USER´S MANUAL

Salu*Tron*® D2X

PORTABLE
THICKNESS
GAUGE

Contents

1. Preface

Thank you for choosing our product. You have purchased a product that meets precise specifications and upholds globally recognized quality standards.

The purpose of this thickness gauge is to withstand the most demanding conditions, including temperature variations, humidity, shock, dust, and vibration. Our rigorous testing standards, along with our unwavering commitment to ensuring customer satisfaction, guarantee that you can rely on its quality at all times.

You can start using the device immediately, even without prior expertise, thanks to its user-friendly design. The device incorporates advanced technology, allowing you to effortlessly activate the extensive range of additional functions.

Should you have any inquiries regarding thickness measurements, our dedicated distributors or we ourselves are available to assist you.

Salu_Tron_ Messtechnik GmbH

2. Device Description

The **Salu**Tron D2X coating thickness gauge is a compact, durable, and user-friendly device optimized for your convenience. It is designed as a versatile tool with memory and interface capabilities, enabling non-destructive measurements on both magnetic (Fe) and non-magnetic (NFE) metal surfaces (substrates).

The FE probe is specifically designed for measuring non-magnetic coatings, including lacquer, plastic, chrome, copper, zinc, enamel, etc., on steel or iron surfaces.

The NFe probe is intended for measuring insulating coatings, such as lacquer, plastic, enamel, etc., on non-magnetic metals such as aluminum, copper, brass, and even certain types of stainless steel.
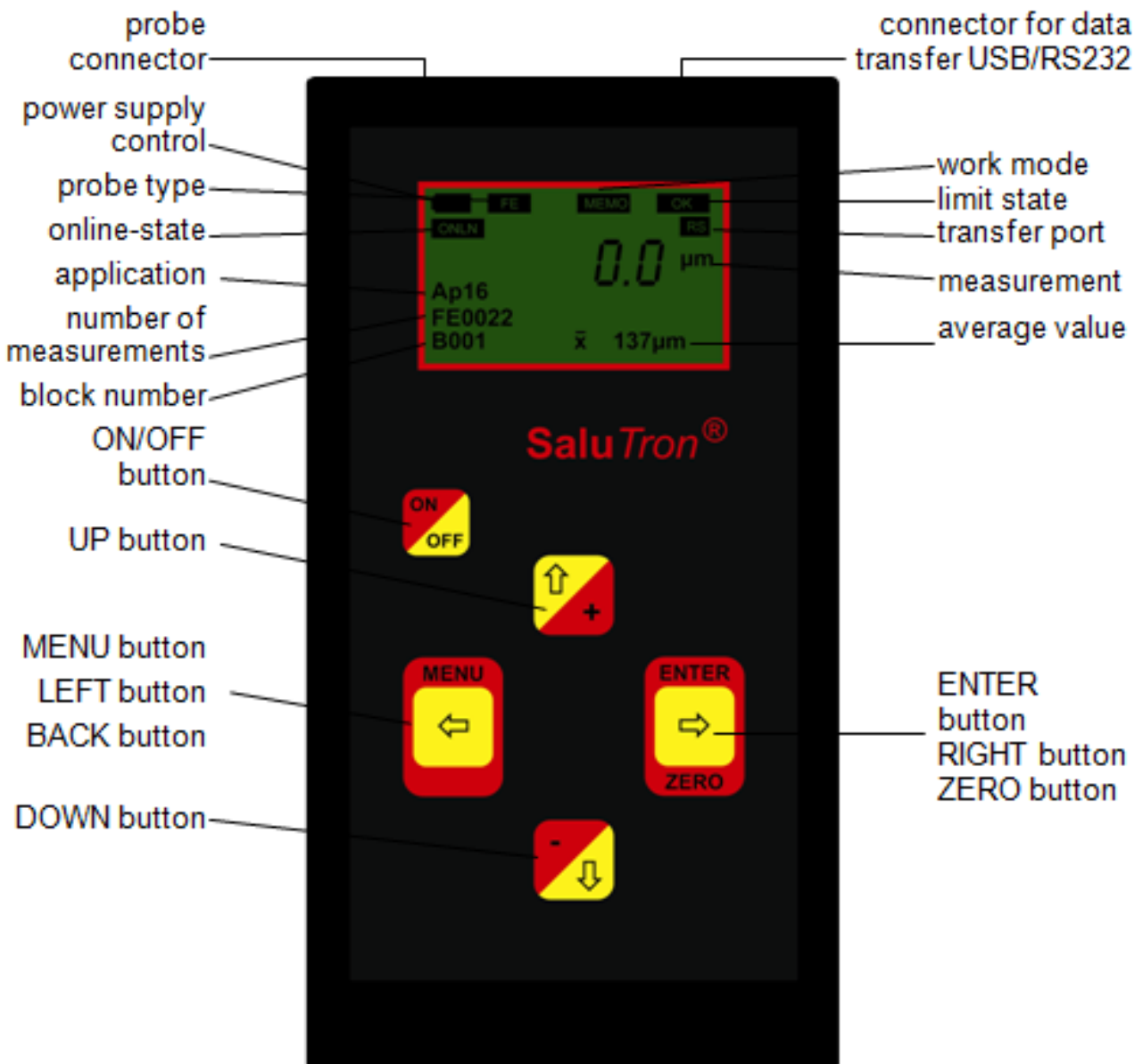
3. Maintenance

