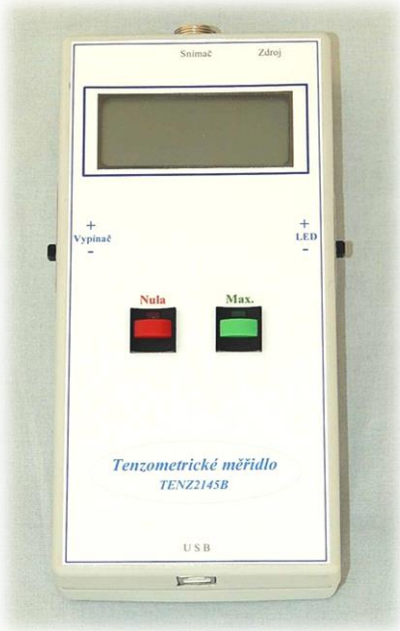
TENSOMETRIC METER

type TENZ 2145B (USB)



CE

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1. Introduction

This product has been designed according to actual state of the engineering, and corresponds to a valid European and national standards and directives. The product is corresponding with the relevant standards. All declarations and documents are deposited at the producer.

The product has a corresponding level of electromagnetic resistance to his ability of undisturbed running in the usual environment.

You should read this documentation, before you start using this product.

The producer doesn´t take responsibility for damaging device and accidents caused to individuals, which result from the incompetent manipulation. The producer also isn´t responsible for damaging property and casualties caused by incompetent manipulation with this product or by contravening safety regulations. For security reasons and reasons of registration (CE) you hasn´t to make any changes in its internal arrangement. The product is intended for using by persons with relevant qualification. Incompetent handling can damage product.

After the end of its working life, the product must be disabled or scrapped according to the laws. Protect your environment and deliver your product to the central collection electro-scrap or return to producer to ensuring its liquidation.

2. General description

The tensometric meter TENZ2145B is a digital electronic device for the measurement of a force or weight with a tensometric sensor. A front panel of the device has a LCD display with two lines, each with eight characters and the two control buttons. Device is installed in a plastic box with connectors for connection of the sensor, a charging adapter and an interface USB.

The tensometric sensor is connected by four-polar connector type XLR. The network adapter for recharging (12V/500mA) is connected via the power connector type K3716A. The serial interface is connected via nine-polar connector Canon. The instrument is equipped with the functions of monitoring the condition of the accumulator, an alarm of defective sensor, the function of the zero setting of the measured value and the function display of the maximum value. Power supply is by six Ni-MH accumulators with voltage 1,2V.

Part of the device is a communication cable for USB line, and basic software for Windows that allows you to set up the parameters, read measured data from device to the computer and save it to disk in the text or database (Excel) format.

3. Technical description

a) The control microprocessor and interface USB

The core of the device is single-chip microprocessor, which controls all of its activities. Configuration constants are stored in the EEPROM that stores the values even when switched off the power. The device can be connected via RS232 interface (connector Canon 9) to the computer and use the software to set all the parameters of the device. The basic parameters are the amplification of the measuring amplifier (1, 2, 4, 8 or 16), the metering mode (unipolar/ bipolar), units of the measured signal (2 character), the position of the decimal (0-4), the multiple constant for the negative range, the multiple constant for the positive and the frequency measurement.

b) The tensometric sensor

The tensometric sensor is attached to meter by four wires via XLR-type connector. The sensor is powered by a voltage 5V through a pair of resistors 10Ω.

