

USER'S MANUAL

SaluTron[®] D2X



PORTABLE
THICKNESS
GAUGE

WITH MEASURING MEMORY

SaluTron

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1. Preface

Thank you for purchasing our product. You have bought a product that fits exact specifications and globally recognized quality standards.

This thickness gauge is designed to stand even the toughest requirements in relation to temperature, humidity, shock, dust and vibration. Our testing standards and our commitment to absolute customer satisfaction guarantee that you can rely on the quality at any time.

Without much prior knowledge you can use the device immediately. Thanks to modern technology, the extensive additional functions can be activated easily. For questions about the thickness measurement our distributors or we are at your disposal.

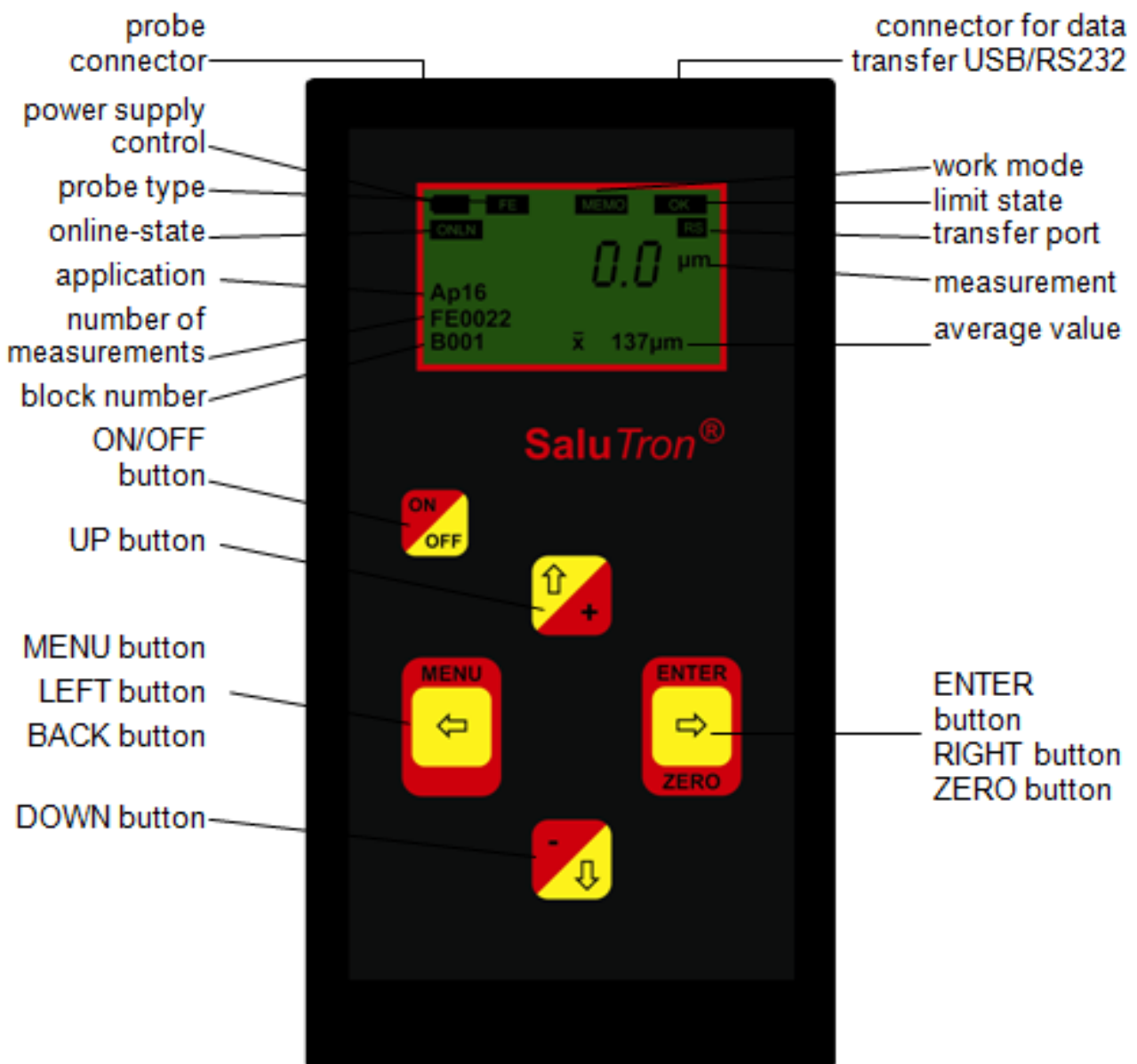
SaluTron[®] Messtechnik GmbH

2. Device Description

Small, handy, robust and user-optimized - these are characteristics of the coating thickness gauge **SaluTron® D2X**. Designed as a combination device with memory and interface it allows non-destructive measurements of magnetic (Fe) as well as non-magnetic (NFE) metal surfaces (substrates).