To achieve optimal results and ensure a long service life, it is crucial to handle the device properly. Please follow these guidelines:

- Avoid subjecting the device to strong shocks and prevent the ingress of dirt, chemicals, corrosive substances, and water. This will help maintain its performance and accuracy.
- Regularly clean the probes to ensure accurate measurements. Remove any dirt or paint from the measuring head to prevent interference with readings.
- If the device is not going to be used for an extended period, we recommend removing the batteries. This will help preserve battery life and prevent potential damage due to battery leakage.
- In the event of any faults or issues with the device or probes, please refrain from attempting repairs on your own. Instead, we kindly request you to contact our service center. Our dedicated team will be available to assist you and provide the necessary support.

By adhering to these guidelines, you can ensure optimal performance, longevity, and reliable measurements from your coating thickness device.

4. Power Supply

This gauge is powered by two 1.5V AA batteries. These batteries provide extended usage for many thousands of measurements, equivalent to approximately 60 operating hours without activating the backlight. The battery capacity level is indicated by a battery symbol located in the upper left corner of the display (refer to the picture).

Note:
Please do not dispose of used batteries with household waste. Instead, ensure proper disposal at designated collection sites.

5. Measuring

The gauge comes with an external cable probe, two 1.5V AA Alkaline batteries, a set of measuring foils, a zero plate, a kit for data transfer to a PC and a user manual. To turn on the device, simply press the

button. Once turned on, the device will display the device ID and the last measured value. To begin measurements, place the probe on the coating surface. The V-groove on the probe head is especially useful for measurements on rods, pipes, and similar objects.

The gauge is delivered with an attached probe, batteries, a set of measuring foils, a zero plate, kit for data transfer to PC and user manual. With the button

Magnetic fields, electric fields, and electromagnetic radiation can affect the measurement accuracy in both the Ferro (Fe) and Non-Ferro (NFE) sectors. In such situations, it is necessary to perform a zeroing procedure for the device. If required, the probe should be calibrated using three new standard foils. Detailed instructions on how to carry out this adjustment can be found in the main menu under the 'Applications' section.

Please refrain from measurements on magnets as they may produce inaccurate results. Additionally, to prevent any potential damage, the device automatically shuts off when exposed to high electrostatic charges.

When the device is powered on and you press the

button, the **Salu**Tron D2X will immediately power off. If the device is not used, it will automatically power off after approximately three minutes. If the device is turned on without the probe screwed in, a blinking probe icon ▭ will appear on the display accompanied by an audible signal. After a brief period, the device will automatically power off.

6. Work Modes of SaluTron D2X

The device can work in three work modes.

