ,t_C or t_D (when input signal stay in ***zone A*** or ***zone B***) are lower than parameters **"t on"** or **"t oFF"**, the relay will not change his state (see points A and C, graph: a, d, e). The state of relay output while the input value exceeds the ***border values*** (points A,

B, C, D) is described by parameter **“modE”.** The relay can be turned on (**“modE”** = **”on”**), or turned off (**“modE”** = **”oFF”**) when input signal value is contained in ***zone A*** (graph: a).

The parameter **“ALArmS”** allow user to set the relay output behaviour in critical situations (e. g. Input values exceeds ***permissible measurement range*****).** User can select that the relays will be turned on, turned off, or not changed in critical situations.

All parameters connected with relay outputs are described in paragraph ***”rELAy1” menu****.*

4.3.2 Two thresholds mode



Description:

A, B, C, D, E	- points where measured signal exceeds border values (expected value ± allowed deviation)
B_{ON}, B_{OFF}, C_{ON}, C_{OFF}, E_{ON}, E_{OFF}	- relays state changes moments: (for **“t on”** > 0, **“t oFF”** > 0)
t_A , t_B , t_C , t_D , t_E	- time periods while input signal is in zone A or zone B

Figure 4.5 Principle of LED/relay output operation for two thresholds mode

Figure 4.5 presents the principle of relay outputs operation for two thresholds mode, and an example value of other parameters. In this mode parameter **“SEt P2”** is accessible in common with **“SEt P2”**, this parameter describes a second threshold of the relay output. The parameters **“HYSt”**, **“modE”**, **“t on”**, **“t oFF”**, **“unit”** and **“ALArmS”** are connected with both **“SEt P”** and **“SEt P2”** thresholds. While the controlling process, the relay output changes his state depends of both **“SEt P”** and **“SEt P2”** thresholds in similar way as it was described in one threshold mode (for more details see table at relay parameter description). Time parameters like **“t on”**, **“t oFF”** and **“unit”** also affects both thresholds.

If two threshold mode is used, **“modE”** parameter defines state of the relay output when the input value occurs in a particular zone defined by ***border values*** of both **thresholds**. The relay can be turned on if the input value is contained in ***zone A*** (**“modE”** = **”in”**) or ***zone B*** (**“modE”** = **”out”**) and turned off if it is contained in the second one (**Figure 4.5**).

Control of relay outputs depends on difference between thresholds values (**zone A**) and outside of threshold values (**zone B**). But the order of the thresholds is important if **“HYSt”** parameter is equal zero.

5 Instrument Set-up

5.1 General

The device menu allow user to set all parameters connected to operation of measurement input, control modes, critical situations behaviour, communication via RS-485 and access settings. The meaning of the particular parameters is described in paragraph ***MENU DESCRIPTION***.

Some of the parameters can be accessed without menu entering (quick view mode). After pressing **[ENTER]** button, name of the threshold (**"rELPr1"**) and his value will be displayed on the display in alternating mode. If **[^]** or **[v]** will be pressed in 5 sec, the next threshold will be displayed, else the device comes back to the measurement mode. If a ***free access*** is enabled (see description of ***"SECUr"*** menu), user can change the value of particular threshold pressing button **[ENTER]** (see: ***PARAMETERS EDITION***).

If particular parameter has been changed and confirmed in quick view mode, its new value is displayed in alternating mode with parameter name by few seconds. Confirmed changes may be checked or user can switch viewed parameter pressing [^] or [v] button.

5.2 Enter Menu System

To enter main menu (being in the measurement mode) operator must to press and hold at least 2 sec. **[ESC/MENU]** button.

If the user password is defined (see parameter **"SEtCod"**, menu ***"SECUr"***), operator have to enter correct one before proceeding to menu options . Entering of the passwords is similar to the edition of numeric parameters (see: ***PARAMETERS EDITION***), however presently editing digit is showed only on the display, other digits are replaced by "-" sign.

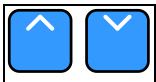
After entering of last digit of the password first menu position will be displayed (if the password is correct) or warning "**Error**" in other case.

Pay attention when device parameters are being changed. If it is possible, turn off controlled installation (machine)

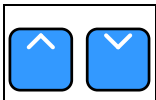
Due to problem with direct displaying of **"m**" letter, it is exchanged with special sign " ". Independently in this technical manual letter „**m**" is used to make it more readable (example: **"modE"**).

If a password different from „**0000**" is set, then entering main menu requires that a correct password is given. If the wrong password is entered a warning is displayed and the instrument unit returns to measurement mode.

5.2.1 Button Functionality in Menu System

	Selection of sub-menu or parameter for editing. Name of selected item (sub-menu or parameter) is displayed.
	Operation of **[ENTER]** button depend on present menu position: • if the name of some sub-menu is displayed - enter this sub-menu; name of the first parameter (or next level sub-menu) is displayed, • if the name of some parameter is displayed - enter the edition of this parameter; present value of the parameter is displayed,
	**[ESC/MENU]** button allow user to exit present menu level and goes to upper level menu (or measurement mode).

5.2.2 Buttons Functionality when Editing Parameters:

	While editing numeric parameter: • Change of current (flashing) digit • Slide change of value (acceleration, deceleration, direction change) While editing choice parameter - selection of choice parameter.
	If numerical parameter is being edited, a short press of **[ENTER]** button change edited position. A long press of **[ENTER]** button (at least 2 sec.) causes of display a **"SEt?"** ask, which allow user to make sure if change of the parameter value is correct. If choice parameter is being edited, a short press of **[ENTER]** button causes of display a **"SEt?"** ask. When **[ENTER]** button is pressed again (while **"SEt?"** is displayed) the new value of the parameter is stored in EEPROM memory.
	Pressing this button operator can cancel the changes done up to now (if they were not approved by **[ENTER]** button after the **"SEt?"** ask) and come back to menu

5.3 Parameter Editing

To start edition of any parameter user should select name of desired one using **[^] [v]** buttons and then press **[ENTER]**.

5.3.1 Numeric Parameters (digit change mode)

Numerical parameters are displayed as decimal numbers. The mode of its new value entering depends on chosen edit method (see parameter „**Edit**").

In mode "by digit" („**Edit**"="**dig**") pressing one of the keys **[^]** or **[v]** causes change of current position (flashing digit) or the sign (+/-). Short pressing of the **[ENTER]** button causes change of the position (digit).

Press **[ENTER]** at least 2 seconds to accept the changes, after that question **"SEt?"** is displayed, and user must to confirm (or cancel) the changes. To conform changes (and story it in EEPROM) press **[ENTER]** button shortly after **"SEt?"** is displayed. To cancel the changes press **[ESC]** button shortly after **"SEt?"** is displayed. After that the device returns to the menu.

5.3.2 Numeric Parameters (slide change mode)

In "slide change" mode („**Edit**"="**Slid**"), buttons **[^]** and **[v]** has different functions.

To increase edited value press (or press and hold) **[^]** button only, the increasing became quickest as long as button **[^]** is pressed. To slow down the increasing, button **[v]** can be used. If **[v]** is pressed shortly (and button **[^]** is still pressed), increasing slow down for a moment only, if **[v]** is pressed and held while button **[^]** is still pressed the increasing slow down and will be kept on lower speed.