The **FE-probe** is used for measurements on non-magnetic coatings such as lacquer, plastic, chrome, copper, zinc, enamel etc., on steel or iron.

The **NFe-probe** applies to measurements on non-magnetic coatings such as lacquer, plastic, enamel etc., on aluminium, copper, brass, that is on non-magnetic metals (also on some sorts of stainless steel).



3. Maintenance

Good results and a long service life can only be achieved if the device is properly handled.

Avoid strong shock, the ingress of dirt, chemicals, corrosive substances and water. Clean probes allow good measurements. Remove dirt or paint from the measuring head.

In case of prolonged non-use it is recommended to take the batteries from the device.

If there are faults on the device or on the probes, we ask you not to make own repair attempts. Our service is available to you.

4. Power Supply

This gauge is powered by two 1.5 Mignon-cells. They extend for many thousands of measurements (about 60 operating hours without backlight activated). The level of capacity is shown by the battery symbol:



in the upper left corner of the display (see picture).

Note:

Never dispose used batteries with household waste, but only to the appropriate sites.

5. Measuring

The gauge is delivered with an attached probe, batteries, a set of measuring foils, a zero plate, a manual and a service kit. With the button




the device is switched on. After displaying the device ID and the last measured value the measurements can be started by placing the probe on the coating. For measurements on rods, pipes, etc. the V-groove on the probe head is helpful.


Magnetic and electric fields and electromagnetic radiation can influence the measurement both in the Fe as well as in the NFE sector.

In these cases, the device must be zeroed. If necessary the probe must be calibrated on three new standard foils. How to carry out the adjustment can be found in the main menu under [Applications](#).

Measurements on magnets should be omitted.

At high electrostatic charges the device turns off automatically to prevent damage.


While the device is switched on and you press the button 

the **SaluTron® D2X** will switch off immediately. In case of non-use the device switches off automatically after about three minutes. If the device is switched on without screwed probe a blinking icon will appear in the display: 

and it also makes an audible signal. After a short time the device switches off automatically.


6. Work Modes of SaluTron® D2X

The device can work in three work modes.

 ➤ work mode: normal / continuous / memory

In each mode special icons appear in the upper part of the display.


 ➤ battery: capacity of the battery supply

 ➤ no probe connected

 ➤ probe type: Fe / NFE (steel / non-steel metals)

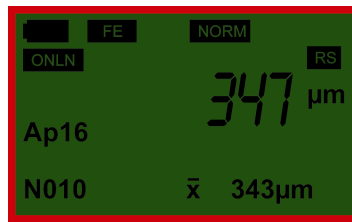
 ➤ limit: within limits / above limit / below limit

 ➤ transfer port: USB-RS / HP Infrared

 ➤ online: to transfer the measuring results online

 ➤ Data is retrieved and transferred from the PC.

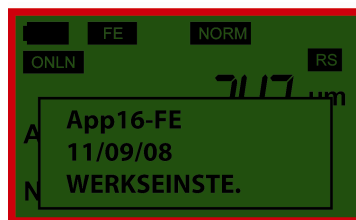
In the ordinary **non-memory mode** (**NORM**) the measurements are only displayed and not stored. In addition, the mean-value is determined continuously and displayed together with the number of measurements. This may be deleted in the menu item **Reset** (see menu description) at any time.



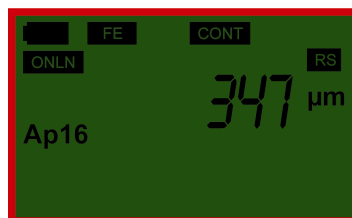
The active application (calibration of the probe) is shown in the figure after **Ap**. By pressing the button:



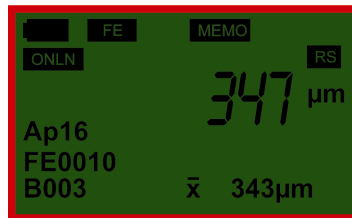
the information (date and comment) is shown for this application.