NORM CONT MEMO   ➢ 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

FE NFE   ➢ probe type: FE / NFE (steel / non-steel metals)

OK DOWN UP   ➢ limit: within limits / above limit / below limit

RS IR   ➢ transfer port: USB-RS / HP Infrared

ONLN   ➢ online: to transfer the measuring results online

PC   ➢ Data is retrieved and transferred from the PC.

In the standard **non-memory mode** (NORM), measurements are displayed but not stored. Furthermore, the mean value is calculated continuously and shown along with the total number of measurements. You have the option to delete this information at any time by accessing the **Reset** menu item (refer to the menu description for more details).

The active application (calibration of the probe) is shown in the figure after **Ap**. By pressing the button:
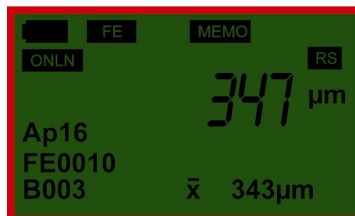
the information (date and comment) is shown for this application.
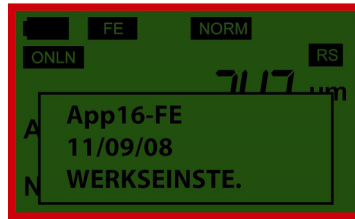
In addition to the basic point measurement (without storage), you can also perform **continuous surface measurements** (CONT) with this device. In this mode, two or three measurements are recorded and displayed within a second. However, please note that these measurements are not used to calculate the continuously determined mean value, so it will not be displayed. Online transfer of the data is not available in this mode 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 like in the normal mode, you can retrieve information about the active application by pressing the button:

.

Furthermore, by pressing the key

,

relevant information such as the date and comment is displayed outside the currently selected block.
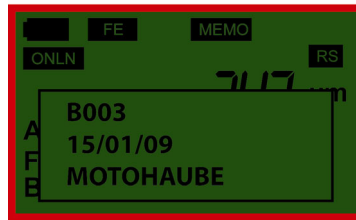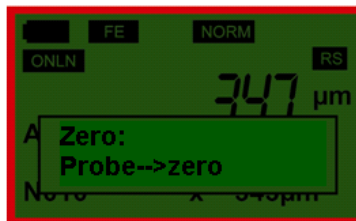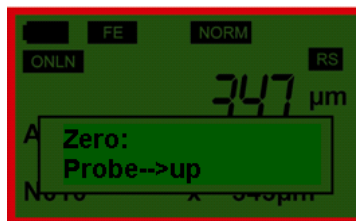
7. Zeroing of the device

Special conditions, such as fluctuating temperatures, the introduction of new batteries, extended periods of non-use, or variations in substrates (surfaces), can potentially impact the accuracy of the measurements. In these instances, it is advisable to perform regular zeroing procedures.

- 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.

The following section of the manual demonstrates the various options available to the user, including device settings, storage, and other available features. The selection of these options can be tailored to suit your specific requirements.
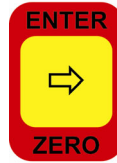
8. Working with the menu
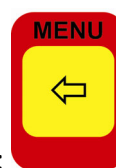
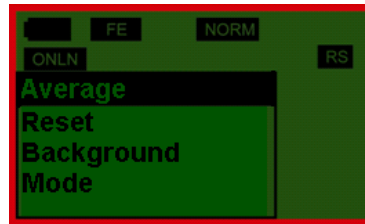The main menu of the device can be retrieved by pressing:

To select individual items, use the buttons:
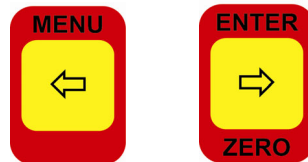
and confirm your selection by pressing the

button. In the main menu, you can quickly navigate from the last item to the first item.

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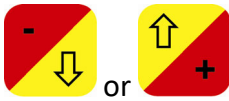
- Press   or   as long until "1" is displayed.

- 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 process is now complete. The procedure remains the same whether you need to enter the time, date, or comments for the measurement or applications.