To decrease the edited value press (or press and hold) **[v]** button only. The decreasing became quickest as long as button **[v]** is pressed. To slow down the decreasing, button **[^]** can be used. If **[^]** is pressed shortly (and button **[v]** is still pressed), decreasing slow down for a moment only, if **[^]** is pressed and held while button **[v]** is still pressed the decreasing slow down and will be kept on lower speed.

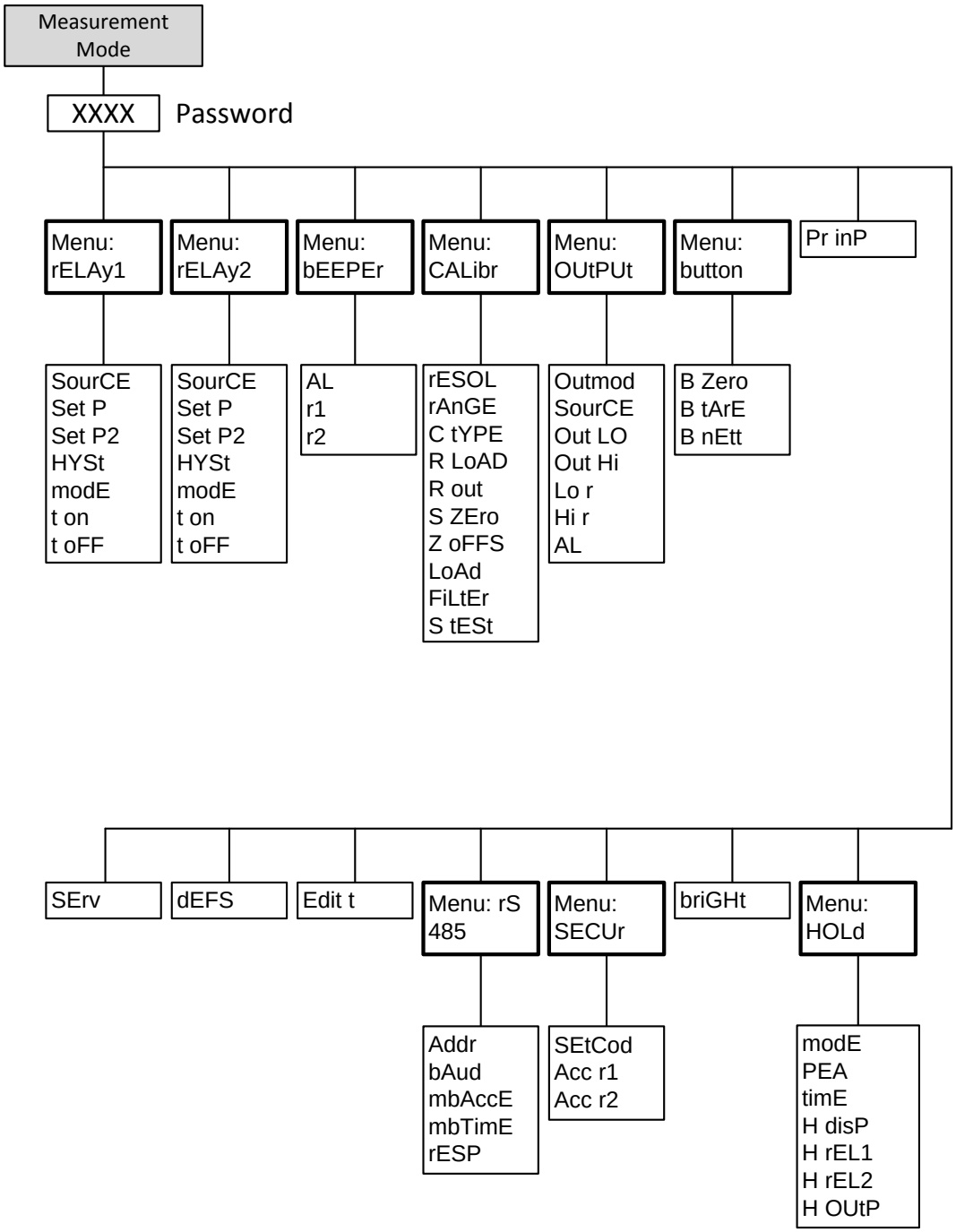
Press **[ENTER]** at least 2 seconds to accept the changes, after that question **"SEt?"** is displayed, and user must to confirm (or cancel) the changes. To conform changes (and story it in EEPROM) press **[ENTER]** button shortly after **"SEt?"** is displayed. To cancel the changes press **[ESC]** button shortly after **"SEt?"** is displayed. After that the device returns to the menu.

5.3.3 Choice Parameters

Switch parameters can be described as a sets of values out of which only one of the options available on the list can be selected for the given parameter. Options of switching parameter are selected using **[^]**, **[v]** keys.

Short pressing of **[ENTER]** causes in displaying of the acknowledge question (**"SEt?"**). If key **[ENTER]** is pressed again, the changes are accepted, stored in EEPROM end the edition process finished. Pressing the key **[ESC]** after **"SEt?"** causes in cancelling of made changes and returning to menu.

5.4 Menu Structure



5.5 Parameters

On the following pages a survey of all parameters is presented. The parameters are divided in groups following the menu they belong to. For choice parameters the available choices are given. For numerical parameters, a value range is given.

At the end of the table, the default value is given in < >.

To the right there is a short parameter explanation and, *in italic,* the results for the different alternatives.

Range/Alternatives <default value>	Explanation and result of alternatives.

5.5.1 rELAy1 and rELAy2 Menu

This menu allows configuring the operation mode of relays and LEDs marked „**R**" (e.g. **"R1"** or **"R2"**). If there are few relay outputs available, then every output has its own configuration menu (e.g. menu **„rELAy2"** for relay (LED) „**R2**").

SourCE

GroSS nEtt <GroSS>	Parameter defining kind of result using to control state of this relay. **GroSS** Relay is controlled due to gross value of weight, **nEtt** Relay is controlled due to nett value of weight.

SEt P

Range: -99999 – 999999 <20>	First threshold of the relay. **Threshold is the medium value of relay hysteresis.**

SEt P2

Range: -99999 - 999999 <30>	Second threshold of the relay. This threshold is accessible when **"modE"** parameter is set to **„in"** or **„out"** value. **Threshold is the medium value of relay hysteresis.**

HYSt

Range: 0 - 99999 <0.0>	Hysteresis of relay. Full hysteresis of the relay is equal to 2x **"HYSt"** parameter. The relay state can change when an input signal is out of **threshold-hysteresis** to **threshold+hysteresis** zone.

Presented parameters should be set to ensure that **"SEt P" + "HYSt", "SEt P2" + "HYSt", "SEt P" - "HYSt"** or **"SEt P2" - "HYSt"** do not exceeds the measure range. Additionally, in two threshold mode ("**modE**"= „**in**" or „**out**"), the hysteresis for both thresholds must not cover each other (in other case relay can't change his state).