Beside the mere point measurement (without storage) you can also carry out **continuous surface measurement** (**CONT**). In this case two or three measurements are recorded and displayed within a second. These measurements are not taken for the calculation of the continuously determined mean-value, so it is not displayed here. The **online** transfer will not take place here either.



In the **memory mode** (**MEMO**) the measurements are not only displayed but also stored in different blocks. The display of the mean-value refers here always to the measurements that are currently stored in the active measurement block.



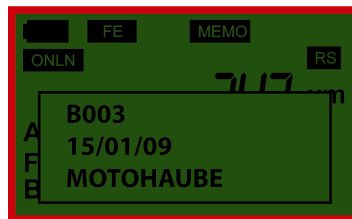
Just as in the normal mode information can be retrieved here also in "just active application" with the button:



In addition with the key




information (date and comment) is shown on the block that is currently open.

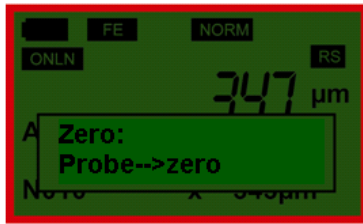


7. Zeroing of the device

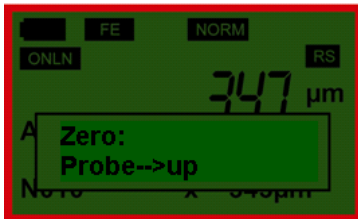
Special conditions such as changing temperature, new batteries, long non-use or different substrates (surfaces) may affect the measurement. In such cases take generally a zeroing from time to time. Take the measuring foils either from the service-suitcase or take your own foils.



- Press  in measuring mode.



- Place the probe on the measuring foil. You will hear a beep.



- Lift the probe at least 5 cm from the foil. You will hear a beep.

The zeroing is now complete. The device goes automatically into the measurement mode and is ready for measurements.

In the following part of the manual various possibilities are shown to the user like device settings over storage up to options available. The selection of points can be made individually and will depend on your personal needs.

8. Working with the menu



The manifold options of the device can be retrieved by pressing:

The individual items are first selected by using



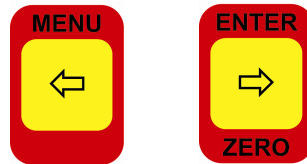
and then have to be confirmed with the Enter-button. You can skip quickly from the last to the first menu item in the main menu.





All four buttons have the function of arrow keys by which the input of data such as block numbers, limits and comments are possible. Press




and the next character from the letters or digits line (e. g. 0,1,2,3 or A, B, C, D. ...) is shown. Pressing




pushes the cursor on the device display according to the left or right. If you press the arrow keys **for more than 2 seconds** you can step quickly to the next input of scroll fast. For example, if you want to exceed the limit by 125 µm, proceed as follows

- Press  or  as long until "1" is displayed.

- With  you push the blinking cursor one place to the right.

- Press  or  until "2" is displayed.

- With  you push the blinking cursor one place to the right.

- Press  or  until "5" is displayed.

- Confirm with .

The input is now complete. The procedure is always the same even if you want to enter the time, date and comments for the measurement or applications.

The **SaluTron® D2X** can work in three different work modes - point measurement, continuous measurement and memory measurement - (see item - MODE). The menu structure changes according to the work mode. The settings which do not make sense in the selected mode are hidden in the MENU. The last work mode will be saved if you shut down the instrument.

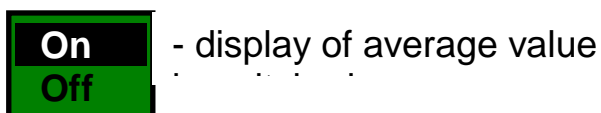
Average	Background
Reset	Mode
Background	Block
Mode	Values
Unit	Last delete
Buzzer	Memo delete
Language	Statistic
Time/Date	Print
Limits	Unit
Port	Buzzer
Online	Language
Application	Time/Date
Device	Limits
	Port
	Online
	Application
	Device

Point measurement and continuous measurement

memory measurement

8.1 Average (only in point measurement)

The **SaluTron® D2X** determines with each measurement (excluding storage of individual measurements) the ongoing mean-value. If this function is activated the mean-value will be shown together with the number of measurements in the display. This setting is very useful for measurements with high surface roughness, where repeated measurements on the same point can be different. In this case it is recommended to take the average of about 5 measurements as one result.




8.2 Reset

With the help of this item the mean-value, that is recalculated with each measured value and that is displayed in the bottom line, can be reset.