The **Salu**Tron D2X offers three different work modes: point measurement, continuous measurement, and memory measurement (refer to item - MODE). The menu structure adapts based on the selected work mode. Settings that are irrelevant in the chosen mode are concealed within the MENU. The instrument will save the last used work mode when powered off.

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 and continuous measurement	memory measurement

8.1 Average (only in point measurement)

The **Salu**Tron D2X continuously calculates the average value during each measurement (excluding the storage of individual measurements). When this function is enabled, the average value, along with the number of measurements, will be displayed. This feature is particularly valuable when dealing with

surfaces that exhibit high roughness, where repeated measurements at the same point may yield different values. In such cases, it is advisable to take an average of approximately five measurements to obtain a reliable result.

On — - display of average value is on
Off — - display of average value is off

8.2 Reset

This item allows you to reset the mean value, which is recalculated with each measured value and displayed in the bottom line.
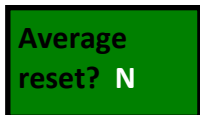
Average
reset? N

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

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

.

8.3 Background

This item controls the background illumination of the display. This function proves to be highly beneficial in low-light settings, enabling users to conveniently use the device even in dark environments.

On — - background illumination is on
Off — - background illumination is off

8.4 Mode
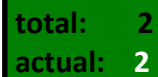
In addition to performing single point measurements without storage, you can also carry out continuous surface measurements using the device. In this mode, two to three measurements are recorded and displayed per second. When using the memory mode, these measurements are stored in the device's database.

normal — - point measurement
continuous — - continuous measurement
memory — - memory measurement

When entering storage mode, the device will display information about the memory contents. The first line of the window shows the total number of blocks stored in the memory. The second line displays the

number of the most recently accessed block. By modifying this number, you can access either an existing block or create a new one (the number of the new block should be the number of existing blocks +1).

```
total:     2
actual:    2
```

Please ensure that the device only accepts valid input. For instance, if a block is assigned the number "0" or a number greater than the total number of existing blocks +1, the display will show:

```
Block-No. not
correct
```

When a new block is created, the date is automatically saved. Furthermore, it is possible to enter up to 12 characters in the block comment field (e.g., information regarding the measurement object), which will also be saved.

```
B.Comment:
xxx…
```

Including measurements in different blocks can be advantageous, especially when drawing conclusions about the quality.

8.5 Unit

The device allows you to choose between displaying readings in µm-mm or the American unit mil (1 mil = 25.4 µm = 0.0254 mm).

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

8.6 Buzzer

In this setting, you can enable or disable the confirmation beep for each key press.

```
On             - key press with beep
Off            - key press without beep
```

8.7 Language

The device offers a menu guide and instructions in three different languages for your convenience. You can choose your preferred language from the available options.
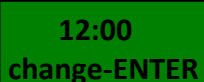
```
deutsch        - activated language is german
english        - activated language is english
polski         - activated language is polish
```
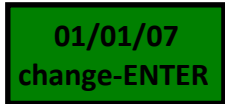
8.8 Time/Date

In this menu item, you can correct or re-enter both the time and date.

```
    12:00
change-ENTER
```

- for a correction press [ENTER/ZERO] and then [-/↓] or [↑/+] to change the time.

Confirm with [ENTER/ZERO] .

```
01/01/07
change-ENTER
```

- for a correction press [ENTER/ZERO] and then [-/↓] or [↑/+] to change the date.

Confirm with [ENTER/ZERO] .
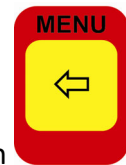
If the displayed time and date are not to be corrected, the entry can be interrupted with [MENU] .

Note:
When replacing the batteries, please note that the set date and time will be lost. Therefore, it is necessary to reset the time and date after battery replacement.

8.9 Limits

In order to ensure quality assurance, it is necessary to maintain specific upper and lower limits for the coating thickness. When measurements fall below or exceed these boundaries, special symbols (DOWN, UP) along with an audible beep will be displayed.
- enter upper limit

Upper limit

```
0.0 µm
Limit up? N
```
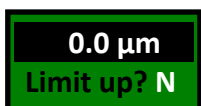
- Enter The upper limit with [ENTER/ZERO] and [-/↓] or [↑/+] .