Range/Alternatives <default value>	Explanation and result of alternatives.

modE

noACt
on
oFF
in
Out
modbuS
<in>

Relay operation mode.

noACt The relay is not active (permanent turned off)

on One threshold mode, the relay is turned **ON** when input signal is greater than or equal to the threshold; detailed mode of action depends on **"SEt P"** and **"HYSt"** parameters settings and is shown in **Tab.7.1**,

oFF One threshold mode, the relay is turned **OFF** when input signal is greater than or equal to the threshold; detailed mode of action depends on **"SEt P"** and **"HYSt"** parameters settings and is shown in **Tab.7.1**,

in Two thresholds mode; relays turns on when measured signal is between thresholds; detailed mode of action depends on **"SEt P"**, **"SEt P2"** and **"HYSt"** parameters settings and is shown in **Tab.7.1**,

Out Two thresholds mode; relays turns on when measured signal is outside the thresholds range; detailed mode of action depends on **"SEt P"**, **"SEt P2"** and **"HYSt"** parameters settings and is shown in **Tab.7.1**,

modbuS **T**he relay is controlled via RS-485 interface, independently on the input signal.

Relay mode of action depending on modes and values in parameters **"SEt P"**, **"SEt P2"** and **"HYSt"**

Mode:		Relay switches on when:		Relay switches off when:	
„on"		$w \geq Pr$, $w \geq Pr + h$,	for h=0 for h≠0	$w < Pr$, $w \leq Pr - h$,	for h=0 for h≠0
„oFF"		$w < Pr$, $w \leq Pr - h$,	for h=0 for h≠0	$w \geq Pr$, $w \geq Pr + h$,	for h=0 for h≠0
„in"	for SEt P **<** SEt P2	$Pr_1 \leq w \leq Pr_2$, $Pr_1 + h \leq w \leq Pr_2 - h$,	for h=0 for h≠0	$w < Pr_1$ *v* $w > Pr_2$, $w \leq Pr_1 - h$ *v* $w \geq Pr_2 + h$,	for h=0 for h≠0
„Out"	for SEt P **<** SEt P2	$w < Pr_1$ *v* $w > Pr_2$, $w \leq Pr_1 - h$ *v* $w \leq Pr_2 + h$,	for h=0 for h≠0	$Pr_1 \leq w \leq Pr_2$, $Pr_1 + h \leq w \leq Pr_2 - h$,	for h=0 for h≠0
„in"	for SEt P **>** SEt P2	$Pr_1 > w > Pr_2$, $Pr_1 - h \geq w \geq Pr_2 + h$,	for h=0 for h≠0	$w \geq Pr_1$ *v* $w \leq Pr_2$, $w \geq Pr_1 + h$ *v* $w \leq Pr_2 - h$,	for h=0 for h≠0
„Out"	for SEt P **>** SEt P2	$w \geq Pr_1$ *v* $w \leq Pr_2$, $w \geq Pr_1 + h$ *v* $w \leq Pr_2 - h$,	for h=0 for h≠0	$Pr_1 > w > Pr_2$, $Pr_1 - h \geq w \geq Pr_2 + h$,	for h=0 for h≠0

Where:

Pr_1 – value in parameter **SEt P**,

Pr_2 – value in parameter **SEt P2**,

h – value in HYSt parameter,

w – measured value,

Range/Alternatives <default value>	Explanation and result of alternatives.

- **LEDs light when relays are closed**, independently of relays' mode.
- When power supply fail, unit do not store relays state selected by RS-485 interface.

t on

0 - 99.9 <0.0>	Turn on delay time, the relay is turned on with delay equal **"t on"** if the input value is equal to or greater than appropriate ***border value*** (defined with ***threshold*** and ***hysteresis***), at least **"t on"** time. **D**efined with 0.1 sec. resolution. Unit of this parameter is set by **"unit"** parameter.

t oFF

0 - 99.9 <0.0>	Turn off delay time, the relay is turned off with delay equal **"t oFF"** if the input value is equal to or greater than appropriate ***border value*** (defined with ***threshold*** and ***hysteresis***), at least **"t oFF"** time. Defined with 0.1 sec. resolution. Unit of this parameter is set by **"unit"** parameter.

If time when the input signal is equal to or greater than some border value is shorter than **"t on"** or **"t oFF"** time, the relay do not change his state (see paragraph ***0***).

unit

min SEC < SEC>	Unit of time for **"t on"** and **"t oFF"** parameters. Can be set on one of two values: ***min*** - minutes, ***SEC*** - seconds.

Range/Alternatives <default value>	Explanation and result of alternatives.

ALArmS

noCHAn
on
oFF
<oFF>

This parameter defines the relay reaction when some critical situations occurs:

noCHAn - relay do not change his state,

on - relay will be turned on,

oFF - relay will be turned off.

If parameter **"modE"** is set to **"on"** , **"oFF"**, **"in"** or **"Out"** the "critical situation" means that ***nominal input range*** is exceeded.

If parameter **"modE"** is set to **"modbuS"**, the "critical situation" means communication delay (when no data is received) longer than **"mbtimE"** parameter (see description: ***"rS-485" menu***).

- **If option "noCHAn**" is selected for **"ALArmS"** parameter, behaviour of the relay may depend on "**FiLtEr**" parameter in some cases. If "**FiLtEr**" is set to big value and the input signal drops, result value of the measure will change slow, causes of turning on or off relay due to thresholds values. The critical situation is slowly detected, so it is impossible to predict the relay state in that situations.
- If parameter „**AL**" = „**on**", the relay will be turned on in the critical situations, even if his parameter ***"modE"*** = ***"noAC".***

5.5.2 bEEPEr Menu

This menu contains options connected with acoustic signal.

AL

on
oFF
<oFF>

on any critical situation causes by acoustic signal

oFF no acoustic signal

r1

on
oFF
<oFF>

on activation of relay **R1** causes by acoustic signal

oFF no acoustic signal by **R1**

r2

on
oFF
<oFF>

on activation of relay **R2** causes by acoustic signal

oFF no acoustic signal by **R2**

Acoustic signal (turned on by e.g. relay) can be turned off by pressing of any button.

Range/Alternatives <default value>	Explanation and result of alternatives.

5.5.3 CALibr Menu

This menu contains options for measurement input calibration.

rESOL

0.01
0.02
0.05
0.1
0.2
0.5
1
2
5
10
20
50
<0.1>

Display resolution of measurements, relays thresholds, and calibration values.

> **According to practical application circumstances (to get stable measurements) it is recommended to set „rESOL”** parameter value according to selected measurement range. Set such value of **„rESOL”** to ensure that whole number of measurement divisions do not exceed permissible value (for theoretical calibration ratio of „**r LoAd**” / ”**rESOL**” < 10000, similarly while dead weight calibration ratio of „**LoAd**” / ”**rESOL**” < 10000).

rAnGE

2 mV/V
4 mV/V
<4 mV/V>

Measurement input range. Set this range according to parameter Rated Output (R.O.) of strain bridge.