Average
reset? N

If the average should be calculated anew before the next measurement, change it

with  or 

from N (No) into Y (Yes) and confirm with  .

8.3 Background

With the help of this point the illumination of the display can be turned on or off. This function is very useful when using the device in dark environments.

On
Off

- Light of Background switched on
- Light of Background switched off

8.4 Mode

Besides the pure point measurement (without storage) you can also make continuous surface measurements. In this case, two to three measurements are recorded and displayed within a second. In the memory mode the measurements are stored in the database.

normal point measurement
continuous continuous measurement
memory memory measurement

Going into storage mode, first some information about the contents of the memory is displayed. In the first line of the window you see the number of all blocks that have been formed in the memory. In the second row the number of the last opened block is displayed. By changing this number, you can open an existing or a new block (number of the new block complies with the number of existing blocks +1).

total: 2
actual: 2

It must be considered that only meaningful input may be accepted from the device. For example, if a block has the number "0" or a number that is larger than the number of existing blocks +1, in the display appears



When creating a new block, the date is automatically saved. In addition, 12 characters can be entered into the block comment (e. g. information on measurement object) which also will be saved.



The inclusion of measurements in different blocks could be of interest, for example to draw conclusions about the quality.

8.5 Unit

It is possible to display the readings in μm -mm or in the American unit mil (1 mil = 25.4 μm = 0.0254 mm).



- measurement display in μm or mm
- measurement display in mils

8.6 Buzzer

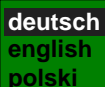
In this setting you can activate or deactivate the confirmation of each key press with a beep.



- key press with beep
- key press without beep

8.7 Language

For the menu guide and the instructions of the device can be chosen between three different languages:



- activated language is german
- activated language is english
- activated language is polish

8.8 Time/Date

In this menu item both time and date can be corrected or re-entered.



- for a correction press  and then  or  to change the time.


Confirm with .



- for a correction press  and then  or  to change the date.

Confirm with .



If the displayed time and date are not to be corrected, the entry can be interrupted

with .

Important:

When changing the batteries the set date and time gets lost. For this reason time and date have to be set after replacement of the batteries.




8.9 Limits

For quality assurance certain upper or lower limits in the coating have to be kept. When measurements go below or beyond these borders special characters (, ) and an additional audible beep will appear in the display.

- enter upper limit




Upper limit

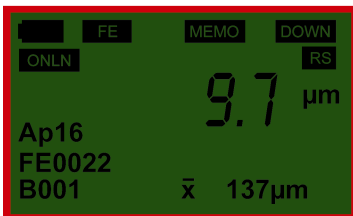


- The upper limit enter with  and  or .
- Activate with Y-Yes or N-No.

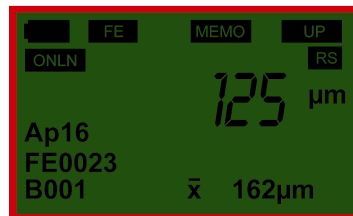
Lower limit



- Enter the lower limit value with  and  or .
- Activate with Y-Yes or N-No.



lower limit exceeded



upper limit exceeded

8.10 Port

With this setting the corresponding output port of the SaluTron® D2X is activated. You can choose between infrared transmission to a portable IR HP printer (using an IR adapter) or the classic serial interfaces USB/RS232.

If no classic USB/RS232 interface for the PC exists, a virtual interface USB/RS232 may be operated by a fixed USB/RS232-converter.

In this case the cable for the USB interface should be used for the transfer. Further information can be found under "**FTDI Driver Installation under Windows XP.**"

The transmission format of the serial interface has the following setting:

- **Baudrate:** 9600
- **Length of word:** 8 bits
- **Parity:** non
- **Stop bit:** 1
- **Xon/Xoff** active



- IR-HP - transfer by IR-Adapter
- USB/RS232 - transfer by interface cable

The corresponding IR adapter, or interface cable together, together with the evaluation software can be ordered as accessories. Furthermore, our evaluation software is available on our website www.salutron.de for free download.

8.11 Online

Online means that any measured value at the time of measurement can be transferred immediately to a printer (infrared, serial or transfer to a PC).



- direct transfer switched off
- direct transfer switched on

8.12 Application

As provided from the manufacturer, the device is set for normal measurements. There are, however, measurements outside of the standards, for example measurements on curvatures, etc.

To set the device at these very special measurements, SaluTron® D2X has a total of 16 application memories. The adjustment of the probe to the new conditions is performed by four measurements at four different layers from the entire range.