- Activate with Y-Yes or N-No.

Lower limit

0.0 µm
Limit down? N
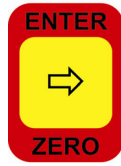
- Enter the lower limit value with **ENTER ⇨ ZERO** and **− ⇩** or **⇧ +** .
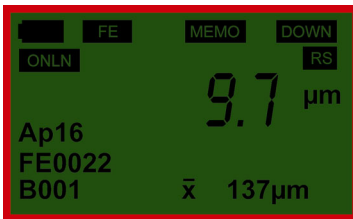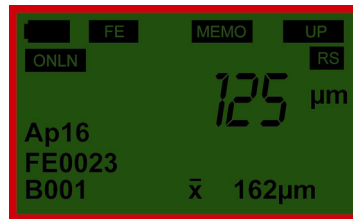
- Activate with Y-Yes or N-No.

lower limit exceeded   upper limit exceeded

8.10 Port

This setting activates the corresponding output port of the SaluTron® D2X device. You have the option to select either infrared transmission to a portable IR HP printer (using an IR adapter) or the traditional serial interface, USB. If you choose the USB interface, please use the USB cable for the data transfer. For more detailed instructions, refer to the "**FTDI Driver Installation under Windows**" section for additional information.

The transmission format of the serial interface is as follows:
- **Baudrate:**   9600
- **Datalength:** 8 bits
- **Parity:**   non
- **Stop bit:**   1
- **Xon/Xoff**   active

IR-HP
RS232

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

The IR adapter, along with the evaluation software, can be ordered as additional accessories. Moreover, our evaluation software is also available for free download on our website, www.salutron.de.

8.11 Online

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

On
Off

     - direct transfer is on
     - direct transfer is off

8.12 Application

The following is a revised version of the text:

By default, the device is set for standard measurements as per the manufacturer's specifications. However, there are situations where non-standard measurements are required, such as measurements on curved surfaces, and so on.

To enable these specialized measurements, the **Salu***Tron* D2X offers a total of 16 application memories. Adjusting the device for these unique conditions involves conducting four measurements at different layers across the entire range.

The first measurement point, known as the "zero point," remains fixed and represents a thickness of zero. This measurement is typically performed on bare metal, a zero plate, or an uncoated object model.
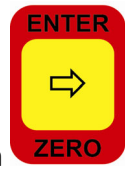
Additionally, three measurements need to be taken using sample films of varying thicknesses. The choice of thickness for these specimen foils is flexible. The factory default settings include measurements using foils of 50, 250, and 700 µm for both the Fe and NFE probes.

It's important to note that the selected calibration foils must always be measured in ascending order, such as 10, 100, and 700 µm.
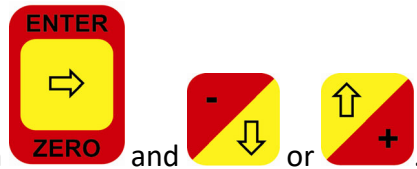
We recommend selecting measurement points that adequately cover the anticipated range of coatings. For instance, if the expected layer thicknesses primarily fall between 20 and 200 µm, perform the adjustment using foils of 20, 100, and 200 µm.
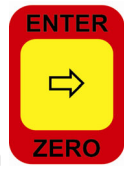
App-No. 15
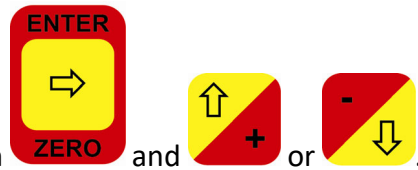
- Enter the application number (1 to 16) with [ENTER ⇨ ZERO] and [⇧ / +] or [- / ⇩].

01/01/07
Fe: 16

- Enter the application comment (if necessary) with [ENTER ⇨ ZERO] and [- / ⇩] or [⇧ / +].

Zero: 4x
Probe → zero

If only the previously saved application needs to be activated, confirm by pressing the
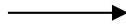
[ENTER ⇨ ZERO].