C tYPE

dAtA
rEAL
< dAtA>

Calibration type.

dAtA - theoretical calibration („Data Sheet” type calibration) according to data sheet

of load cell transducers (strain bridges),

rEAL - dead weight calibration (entry of values for certain known loads).

> **“CALibr”** menu shows option related to selected calibration method only. When dead weight calibration is selected then **“LoAd”** parameter is visible**.** When theoretical calibration is selected then parameters **“r LoAd”** and **“r out”** are visible in place of **“LoAd”**.

Range/Alternatives <default value>	Explanation and result of alternatives.

r LoAd

000000 – 999999 <100.0>	Rated Load calibration parameter. This parameter is expressed in **kg.**

In case of connection of two, three or four transducers parameter „r LoAd" should be set to arithmetic sum of nominal weights of all the sensors.

r out

0.0000 - 1.9999 0.0000 - 3.9999 <2.0000>	Rated Output calibration parameter (output value of load cell transducer at nominal load). This parameter is expressed in mV/V. 0.0000 - 1.9999 (when **„rAnGE"** = 2mV/V). 0.0000 - 3.9999 (when **„rAnGE"** = 4mV/V).

In case of connection of two, three or four transducers parameter „r out" should be set as arithmetic mean of all sensors signals.

LoAd

000000 – 999999 <100.0>	Dead weight calibration. After selection of this function it is necessary to enter some value (expressed in **kg**) and confirm entered value by pressing [**ENTER**] or press [**ESC**] when value needn't to be changed. To cancel calibration press [**ESC**] after questions „**rEADY?**" appear. Pressing [**ENTER**] after „**rEADY?**" appear causes storing current value of input signal. If input signal value exceeds permissible range then calibration fails and message „**Err**" is displayed. Weight is expressed in **kg.**

Due to measurement precision it is recommended to use weight not less than 2/3 of full scale weight while dead weight calibration. Best results can be obtained after calibration with dead weight equal to maximum expected weight put of the scale

S ZEro

This function allows to storing momentary value as "zero" of recalculation characteristic. Storing is done directly after pressing of [**ENTER**] button.

Z oFFS

000000 – 999999 <0.0>	Zero Offset calibration parameter. This parameter is expressed in **kg**.

Range/Alternatives <default value>	Explanation and result of alternatives.

FiLtEr

0 (26 Hz) 1 (17 Hz) 2 (8 Hz) 3 (4 Hz) 4 (1 Hz) 5 (0.5 Hz) <4>	Defines input signal filtration rate. Larger filtration level causes slower changes of measurement results because measurements are realised with longer time interval. While fast changes of input signal (weight) high value of „**FiLtEr**" can cause degradation of measurement precision.

S tESt

This function allows to view transducer signal value expressed in mV/V.

5.5.4 Procedure of Theoretical Calibration

1. Set parameter „**C tYPE**" = „**dAtA**".
2. Set required measurement displaying resolution (**rESOL**" parameter).
3. Set proper working range of measurement input („**rAnGE**" parameter).
4. Set required values of parameters „**r LoAd**" and „**r out**".
5. Unload scale (get weight off from a scale if it was loaded).
6. Make zeroing using „**S Zero**" function.

After this procedure device is ready to work.

If it is impossible to get weight off from a scale if it was loaded then points 5 and 6 can be skipped. Instead it is required to enter known value of the empty scale as a **„Z oFFS"** parameter.

5.5.5 Procedure of Dead Weight Calibration:

1. Set parameter „**C tYPE**" =„**rEAL**".
2. Set required measurement displaying resolution („**rESOL**" parameter).
3. Set proper working range of measurement input („**rAnGE**" parameter).
4. Unload scale (get weight off from a scale if it was loaded).
5. Make zeroing using „**S Zero**" function.
6. Load scale with known weight.
7. Enter the value of known (calibration) weight using „**LoAd**" function.

After this procedure device is ready to work.

Range/Alternatives <default value>	Explanation and result of alternatives.

5.5.6 OutPUt menu

This menu contains parameters of analogue output control.

> Analogue output can be controlled depend on both present measured value and peak value (if peak detection is enabled)

OUtmod

oFF
0-20
4-20
modb
<4-20>

Analogue output mode.
oFF - Current output disabled,
0-20 - Current output enabled with 0 ÷ 20 mA mode,
4-20 - Current output enabled with 4 ÷ 20 mA mode,
Modb - Current output controlled via RS-485 interface.

SourCE

GroSS
nEtt
<GroSS>

Defines source of signal controlling the analogue output,
GroSS - output is controlled due to gross value of weight,
nEtt - output is controlled due to nett value of weight.

OUt LO

<0.0>

Determines the input value for which the output signal is **minimal** (depend of output mode „**OUtmod**").

OUt HI

<100.0>

Determines the input value for which the output signal is **maximal** (depend of output mode „**OUtmod**").

The analogue output value is calculated due to formula given below:

$$Iout = \frac{W - OUt\ LO}{OUt\ HI - OUt\ LO} * (B - A) + A$$

Where: **W** – displayed value,
Iout – analogue output value,
B – High range limit (20mA),
A – Low range limit (0mA / 4mA),

> **"Out LO**" parameter can be greater than "**Out HI**". In this case the conversion characteristic is reversed; it means that if input value rises the output value falls.

Range/Alternatives <default value>	Explanation and result of alternatives.
Lo r	
0 - 99.9% <5.0>	Define the output value range. If calculated output value **Out** exceeds defined range then analogue output generates signal equal to upper or lower border of the defined range. These parameters define the percentage extension of nominal analogue range (with 0.1% resolution). Parameter "**Lo r**" defines lower border of the range due to formula: $\mathbf{Out}_{min}$ = **A** - (**A** × "**Lo r**" %), where: **A** – Low signal value range limit.
Hi r	
0 - 19.9% <5.0>	Define the output value range. If calculated output value **Out** exceeds defined range then analogue output generates signal equal to upper or lower border of the defined range. These parameters define the percentage extension of nominal analogue range (with 0.1% resolution). Parameter **"Hi r"** defines higher border of the range due to formula: $\mathbf{Out}_{max}$ = **B** + (**B** × "**Hi r**" %), where: **B** – High signal value range limit.
AL	
noCH 22.1 3.4 0.0 <22.1>	Determines the behaviour of analogue output if any critical situation occurs. For active current output: ***noCH*** - Current will not change, ***22.1*** - Current will be set to 22.1 mA, ***3.4*** - Current will be set to 3.4 mA, ***0.0*** - Current will be set to 0 mA.

When the critical situation goes, the output signal will be set to value calculated due to formulas given above.

If parameter **"OUtmod"** is set to "**oFF**", "**4-20**", "**0-20**" the "critical situation" means that ***nominal measurement range*** is exceeded.

If parameter **"OUtmod"** is set to **"modbuS"**, the "critical situation" means communication delay (when no data is received) longer than **"mbtimE"** parameter.

Before turning off the device it is recommended to first disable the current output's power supply, and then the device itself. If the current output is supplied while the device itself is turned off, the output current will be about 27.5 mA

Range/Alternatives <default value>	Explanation and result of alternatives.