The first measuring point, also called "zero point", refers to the thickness equal to zero and may not be changed. In practice, this means that the measurement is to implement on a bare metal, on the zero plate or on an uncoated object model.

A further three measurements must be carried out at three sample films of different thicknesses. The thickness of the specimen foils may be arbitrarily chosen. The factory setting contains the measurement with the foils 50, 250 and 700 µm for both probes (Fe and NFE).




It should be noted that the sequence of measurements of the selected calibration foils must always be ascending, e.g. 10, 100 and 700 µm.

It is recommended that the points should be selected in a way that they cover the used measuring range. For example if the layers are mostly in the range between 20 and 200 µm, perform the adjustment with a probe of 20, 100 and 200 µm.

App-No. 15

- Application number (1 to 16) enter with  and  or .

01/01/07
Fe: 16
preset

- Application comments (if necessary) enter with  and  or .

Zero: 4x
Probe → zero

Should now only the previously saved application be activated, then confirm with






Thus, the device is initialized with the new calibration values from the application memory and it is ready to measure.

If you want to save a new application in the calibration memory you have to go on with the zero measurement.






- **Zero point:** measure 4 x

State: 50.0 µm
change-ENTER

- for correction press  and then set the right foil value with  or .




- **Foil 1:** measure 4 x

State: 250 μm
change-ENTER

- for correction press  and then set the right foil value with  or .

- **Foil 2:** measure 4 x

State: 250 μm
change-ENTER

- for correction press  and then set the right foil value with  or .

- **Foil 3:** measure 4 x

The calibration is now complete, activated and stored in the application memory.

Note:

The procedure described here you must also apply if you use a new probe for your device, because the old probe, e.g. by defect, had to be exchanged.

8.13 Device

In this menu item, in which no adjustments are possible, you can find information about the device: device name and serial number.

```
SaluTron D2X
Serial-No: 20000
```

9. Additional Items in Memory Mode

9.1 Block



In this menu item an already existing block can be opened or a new block can be created (see point **mode** in this manual).

9.2 Values

This sub menu item has the opportunity to view the measurements of a certain block. First you get the total number of created blocks in the first display line. In the second line the current block is displayed, that means the block in which the last measurements were stored. If you want to look at the readings of another block

enter the number of the current block with  or  and confirm with .

```
All:    3
Actual: 3
```

The display shows a list of values that can be scrolled with  or .

```
FE1    11.5µm
FE1    24.7µm
```

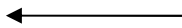
Note:

In this sub menu item individual readings can be highlighted as deleted. This means that the measured value is not removed from the measurements row, but it is not taken into account with the calculations of the statistics.

That would be important if someday it is recognized that a reading accidentally was completely false and thus distorted the statistics. In this case, the measured value



must be placed in the first row of the display and be marked with " * ". This measured value will get a " * " and will not be taken into account in the statistics.



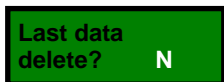
Measured value not allowed for statistics






Return to menu with

9.3 Last delete

Under this menu item, the last recorded reading or the just created block can be deleted.






- Select Y-Yes or N-No with  or  and confirm with .

9.4 Memo delete

With this menu item, the entire memory (not only the measured values, but all formed blocks with associated comments) can be deleted.



- Select Y-Yes or N-No with  or  and confirm with .



9.5 Statistic


All measurements that were previously recorded and stored will be processed in the device and can be seen as statistics. These include the following factors:

N	=(number of all measurements)
Fe	=(number of Fe - measured values)
NFe	=(number of NFe - measured values)
Nst	=(number of readings for statistics)
*N	=(number of deleted readings)
Min	=(smallest measured value)
Max	=(largest measured value)
Ave	=(arithmetical mean-value)
Sta	=(Standard Deviation)
Vk	=(coefficient of variation in %)



The statistics can be calculated for individual as well as for multiple measurement blocks. If the statistics should be calculated only for one block, enter the same figure of "from block" and "till block".

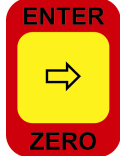
from bl	
	3

- Enter the number of the top block for the statistics with  or  and confirm



with  .

from bl:	1
till bl:	2

- Enter the number of the last block for the statistics with  or  and confirm

with  .

N	51
Fe	27
...	

- You can browse in the statistical parameters by pressing  or .

9.6 Print

With **SaluTron**® D2X all measurements and statistics can be printed or even transferred to the PC. This can be made with a portable infrared HP compatible printer (see menu item **Port** of this manual) or via a serial printer using an interface cable USB/RS232.