XRL pins are as follows:

1: power supply sensor + I

2: power supply sensor –I

3: the output of the sensor +U

4: the output of a sensor -U

The device can detect some cases damage to the sensor and this status indicates by displaying the text *"E-sensor"* on the bottom line of the LCD display. The tensometric sensor is designed for a maximum load of force, which is set by using the parameter *"Nominal value"*. The sensor mostly holds overloading about several tens percent without problems, but it is not acceptable to overloaded him repeatedly.

c) The range and units of the measuring

Measuring transducer has a range of 16 bits. This corresponds to the range 0 to 65536 measured intervals in unipolar mode or -32768 to 32767 intervals in bipolar mode. Measured range can be modified in several ways. The choice of the decimal point us in the measured range doesn't change anything, but it is displayed on the selected decimal place. If we have a unipolar mode measurement and we choose the decimal dot in second place, will be a measurement range from 0 to 655.36.

Furthermore, you can set the amplification (gain) of the measuring amplifier in the range 1, 2, 4, 8 or 16. It is important to choose a value for the gain with a view to the displayed value was greater than the actual value. Correspondence between the real and the displayed value of force is then achieved by standardization of measured signal when each measured value is multiplied by the

multiplier constant with a value of less than 1. The device Tenz2145B is used two multiplier constants, one for positive measuring range and second for negative measuring range.

Another optional parameter is the units of measurement which are reserved for the two characters on the display. You can choose any characters (e.g., g, T, N, kN, kg, ...).

Measured value is five-digit. If the measured value is displayed with the decimal dot there is a little restriction for negative measured values. Negative sign will not be displayed in the event, which is the highest measured numbers greater than zero.

The nominal value is the value of 100% of the load transducer. For example if we use the sensor for load 20kN, so we set the nominal value to 20, and the decimal dot to 2.

d) Setting the device parameters

The displayed value of the measured force must correspond with the real value of the force. If the transfer characteristic of the tensometric sensor is linear, so we could use the multiplier method, in the case of non-linear characteristic of the linearization method is more appropriate. **The multiplier method** of standardization is based on the multiplication of the measured values of the appropriate constant. This constant should be less than 1 as not to eliminate some of the values of the resulting force. (If the multiplier constant had a value of 2, so then will be displayed on the screen only even values, while a constant 10 will then be displayed only by multiples of 10).

The multiplier constant K is calculated as follows:

K = Desired value/ Measured value.

The desired value is the value that we want to show on the screen, and the measured value is the present value displayed on the screen. For the constant K = 1 is the desired value identical with the measured value.

For example for the constant K = 1 we load the sensor by 25000N force and the display shows the value of 50000. Then for the

correct display of the measured value shall be multiplied by the constant K = 25000/50000 = 0.5.

Prior to calibration the device need to be in constant multiplier set to a value of 1. We turn off the device and then we connect the data cable to the computer to USB port and then we press any button on the device and we turn on the power switch. On the bottom line of the display shows the text ***"U S B"***. Then we run TENZ2145B.EXE software. In the menu item below the top row we click to the item ***„Device parameters"***. Is open a window for setting the system parameters. By button ***"Reading from device"*** are loaded the parameters from the device into the computer. The multiplier constant is named here as the linear constant. For the positive and negative range are used separate constants. If we assume the same measuring progress in a positive and negative, so we set the two constants equally. Before the calibration process we both calibration constants set to 1 and by button ***"Writing to device"*** we write the parameters to the EEPROM of the device. Then we turn off the device and again we turn on to the mode of the current measurement (already we're not pressed any button).

Further the process of normalization is the following:

- First we zeroed the device for unloaded sensor. The display shows a zero value.
- Then load the sensor by force preferably of a nominal value, i.e.. 100% of the measured value.
- Then we calculated the multiplication constant according to the above relation, where for the desired value we insert the load force (weight) and for the measured value we insert the value from the display.
- If the result is greater than 1, so we have to increase the value of the gain. If the result is less than 0.5, it is appropriate to reduce the value of the gain. (The procedure is similar as when specifying constants).
- If the result is in the range of 0.5 to 1, so we can enter a new constant into the device.