5.5.7 button Menu

This menu allows enabling of functions realised by **[>0<]**, **[T]** and **[B/N]** buttons.

b ZEro

oFF
on
<oFF>

Zeroing function - button **[>0<]**:
oFF - disabled,
on - enabled.

b tArE

oFF
on
<oFF>

Tare function - button **[T]**:
oFF - disabled,
on - enabled.

b nett

oFF
on
<oFF>

Gross/net – button **[B/N]**:
oFF - disabled,
on - enabled.

5.5.8 Pr inP Parameter

Pr inP

diSAbL
ZEro
tArE
< diSAbL >

This parameter controls programmable input function.
diSAbL - input disabled
ZEro - input used to execute zeroing function
tArE - input used to execute tare function

Range/Alternatives <default value>	Explanation and result of alternatives.

5.5.9 HOLd Menu

This menu contains parameters connected with peak detection function. See also full description of the peak detection function in paragraph: ***Detection of the Peak Values***

modE

norm
inv
<norm>

Type of detected changes of the input signal.

norm - peaks, peak and next drop of the input signal of value equal at least **"PEA"**,

inv - drops, drop and next peak of the input signal of value equal at least **"PEA"**,

PEA - minimal detected signal change classified as peak or drop (see **Figure 6.1**)

PEA

<0.0>

Minimal detected signal change classified as peak or drop (see **Figure 6.1**)

timE

0.0 to 19.9 sec
<0.0>

Maximum time of displaying of the peak (drop) value, with 0.1 sec. resolution. If „**H diSp**"="**HOLD**" then setting parameter **"timE"**=**0.0** causes holding peak value until **[ESC]** button is pressed. If „**H diSp**"="**rEAL**" then value **"timE"**=**0.0** means no holding.

H diSp

rEAL
HOLd
<rEAL>

Type of displayed values

rEAL - current value is displayed

HOLd - peak (drop) value is displayed

H rEL1

rEAL
HOLd
<rEAL>

Relay R1/LED outputs operation mode:

rEAL - relay/LED operates on the current value,

HOLd - relay/LED operates on the peak (drop) value.

H rEL2

rEAL
HOLd
< rEAL>

Relay R2/LED outputs operation mode:

rEAL - relay/LED operates on the current value,

HOLd - relay/LED operates on the peak (drop) value.

H OUtP

rEAL
HOLd
< rEAL>

Current output operation mode:

rEAL - current output operates on the current value,

HOLd - current output operates on the peak (drop) value.

Range/Alternatives <default value>	Explanation and result of alternatives.

5.5.10 briGHt Parameter

briGHt

1 - 8	LED display brightness setting.

5.5.11 SECUr Menu

This menu contains presets connected with availability of other parameters:

SEtCod

0000 - 9999	User password (4-digits number). If this parameter is set at value **“0000”**, user password is turned off

If the user do not remember his password, the access to the menu is possible by the “one-use password”. To get this password please contact with Marketing Division. “Single use password” can be used only one time, after that it is destroyed. Entering this password causes in clearing of user password, it means sets the user password to „0000”.

The “one-use password” can be used **ONE TIME ONLY**, it is impossible to use it again! The “one-use password” can be restored by Service Division only.

Acc r1

on oFF	This option permits user (**”on”**) or prohibits (**”oFF”**) to modify the thresholds of the relay/LED R1 without knowledge about user password.

Acc r2

on oFF	This option permits user (**”on”**) or prohibits (**”oFF”**) to modify the thresholds of the relay/LED R2 without knowledge about user password.

Range/Alternatives <default value>	Explanation and result of alternatives.

5.5.12 rS-485 Menu

This menu is connected with RS-485 interface, and sets his properties:

Addr

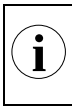
0 – 199 <0>	Defines the address of the device, accordingly to Modbus protocol. If the value 0 is set then device, responds to frames with address 255 (FFh).

bAud

1200 2400 4800 9600 19200 38400 57600 115200 <9600>	RS-485 interface baud rate setting

mbAccE

on oFF <on>	Sets the access to the configuration registers of the device. ***on*** - configuration can be set via RS-485 interface, ***oFF*** - configuration cannot be set via RS-485 interface.



The access to registers no 04h and 05h can't be denied by "mbAccE" parameter (see: *LIST OF REGISTERS*).

mbtimE

0 - 99 seconds <0>	Defines maximal time (sec) between following frames received by the device. If the delay will be greater than the value of **"mbtimE"** parameter, the relays and the current output which are controlled via RS-485 interface, will set to alert state (see **"OUtPUt"** menu and and **"rELAy1"** menu description). The value 0 means that the time will be not controlled.

Range/Alternatives <default value>	Explanation and result of alternatives.

rESP

Std
10c
20c
50c
100c
200c
<Std>

Defines minimal (additional) delay between the Modbus message and the answer of the device (received and sent via RS-485 interface). This allows the instrument to communicate with devices which do not work properly on baud rates higher than 19200.

Std - answer as quick as possible, no additional delay

10c
20c
50c
100c
"200c"
- answer delayed of 10, 20, 50, 100 or 200 chars respectively, where one character time depends on selected baud rate

In the most cases parameter "rESP" should be set to **"Std"** (no additional delay). Unfortunately for some third party RS-converters **"rESP"** should be adjusted experimentally. Below are the most frequently used values listed.

"bAud" parameter	"38.4"	"57.6"	"115.2"
"rESP" parameter	" 10c"	" 20c"	" 50c"

5.5.13 Edit t Parameter

Edit t

dig
Slid
<dig>

This parameter allows to change the edition mode of numerical parameters:

dig - the change to "by digit" mode,
Slid - slide change mode.

5.5.14 dEFS Parameter

dEFS

Used to restore the factory settings of the device. To get access to this option special password is required: „5465", next the device displays acknowledge question **„SEt?"**. Press **[ENTER]** to acknowledge the restoring of factory settings or **[ESC]** to cancel.

5.5.15 SErv Menu

This menu contains the parameters for authorized service only. To enter this menu proper service password must be entered. Improper settings can causes of damage of the device.

6 Output Value Calculation

Assume the following parameter values:
“modE” = “on”,
“OUt LO” = 10.0,
“OUt HI” = 20.0,
“Lo r” = 5.0,
“Hi r” = 5.0

Parameters **“Lo r”** and **“Hi r”** define working range of current output to 3,8 ÷ 21 mA.
Output current will be calculated for three displayed values D:

a) D = 17.5
According to formula from page **5-12**:

I_{out} = (17.5-10.0) / (20.0-10.0) x 16 mA + 4 mA = 0.75 x 16 + 4 = 16 mA

Calculated I_{out} do not exceed the output working range (3 - 21 mA).

b) D = 20.5
According to formula from page **5-12**:

I_{out} = (20.5-10.0) / (20.0-10.0) x 16 mA + 4 mA = 1.05 x 16 + 4 = 20.08 mA

Calculated I_{out} do not exceed the output working range (3 - 21 mA).

c) D = 30.0
According to formula from page **5-12**:

I_{out} = (30.0-10.0) / (20.0-10.0) x 16 mA + 4 mA = 2 x·16 + 4 = 36 mA.