The measurement protocol or measured data can be transferred with the help of a program and an interface cable into a file on a PC and then further processed. If you choose option “report” you get a listing in a format that can be read directly by programs such as Excel or Lotus. The required software is available on our homepage www.salutron.de. The transmission format for the serial interface is:

- **Baudrate:** 9600
- **Word length:** 8 Bit
- **Parity:** none
- **Stop bit:** 1
- **Xon/Xoff** active

To print out the protocol it is to proceed as follows:

Report
Measure



- Confirm with .

Now the data for the measurement report (gauger, supplier, customer, object, Commission number and batch no.) and the configuration of the printout (output of individual measurements, blocks of Statistics, histograms) have to be entered. Press **Enter** so long until the next item appears.

Examiner:
xxxx

- Enter examiner's name (if necessary) with  or  and confirm with .




Supplier:
xxxx

- Enter supplier's name (if necessary) with  or  and confirm with .




Customer:
xxxx

- Enter customer's name (if necessary) with  or  and confirm with .

Object:
xxxx

- Enter object's name (if necessary) with  or  and confirm with .



Com.No:
xxxx


- Enter the commission number (if necessary) with  or  and confirm with .

Charge.No:
xxxx



- Enter the batch number (if necessary) with  or  and confirm with .


from bl:	1
till bl:	2

- Enter the number of the top block for the statistics with  or  and confirm




with  ZERO .

from Bl.:	1
to Bl.:	2




- Enter the number of the last block for the statistics with  or  and confirm

with  ZERO .




Select measureme.? N

- Select Y-Yes or N-No with  or  and confirm with  ZERO .




All Blocks together? N

- Select Y-Yes or N-No with  or  and confirm with  ZERO .

Histogram?
N

- Select Y-Yes or N-No with  or  and confirm with .

Print? N

- Select Y-Yes or N-No with  or  and confirm with .

*) The histogram is a graphical representation of the processed data. It is equal to "Gauss's distribution."

Choosing "**measured values**" effects the outprint of the readings in table form. This print format should also be selected for the transmission of measured values into **SaluTron** - Analysis software (up to ver. 3.0) or into the SaluTron Excel template.

Important:

Because of its' width, the outprint of "measured values" is only possible in the port selection - USB/RS232.

10. Technical Data

	Fe	NFe
Base material (substrate)	iron or steel	non-magnetic metals such as aluminum, zinc, copper, brass, some stainless steel grades
Coating	all non-magnetic coatings as lacquer, plastics, chromium, copper, zinc, enamel, etc.	insulating coatings such as lacquer, enamel, plastics, paper, glass, rubber, etc.
Measuring range	0 - 2 mm or 0.00 - 80 mil	0 - 800 μm , or 0.00 - 32 mil
Measurement display	0.0 - 999 μm and from then 1.00 - 2.00 mm or 0.00 - 80 in mil	0.0 - 800 μm or 0.0 - 32 mil
Resolution	0.1 μm in the range of 0.0 - 99.9 μm 1 μm in the range of 100 - 999 μm 0.01mm in the range of 1.00 - 2.00 mm or 0.01 mil in the range of 0.00 - 9.99 mil 0.1 mil in the range of 10.0 - 80.0 mil	0.1 μm in the range of 0.0 - 99.9 μm 1 μm in the range of 100 - 800 μm or 0.01 mil in the range of 0.00 - 9.99 mil 0.1 mil in the range of 10.0 - 32 mil
Minimum thickness of the base material	0.20 mm or 8 mil	0.05 mm or 2 mil

Repetitive accuracy	$\pm (1.5 \mu\text{m} + 2\%)$ or $\pm (0.06 \text{ mil} + 2\%)$
Minimum measuring area	10 x 10 mm or 0,4" x 0,4"
Memory	8192 locations
Blocks	optional in the range of memory's capacity
Temperature	- Storage: -10 °C to 60 °C or 14 °F to 140 ° F - Operating: 0 °C to 60 °C or 32 °F to 140 ° F
Probes	One-Point
Interface	USB/RS232
Printer	using HP-infrared (distance max. 1m, on request) standard serial printer
Power supply	2 x 1.5 V AA alkaline
Dimensions	152 x 82 x 33 mm
Weight	150 g (with batteries) or 5.3 oz

Technical changes reserved.

All **SaluTron**[®] gauges comply with national (DIN) and international (ISO, BS, ASTM) standards and have the CE mark.

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