For the calculation we can use the built-in calculator, in the window with parameters. Press the appropriate button with the calculator icon (next to the button write-constant). To edit fields we enter the actual measured value (integer without decimal point) and we press the button ***Calculate constant***. Calculated constant is entered directly into the appropriate field. If the resulting value of the constant is outside the range of 0.5 to 1, so the gain value is changed. In this case, we must write a new gain to the device and carry a full normalization again. Press button ***Writing to device*** all parameters are written into the EEPROM device. You can also write a separate switch any of the parameters. New values of these constants are changed in the device immediately after writing. To change other parameters in the device must be switched off and on again.

Other device parameters are:

a) **Type number**: is set to 45 and can not be changed by the user. The program verifies the correct operation of the memory device.

b) **Decimal point**: indicates the position of the decimal point from the 0 to 5 on each display. Dot is displayed on the right side of the selected display. To display with one decimal place value is the decimal point two.

c) **Mode**: unipolar mode measures a positive signal polarity in the range of 0 to 65,365 pieces. In bipolar mode we can measure both signal polarity in the range -32767 to +32767 pieces.

d) **Gain and range**: it must be in accordance with the parameters of the sensor.

e) **Tare after switching**: set whether there after switching the device to automatically reset (tare).

f) **Zero value**: applies if the parameter tare after power is turned off. It allows you to set an arbitrary initial value on the display.

g) **Frequency**: indicates the rated frequency measurements. There are four values: 400Hz, 200Hz, 100Hz and 50Hz. This frequency is evaluated by measuring the maximum value and also can be selected frequencies to transmit measured data to a computer in the *fast measurements*.

e) Power supply of the device

For power the device is used 6 accumulators type AA with a voltage of 1.2V and 2400mAh capacity. For the average current consumption 20mA (turned off the black-light of display) is the operable time of the accumulator on the single charge approximately 120 hours. For turned on the black-light of display is operable time approximately 24 hours. If the battery voltage is below the value 5.3V, is displayed the text *"**Aku-flat**"*. For charging we have to connect the network adapter to the device turned off. On the top row displays the text *"**Charging**"*. On the bottom row, then after 5 minutes shows the current value of the voltage of the battery, which will be in the 5-minute interval to update. During charging is shining the red LED diode under the power supply connector (source).

The charging process is monitored by a microprocessor and after a full charge to the battery charging current is automatically reduced to the maintenance value without exposure his lifetime. Battery charging time is a maximum of 12 hours, depending on the status of the battery. When the voltage of the battery is fully charged, is on the bottom row shows the text *"**Aku-load**"* and it is lit the green LED diode. Red LED diode still lit.

If lifetime of the battery is low, so it's appropriate to replace it. You can use any types of NiMH or NiCd rechargeable battery with a capacity of around 2500mAh. All the accumulators should be the same type. Charging circuits charging battery always to full charge, then the charging current is limited to the maintenance value, so there is no damage of overcharge the battery. Accumulators are placed in the lower part of the device under the plastic cover.

4. Operation of the device

After you turn on the sliding switch to the position + is on the top row displays the text *"**TEN2145B**"* and at the bottom line displays value set frequency measurement. After 2 seconds, followed by the zeroing of the measured value, which is on the bottom row displays the text *„**Zeroing**"*. After zeroing the text disappears and

run the standard of measurement. The top row displays the value of the measured force.

The LED switch can be turned on for back-lightening the display. However, it significantly shortens the period of operation of the accumulator.

Buttons are fitted with LED diodes that are switched on immediately after pressing the button. The action requested is made only after releasing the buttons, the LED diode is shining until the end of the action.

By button *"**Zero**"* can be at any time to perform zeroing of the measured value. By button *"**Max.**"* we can zero of the maximum value.

5. Measurement computer

The communication interface device uses the FT232BM circuit, to which must be appropriate driver is installed on the computer. This is a VCP driver that into the computer system adds a new virtual COM port. Newer operating systems in the case when the computer is connected to the Internet for a suitable driver alone download and install when you first connect your computer to the device. Executable version of the driver is also located on the installation disk in the "FTDI_VCP". Alternatively can be downloaded from: http://www.ftdichip.com/Drivers/VCP.htm .