Calculated I_{out} exceeds the output working range (3 - 21 mA), so current output will generate current equal to the upper border of range defined by parameter **“Lo r”** and **“Hi r”** (it means 21 mA).

7 Signalization of Errors

Some critical situations are signalized in texts or numbers format (like „Err NN”), where NN denotes error number and can be one of values presented below:

NN	Description	Meaning
16	“ ErrC ”	Dead weight calibration error
68	“Short ”	Shortcut on input or resultant impedance of input load cell(s) is to low
70	“ OPEn ”	Break of input circuit or incorrect input voltage level
72	“OvEr V”	Exceeding of input voltage permissible range or connectors 30...35 of the load cell input are not connected
73	“OvEr C”	Exceeding of current source maximum load (load cell overloads measurement input)
74	“tr Err”	Converter (transducer) error – contact with manufacturer's service
75	“no rEF”	No reference voltage or incorrect input voltage level
96	“Lo”	Exceeding of measurement range lower border
160	“Hi”	Exceeding of measurement range upper border
-	“mZ Err”	Manual Zeroing error (function cannot be done)
-	“mt Err”	Manual Tare error (function cannot be done)
-	“-OvEr-”	measured value exceeds the display range (-99999 ÷ 999999)

8 The Modbus Protocol Handling

Transmission parameters: 1 start bit, 8 data bits, 1 or 2 stop bit (2 bits are sent, 1 and 2 bits are accepted when receive), no parity control

Baud rate: selectable from: 1200 to 115200 bits/second

Transmission protocol: MODBUS RTU compatible

The device parameters and display value are available via RS-485 interface, as HOLDING-type registers of Modbus RTU protocol. The registers (or groups of the registers) can be read by 03h function, and written by 06h (single registers) or 10h (group of the registers) accordingly to Modbus RTU specification. Maximum group size for 03h and 10h functions is 16 registers (for single frame).

The device interprets the broadcast messages, but then do not send the answers.

8.1 List of registers

Some parameters are located on two registers (higher word in first register, and lower word in next one). After writing of one of them device controls result of their 32-bit value, and if it is necessary corrects value of second register automatically. If appropriate modification is impossible, both registers stay unaffected and device responds with error code 03h (see: ***TRANSMISSION ERRORS DESCRIPTION***).

Holding register 40001 is addressed as register 0000 in the data address field of the message. The function code field already specifies a Holding register operation. Therefore the 4XXXX reference is implicit.

Register	Write	Range	Register description
40002[1] 40003[1]	No	-99999 - 999999	Measurement value (no decimal point)
40004	No	0h or error no	The status of the current measurement; **0h** - data valid; other values describe errors (see ***SIGNALISATION OF ERRORS***)
40005	No	0 - 2	Decimal point position. The same as 11h register.
40006	Yes	0 - 31	State of the relays, LEDs and programmable input (binary format) (1 - on, 0 - off): **00000000 00fedcba** **a** - relay R1; **b** - relay R2; **c** - LED **"NET"; d** - LED "**><**"; **e** - LED "**>0<**"; **f** - programmable input; If written, only **a**, **b**, bits are important (others are ignored) these bits allows user to control the relays via RS-485 interface
40007	Yes	0h - 1800h	State of current output, expressed in 1/256 mA units – it means that high byte express integer part, and low byte fractional part of desired output current.

Register	Write	Range	Register description
40008[1] 40009[1]	No	-99999 - 999999	Peak (drop) value (no decimal point)
40010[1] 40011[1]	No	-99999 - 999999	Gross measurement value (no decimal point)
40012[1] 40013[1]	Yes	-99999 - 999999	Nett measurement value (no decimal point). Writing a „0” value causes the execution of the tare function.
Parameters of measurement input calibration			
40017	Yes	0 - 11	**“rESOL”** parameter in **“CALibr”** menu (displaying resolution): **0** - ”0.01”; **1** - ”0.02”; **2** - ”0.05”; **3** - ”0.1”; **4** - ”0.2”; **5** - ”0.5”; **6** - ”1”; **7** - ”2”; **8** - ”5”; **9** - ”10”; **10** - ”20”; **11** - ”50”.
40018	No	0 - 2	Decimal point position set by **“rESOL”** parameter in **“CALibr”** menu: **0** - ” 0”; **1** - ” 0.0”; **2** - ” 0.00”.
40019	Yes	0 - 1	**“rAnGE”** parameter in **“CALibr”** (measurement range): **0** - ”2 mV/V”; **1** - ”4 mV/V”.
40020	Yes	0 - 1	**“C tYPE”** parameter in **“CALibr”** menu (calibration type): **0** – theoretical calibration; **1** – real load calibration
40021 40022	Yes	0 - 999999	“**r LoAd**” parameter in “**CALibr**” menu, expressed in kg, 0.1kg or 0.01 kg (depending on **“rESOL”** parameter in **“CALibr”** menu)
40023	Yes	0 - 19999	“**r out**” parameter in “**CALibr**” menu (for 2 mV/V range) expressed in 0.0001 mV/V
40024	Yes	0 - 39999	“**r out**” parameter in “**CALibr**” menu (for 4 mV/V range) expressed in 0.0001 mV/V
40025	Yes	0 - 5	“**FiLtEr**” parameter in “**CALibr**” menu: **0** – the shortest measurement period; **5** – the longest measurement period;
40026	Yes	0	“**S ZEro**” function in “**CALibr**” menu. After writing „0” value current measurement value is stored as „zero”
40027 40028	Yes	0 - 99999	“**Z oFFS**” parameter in “**CALibr**” menu, expressed in kg, 0.1kg or 0.01 kg (depending on **“rESOL”** parameter in **“CALibr”** menu)
40033[2]	Yes	0 - 199	Device address
40034	No	20E6h	Device identification code (ID)