The device is initialized with the new calibration values stored in the application memory, making it ready to measure.

To save a new application in the calibration memory, you need to proceed with the zero measurement.
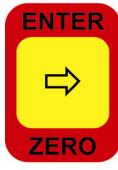
Zero: 4x
Probe → zero

Zero: 4x
Probe → up

→

- **Zero point**: measure 4 x

```
State:  50.0 µm
change-ENTER
```

- for correction press [ENTER ⇨ ZERO] and then set the right foil value with [- ⇩] or [⇧ +].

- **Foil 1:** measure 4 x

```
State:  250 µm
change-ENTER
```
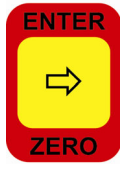
- for correction press [ENTER ⇨ ZERO] and then set the right foil value with [- ⇩] or [⇧ +].

- **Foil 2:** measure 4 x

```
State:  700 µm
change-ENTER
```
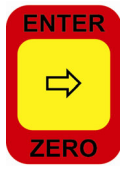
- for correction press [ENTER ⇨ ZERO] and then set the right foil value with [- ⇩] or [⇧ +].

- **Foil 3:** measure 4 x

The calibration process has been successfully completed and is now activated and stored in the application memory.

Note:
You must follow the same procedure described here if you are using a new probe for your device, as the previous probe may have been replaced due to defects.

8.13 Device

In this menu item, you can access information about the device, including its name and serial number. Please note that no adjustments are available in this menu.

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

9. Additional Items in Memory Mode

9.1 Block

In this menu item, you can either open an existing block or create a new one. Please refer to the item **Mode** section in this manual for more information.

9.2 Values

This submenu option provides the ability to view measurements for a specific block. The total number of created blocks is displayed on the first line of the screen. The second line shows the current block, which is the block where the most recent measurements were stored. To view the readings of a different block, use

the buttons [-/⇓] or [⇑/+] to enter the number of the desired block and confirm with [ENTER/⇨/ZERO] .

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

The display presents a scrollable list of values accessible through [-/⇓] , [⇑/+] buttons.

```
FE1     11.5µm
FE2     24.7µm
```

Note:

In this submenu item, individual readings can be marked as deleted. This means that the measured value will not be removed from the measurements row but will be excluded from the statistical calculations. This feature is important in cases where it is discovered that a reading was mistakenly recorded and has therefore distorted the statistics. To mark a reading as deleted, place the measured value in the first row of

the display and press the [ENTER/⇨/ZERO] key. The marked value will be indicated with an asterisk (*) and will not be considered in the statistical analysis.

```
*FE1    11.5µm          ⟵———————  measured value excluded from statistic
FE1     24.7µm
```

Return to menu with [MENU/⇦] .

9.3 Last delete

Within this menu item, you can delete either the most recent recorded reading or the newly created block.

```
Last data
delete?     N
```

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

9.4 Memo delete

This menu item allows you to delete the entire memory, including the measured values and all created blocks with their associated comments.

```
All data
delete?   N
```

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

9.5 Statistic

All previously recorded and stored measurements will be processed by the device and displayed as statistical data. The following information is included in these statistics:

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 measurement blocks or multiple measurement blocks. If you want to calculate the statistics for only one block, enter the same value for both "from block" and "till block".

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

```
from bl:       1
till bl:       2
```
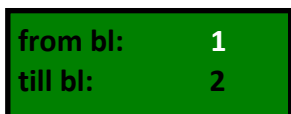
- Enter the number of the last block for the statistics with or and confirm with .

```
N            51
Fe           27
```
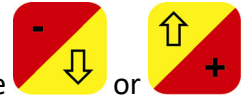
- You can navigate through the statistical data by pressing the [⬇] or [⬆+].

9.6 Print

With the **Salu***Tron* D2X, you have the ability to print all measurements and statistics or transfer them to a PC. This can be done using a portable infrared HP compatible printer (refer to the **Port** menu item in this manual) or a serial printer connected via a USB/RS232 interface cable.

The measurement protocol and data can be transferred to a PC and saved into a file using a program and an interface cable. Once saved, you can further process the data as needed.