In the main window, there are three groups of controls and setting elements. A group called **Measuring parameters** includes setting elements, which are applicable to standard **graphical or periodic** measurements. These two standard measurements operate in slow mode. ***Period*** allows you to choose the measurement period in seconds from seven preset values (0.1 / 0.2 / 0.5 / 1/10/30 or 60 seconds). You can transfer a maximum of 10 measurements per second. ***Nominal value*** is used to set the 100% value "*bar graph*" for the periodic reading or scale graphic display. Storing measurement data is possible in DBF format (can read Excel or dBASE), and in graph format (binary format for later viewing as a graph). Name all

files are automatically created in the format "RRMMDDPP.xxx", where YY is the last two digits of the year, MM is the month, DD is the day, and PP is the serial number of the file in one day. ***Language*** switch can be set to Czech or English. Additional parameters are used for graphical representation. ***Bold graph*** lets you set the power of graphic lines. ***Signal polarity*** allows the graph display either a positive polarity, or with both polarities.

The group element **Functions** contains three buttons:

a) Button ***Device parameters***, is intended for setting the parameters as described in paragraph 3d.

b) ***Viewing*** button opens a new window where you can select a data file for graphical viewing. To move the chart are the arrow keys. Using the ***New data*** button you can select a different data file. Press ***Print graph*** button can be displayed portion of the graph printed.

c) Use the ***Measuring xxHz*** can quickly make measurements in the selected period of time or with a preset number of measured values. After pressing the button, open a new window called ***Fast measurement.*** Measurement period is fixed by the frequency measuring device. The measurement time and the number of readings can be selected. After opening the window is preset values per 960, which corresponds to the width of a graph. You can select multiple values. Graphical dependence will then be distributed to multiple windows (shift chart). Press the ***Start measurement*** run fast measurement. The display device is in the top row displays the text "***Measuring ..***" and the measuring window of the monitor runs counter readings. After measurement, the table entitled *Measured values* displays all measured values. ***Graph*** button can display graphical dependence of the measurement.

A group of elements called **Measuring** includes three buttons. ***Read value*** key is for one-time reading and display of measured values. Use the ***Periodic measuring***, start continuous reading of the measured value in the specified time period. The measured value is displayed both numerically and graphically using "bar graph".

Measured values are stored on disk according to preset items *Saving.* Button ***Graphic measurement*** new window will appear with a plot of measured values at the time. To initiation measurement, press the *Start button* and to termination the measurement, press *Stop measurement*. The chart is on the timeline divided into 16 parts, each of which contains 60 points (measured values). In total, therefore fits into a single graph 960 values. If a large number of measurements, a graph is automatically advanced. The maximum number of measured values is the 65535.

If we run the program without a connected device, so you can try most of the functions in the demonstration mode. Measured values are sinusoidal dependence of the full range of the instrument (± 32767).

6. The safety precaution

The device has protection class number III, where protection against electric shock is ensured by safe low voltage. Network adapter meets the conditions of the CSN EN61585-2-6 on safety protective transformers for general use.

7. Technical specification

Power supply: 7,2V/2400mA

Current consumption without the backlight: 20mA

Current consumption with the backlight: 200mA

Charge adapter: 12V/500mA

Time of charging max. 12 hour

Input: tensometric sensor (bridge): four-wire

Power of the tensometric sensor: 5V

Range of measuring: from –32767 to 32768 pieces

Range of viewing: –99999 až 99999 without the decimal point

Range of viewing: –9999 až 9999 with the decimal point

Operational temperature: 0 to 40 °

Box dimension: 95 x 200 x 45 mm (w x h x d)

Device protection: IP50

Working environment: normal CSN 33 2000-3

Service and production:

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