Register	Write	Range	Register description
40035[3]	Yes	0 - 7	**“bAud”** parameter in **“rS-485”** menu (baud rate); **0** - 1200 baud; **1** - 2400 baud; **2** - 4800 baud; **3** - 9600 baud; **4** - 19200 baud; **5** - 38400 baud; **6** - 57600 baud; **7** - 115200 baud
40036[4]	Yes	0 - 1	**“mbAccE”** parameter in **“rS-485”** menu (permission to write registers via RS-485 interface); **0** - write denied ; **1** - write allowed
40038	Yes	0 - 5	**“rESP”** parameter in **“rS-485”** menu (additional response delay); **0** - no additional delay; **1** - ”**10c**” option; **2** - ”**20c**” option; **3** - ”**50c**” option; **4** - ”**100c**” option; **5** - ”**200c**” option;
40040	Yes	0 - 99	**“mbtimE”** parameter in **“rS-485”** menu (maximum delay between received frames); **0** - no delay checking; **1** ÷ **99** - maximum delay expressed in seconds
40041	Yes	0 - 1	“**AL**” parameter in “**bEEP**” menu: **0** - off; **1** - on
40042	Yes	0 - 1	“**r1**” parameter in “**bEEP**” menu: **0** - off; **1** - on
40043	Yes	0 - 1	“**r2**” parameter in “**bEEP**” menu: **0** - off; **1** - on
40046	Yes	1 - 8	“**briGHt**” parameter (display brightness); **1** - the lowest brightness; **8** - the highest brightness
40048	Yes	0 - 1	“**Edit**” parameter (numerical parameters edit mode); **0** - „**dig**” mode; **1** - „**SLid**” mode
Parameters of relay R1 operation			
40049 40050	Yes Yes	-99999 - 999999	“**SEt P**” parameter in “**rELAy1**” menu, no decimal point included
40051 40052	Yes Yes	0 - 99999	“**HySt**” parameter in “**rELAy1**” menu, no decimal point included
40053	Yes	0 - 5	“**modE**” parameter in “**rELAy1**” menu: **0** - “**noACt**” mode; **1** - “**on**” mode; **2** - “**oFF**” mode; **3** - “**in**” mode; **4** - “**out**” mode; **5** - “**modbuS**” mode
40054	Yes	0 - 999	**“t on”** parameter in **“rELAy1”** menu, expressed in tenth of seconds or tenth of minutes depend on **“unit”** parameter
40055	Yes	0 - 999	**“t oFF”** parameter in **“rELAy1”** menu, expressed in tenth of seconds or tenth of minutes depend on **“unit”** parameter
40056	Yes	0 - 1	**“unit”** parameter in **“rELAy1”** menu: **0** - seconds; **1** - minutes
40057	Yes	0 - 2	**“ALArmS”** parameter in **“rELAy1”** menu: **0** - no changes; **1** - on; **2** - off

Register	Write	Range	Register description
40058 40059	Yes Yes	-99999 - 999999	"**SEt P2**" parameter in "**rELAy1**" menu, no decimal point included
40060	Yes	0 - 1	**"SourCE"** parameter in **"rELAy1"** menu (kind of value controlled relay): **0** - "GroSS"; **1** - "nEtt"
Parameters of relay R2 operation			
40065 40066	Yes Yes	-99999 - 999999	"**SEt P**" parameter in "**rELAy2**" menu, no decimal point included
40067 40068	Yes Yes	0 - 99999	"**HySt**" parameter in "**rELAy2**" menu, no decimal point included
40069	Tak	0 - 5	"**modE**" parameter in "**rELAy2**" menu: **0** - "**noACt**" mode; **1** - "**on**" mode; **2** - "**oFF**" mode; **3** - "**in**" mode; **4** - "**out**" mode; **5** - "**modbuS**" mode
40070	Yes	0 - 999	**"t on"** parameter in **"rELAy2"** menu, expressed in tenth of seconds or tenth of minutes depend on **"unit"** parameter
40071	Yes	0 - 999	**"t oFF"** parameter in **"rELAy2"** menu, expressed in tenth of seconds or tenth of minutes depend on **"unit"** parameter
40072	Yes	0 - 1	**"unit"** parameter in **"rELAy2"** menu: **0** - seconds; **1** - minutes
40073	Yes	0 - 2	**"ALArmS"** parameter in **"rELAy2"** menu: **0** - no changes; **1** - on; **2** - off
40074 40075	Yes Yes	-99999 - 999999	"**SEt P2**" parameter in "**rELAy2**" menu, no decimal point included
40079	Yes	0 - 1	**"SourCE"** parameter in **"rELAy1"** menu (kind of value controlled relay): **0** - "GroSS"; **1** - "nEtt"
Configuration of peaks detection function			
40113	Yes	0 - 1	"**modE**" parameter in "**HOLd**" menu (type of detected changes): **0** - peaks; **1** - drops
40114 40115	Yes	0 - 999999	"**PEA**" parameter in "**HOLd**" menu (minimum detectable change, no decimal point included)
40116	Yes	0 - 199	"**timE**" parameter in "**HOLd**" menu, maximum peaks' (or drops') display time expressed in seconds
40117	Yes	0 - 1	"**H diSP**" parameter in "**HOLd**" menu (the type of values displayed on the display): **0** - current measurement value; **1** - peaks (or drops) values

Register	Write	Range	Register description
40118	Yes	0 - 1	"**H rEL1**" parameter in "**HOLd**" menu (the control mode of relay R1 and LED R1) : **0** - control depends on current measurement values; **1** - control depends on peaks (or drops) values;
40119	Yes	0 - 1	"**H rEL2**" parameter in "**HOLd**" menu (the control mode of relay R2 and LED R2) : **0** - control depends on current measurement values; **1** - control depends on peaks (or drops) values;
40122	Yes	0 - 1	"**H OUtP**" parameter in "**HOLd**" menu (the control mode of current output): **0** - control depends on current measurement values; **1** - control depends on peaks (or drops) values;
Functions of buttons and programmable input			
40129	Yes	0 - 1	**"b ZEro"** parameter in **"button"** menu (function of zeroing button): **0** - disabled; **1** - enabled
40130	Yes	0 - 1	**"b tArE"** parameter in **"button"** menu (function of tare button): **0** - disabled; **1** - enabled
40131	Yes	0 - 1	**"b nEtt"** parameter in **"button"** menu (function of gross/nett button): **0** - disabled; **1** - enabled
40133	Yes	0 - 2	**"Pr inP"** parameter (function of programmable input): **0** - input disabled; **1** - zeroing function; **2** - tare function
Parameters of analogue output operation			
40161	Yes	0 - 3	"**Omod**" parameter in "**OUtP**" menu (current output mode) **0** - current output disabled; **1** - current output enabled with **4÷20mA** mode; **2** - current output enabled with **0÷20mA** mode; **3** - current output controlled via RS-485 interface
40162 40163	Yes	-99999 - 999999	"**OUt LO**" parameter in "**OUtPUt**" menu, no decimal point included
40164 40165	Yes	-99999 - 999999	"**OUt HI**" parameter in "**OUtPUt**" menu, no decimal point included
40166	Yes	0 - 999	"**Lo r**" parameter in "**OUtP**" menu, for current output, expressed in 0.1%
40167	Yes	0 - 199	"**Hi r**" parameter in "**OUtP**" menu for current output, expressed in 0.1%
40168	Yes	0 - 3	"**AL**" parameter in "**OUtP**" menu (current output value on critical exception): **0** - no change; **1** - 22.1 mA; **2** - 3.4 mA; **3** - 0 mA
40169	Yes	0 - 1	**"SourCE"** parameter in **"OUtPUt"** menu (kind of value controlled current output): **0** - "GroSS"; **1** - "nEtt"

1) It is recommended to read these registers simultaneously – in 2-registers frames. If single registers are read, data errors are possible because of changes of read value between successive registers readings.

2) After writing to register no 40033 the device responds with an “old” address in the message.

3) After writing to register no 40035 the device responds with the new baud rate.

4) The value of the “**mbAccE**” parameter is also connected to write to this register, so it is possible to block a write, but impossible to unblock writes via RS-485 interface. Unblocking of the writes is possible from menu level only.

8.2 Transmission Errors Description

If an error occurs while write or read of single register, then the device sends an error code (according to Modbus RTU specifications).