If you select the "report" option, you will receive a listing in a format that can be directly read by programs like Excel. The required software can be found on our homepage at www.salutron.de. The transmission format for the serial interface is as follows:

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

To print out the protocol, follow these steps:

```
Report
Measure
```

- Confirm with [ENTER/ZERO].

Please enter the required information for the measurement report, including the examiner, supplier, customer, object, commission number, and batch number. Additionally, configure the printout settings for individual measurements, statistics blocks, and histograms. Press the [ENTER/ZERO] key repeatedly until the next item is displayed.

```
Examiner:
```

- Enter examiner's name (if necessary) with [-/⇩] or [⇧/+] and confirm with [ENTER ⇨ ZERO].

> **Supplier:**
> _____

- Enter supplier's name (if necessary) with [-/⇩] or [+] and confirm with [ENTER ⇨ ZERO].

> **Costumer:**
> _____

- Enter customer's name (if necessary) with [-/⇩] or [⇧/+] and confirm with [ENTER ⇨ ZERO].

> **Object:**
> _____

- Enter object's name (if necessary) with [-/⇩] or [+] and confirm with [ENTER ⇨ ZERO].

> **Com.No:**
> _____

- Enter the commission number (if necessary) with [-/⇩] or [⇧/+] and confirm with [ENTER ⇨ ZERO].

> **Charge.No:**
> _____

- Enter the batch number (if necessary) with [-/⇩] or [⇧/+] and confirm with [ENTER ⇨ ZERO].

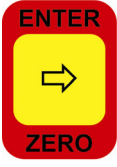> **from bl: 1**
> **till bl: 2**

- Enter the number of the top block for the statistics with [-/⇩] or [+] and confirm with [ENTER ⇨ ZERO].

> **from Bl.:   1**
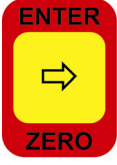> **to Bl.:   2**

- Enter the number of the last block for the statistics with [-/⇩] or [+] and confirm with [ENTER ⇨ ZERO].

> **Select**
> **measureme.? N**

- Select Y-Yes or N-No with [−/↓] or [↑/+] and confirm with [ENTER ⇨ ZERO].

```
┌──────────────────────────┐
│ All Blocks               │
│ together?        N       │
└──────────────────────────┘
```

- Select Y-Yes or N-No with [−/↓] or [↑/+] and confirm with [ENTER ⇨ ZERO].

```
┌──────────────────────────┐
│ Histogram?       N       │
└──────────────────────────┘
```

- Select Y-Yes or N-No with [−/↓] or [↑/+] and confirm with [ENTER ⇨ ZERO].

```
┌──────────────────────────┐
│ Print?        N          │
└──────────────────────────┘
```

- Select Y-Yes or N-No with [−/↓] or [↑/+] and confirm with [ENTER ⇨ ZERO].

*) The histogram is a graphical representation of the processed data, resembling a Gaussian distribution.

Choosing the **Measure** item will display the readings in a table (CSV) format for the output. This print format should also be selected when transmitting the measured values to the **Salu**Tron Analysis software (up to version 3.0) or the **Salu**Tron Excel template.

Note:
Due to its width, the **Measure** printout can only be generated when using the USB/RS232 port selection.

10. Technical Data

	Fe	**NFe**
Base material (substrate)	iron or steel	non-magnetic metals such as aluminium, 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	0.1 µm in the range of 0.0 - 99.9 µm 1 µm in the range of 100 - 800 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	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	± (1.5 µm + 2%) or ± (0.06 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 ir IR-HP	
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 **Salu**_Tron_ ® gauges comply with national (DIN) and international (ISO, BS, ASTM) standards and have the CE mark.

The name Excel is registered trademark.

In the interest of environmental protection, dispose of the device properly. Do not throw it into household waste but take it to a designated collection point for electronic waste or return it to your supplier.

Remove the battery beforehand and dispose of it properly in a designated battery collection container.

Packaging materials are also valuable resources! Therefore, contribute them to the recycling process.