Error codes:

01h - illegal function (only functions 03h, 06h and 10h are available),

02h - illegal register address

03h - illegal data value

08h - no write permission (see: “**mbAccE**” parameter)

While reading of displayed value (registers 01h ÷ 04h) using function 03h (read single register) other error codes can occur. Meaning of such codes is given in chapter ***SIGNALISATION OF ERRORS*** in details.

8.3 Examples of Query/Answer Frames

Examples apply for device with address 1. All values are represented in hexadecimal format.

Field description:

ADDR	Device address on Modbus network
FUNC	Function code
REG H,L	Starting address (address of first register to read/write, Hi and Lo byte)
COUNT H,L	No. of registers to read/write (Hi and Lo byte)
BYTE C	Data byte count in answer frame
DATA H,L	Data byte (Hi and Lo byte)
CRC L,H	CRC error check (Hi and Lo byte)

8.3.1 Read displayed value (measurement) and status

Device address = 01h:

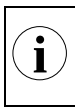
ADDR	**FUNC**	**REG H,L**		**COUNT H,L**		**CRC L,H**	
01	03	00	01	00	03	54	0B

a) The answer (we assume that the measure result is not out of range):

ADDR	**FUNC**	**BYTE C**	**DATA H1,L1**		**DATA H2, L2**		**DATA H3.L3**		**CRC L,H**	
01	03	06	00	01	86	A0	00	00	2A	B4

DATA H1, L1 - reg. 01h (1 - high word of measurement value)
DATA H2, L2 - reg. 02h (86A0h - low word of measurement value),
DATA H3, L3 - reg. 03h (0 - measurement status).

In this example measurement value is equal 186A0h (100 000 in decimal format).



Decimal point position is not included in measurement value (reg. 01h and 02h).
Decimal point position can be read from reg. 04h.

b) The answer (if an error has occurred):

ADDR	***FUNC***	***ERROR***	***CRC L,H***	
01	83	40	40	C0

ERROR - error code = 40h, bottom border of the measurement range is exceeded

8.3.2 Read device ID code

ADDR	***FUNC***	***REG H,L***		***COUNT H,L***		***CRC L,H***	
01	03	00	21	00	01	D4	00

The answer:

ADDR	**FUNC**	**BYTE C**	**DATA H,L**		**CRC L,H**	
01	03	02	20	E6	20	0E

DATA - identification code 20E6h)

8.3.3 Change the device address

Change from 1 to 2 (write to reg. 20h)

ADDR	**FUNC**	**REG H,L**		**DATA H,L**		**CRC L,H**	
01	06	00	20	00	02	09	C1

DATA H - 0
DATA L - new device address (2)

The answer (the same as the message):

ADDR	**FUNC**	**REG H,L**		**DATA H,L**		**CRC L,H**	
01	06	00	20	00	02	09	C1

Change of baud rate of all devices connected to the net (BROADCAST message).

ADDR	**FUNC**	**REG H,L**		**COUNT H,L**		**CRC L,H**	
00	06	00	22	00	04	29	D2

DATA H - 0
DATA L - 4, new baud rate 19200 baud

8.3.4 Write improper data

register 04h

ADDR	***FUNC***	***REG H,L***		***DATA H,L***		***CRC L,H***	
01	06	00	04	00	10	C9	C7

DATA H, L written value (10h = 16) out of allowable range (0 ÷ 2)

Device response (with exception code 03h):

ADDR	***FUNC***	***ERR***	***CRC L,H***	
01	86	03	09	C1

There is no full implementation of the Modbus Protocol in the device. Only the functions presented above are available.

9 Default and User's Settings List

Parameter	Description	Default value	User's value
Parameters of relay R1 operation ("rELAy1" menu)			
SourCE	Kind of value controlled relay state	GroSS	
SEt P	Relay first threshold	20.0	
SEt P2	Relay second threshold	30.0	
HYSt	Hysteresis of relay	0.0	
modE	Operation mode of relay	on	
t on	Turn on delay of relay	0.0	
t oFF	Turn off delay of relay	0.0	
unit	Unit of "t on", "toFF" parameters of relay	SEC	
ALArmS	Reaction for critical situation of relay	oFF	
Parameters of relay R2 operation ("rELAy2" menu)			
SourCE	Kind of value controlled relay state	GroSS	
SEt P	Relay first threshold	40.0	
SEt P2	Relay second threshold	50.0	
HYSt	Hysteresis of relay	0.0	
modE	Operation mode of relay	on	
t on	Turn on delay of relay	0.0	
t oFF	Turn off delay of relay	0.0	
unit	Unit of "t on", "toFF" parameters of relay	SEC	
ALArmS	Reaction for critical situation of relay	oFF	
Activation of acoustic signal ("bEEPEr" menu)			
AL	Activation of acoustic signal by critical situation	oFF	
r1	Activation of acoustic signal by relay R1	oFF	
r2	Activation of acoustic signal by relay R2	oFF	

Parameter	Description	Default value	User's value
Calibration of measurement input (”CALibr” menu)			
rESOL	Displaying resolution	0.1	
rAnGE	Measurement range	4 mV/V	
C tYPE	Calibration type	dAtA	
r LoAd	Rated Load parameter	100.0	
r out	Rated Output parameter	2.0000	
LoAd	Load value of dead weight calibration	100.0	
Z oFFS	Zero Offset parameter	0.0	
FiLtEr	Measurements filtration rate	4	
Current output configuration (“OUtP” menu)			
Omod	Output mode	4-20	
SourCE	Output source	GroSS	
OUt LO	Display value for 0 mA or 4 mA current output	0.0	
OUt Hi	Display value for 20 mA current output	100.0	
Lo r	Extension of the bottom of the nominal output range	5.0	
Hi r	Extension of the top of the nominal output range	5.0	
AL	Current output value on critical exception	22.1	
Front panel buttons configuration (“button” menu)			
b ZEro	Zeroing button	oFF	
b tArE	Tare button	oFF	
b nEtt	Gross/nett display mode switching button	oFF	
Configuration of programmable input			
Pr inP	Function of programmable input	diSAbL	

Parameter	Description	Default value	User's value
Configuration of peaks detection function (“HOLd” menu)			
modE	Kind of detected changes	Norm	
PEA	Minimum detected change	0.0	
timE	Maximum time of peak displaying	0.0	
H diSP	The type of displayed value	rEAL	
H rEL1	Source of relay R1, and LED R1 control	rEAL	
H rEL2	Source of relay R2, and LED R2 control	rEAL	
H OUtP	Source of current output control	rEAL	
Display parameters			
briGHt	Display brightness	bri 6	
Settings of access to the configuration parameters (“SECUr” menu)			
Acc r1	Permission to changes of relay R1 threshold without of the user password knowledge	On	
Acc r2	Permission to changes of relay R2 threshold without of the user password knowledge	On	
RS 485 interface configuration (menu “rS-485”)			
Addr	Device address	0	
bAud	Baud rate	9600	
mbAccE	Permission to changes of configuration registers	On	
mbtimE	Maximum delay between received messages	0	
rESP	Additional delay of answer transmission	Std	
Configuration of numerical parameters edition			
Edit t	Numerical parameters edit mode	dig	

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