

[®] *SaveCoat 10*



www.savecoat.com

Universal Noncontact Thickness and
Profiling Gauge

INNO
TEST **AG**

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Please note that ®SaveCoat 10 is an exclusive HighTech device. Therefore handle it with care and you will have an excellent gauge for years.

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1 Important

Take time to read this user manual before you use your SaveCoat10. It contains important information and notes regarding your SaveCoat 10.


Notice This product meets the applicable Industry technical specifications CE. The equipment must be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Innotest AG maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the Innotest AG cause to dissolve the guarantee.

1.1 Power requirements

- The Gauge requires an external electrical supply of 24 V DC (min 0.75 A). Therefore a universal power supply working with 110-240 volts AC (50-60 Hz) is included in the delivery package. To avoid damages of the unit itself it is highly recommended to use the original power supply unit.

1.2 To avoid damage or malfunction

- Do not allow the charging contacts  or the battery to come into contact with metal objects.

- Do not open it as you could be exposed to high voltages.
 - Do not allow the charger to come into contact with liquids.
 - Never use any other battery than the one delivered with the product or recommended by Innotest AG: risk of explosion.
 - Always use the cables provided with the product.
 - Do not expose the device to excessive heat caused by heating equipment or direct sunlight.
 - Do not drop your device or allow objects to fall on your device.
 - Do not use any cleaning agents containing alcohol, ammonia, benzene, or abrasives as these may harm the set.
 - Do not use the product in places where there are explosive hazards.
 - In case of any pollution (dust, powder, ...) inside the sensor gun only use air at normal or highly reduced pressure to blow out – use of pressurized air may destroy the sensors themselves.
-

1.3 Operating and storage temperatures

- Operate in a place where temperature is always between 10° and 35° C (50° to 95° F).
- Store in a place where temperature is always between -20 and 45° C (-4 to 113° F).
- Battery life may be shortened in low temperature conditions.

1.4 Conformity

We, Innotest AG declare that the product is in compliance with the essential requirements and other relevant provisions of Directive. It corresponds to the EC Guidelines 2004/108/EWG "Electromagnetic Compatibility". The measured thickness of coating values are not affected by the maximum values for disturbances mentioned in the EN 61000-4-2 (2009), EN 61000-4-3 (2006), EN 55011 (2007) which is included in EN 61326-1 (2006). It is well protected against strong electromagnetic fields (e.g. motors, high-voltage cables, radio broadcasting masts).

1.5 Electric, Magnetic and Electromagnetic Fields ("EMF")

- Innotest AG manufactures and sells many consumer oriented products which usually, as with any electronic apparatus, have the ability to emit and receive electromagnetic signals.
- One of Innotest AG leading business principles is to take all necessary health and safety precautions for our products, to comply with all applicable legal requirements and to stay well within the EMF standards applicable at the time of producing the products.
- Innotest AG is committed to develop, produce and market products that cause no adverse health effects.

- Innotest AG confirms that if its products are handled properly for their intended use, they are safe to use according to scientific evidence available today.

1.6 Recycle your batteries

Do not dispose your rechargeable battery packs.



The WEEE directive (Waste electrical and electronic equipment; 2002/96) was established to protect human health and the environment and adopted to ensure that retired products using the best possible reprocessing, recovery and technical recycling opportunities. Your product is developed and manufactured of high quality materials and components and can be recycled and reused. Please do not dispose the old equipment in the normal household waste.

1.7 Disposal options

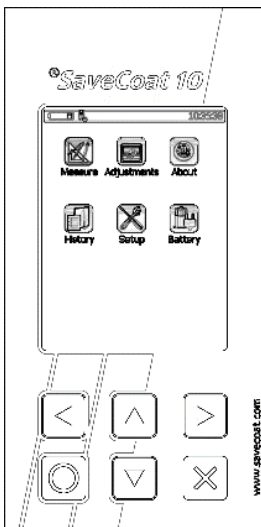
Dispose of the complete product (including cable, plugs and accessories) in the designated WEEE collection facilities.

2 Your [®]SaveCoat 10 Gauge

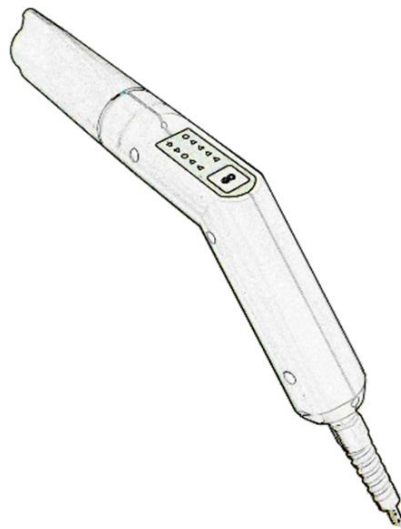
Congratulations on your purchase and welcome to [®]SaveCoat 10!

To get latest product information as well as actual version of this manual visit the web page www.savecoat.com.

Packaging Contents



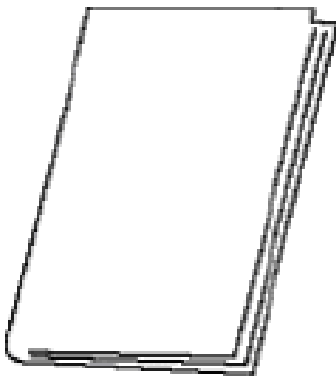
Gauge



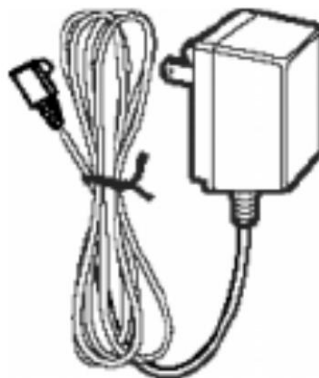
Sensor Gun



Reference Block



Manual



Power Supply



Carry Case



USB Cable

Metal. Base-Plates

Shims / Glass Panes

3 Modes of use

The ®SaveCoat 10 operating firmware is organized in two modes of use giving different capabilities to Users and their SuperVisors.

In addition to the colour of the top bar (orange and olive-green) there is a short on the left side of the time counter expressing the actual mode of use:

- U User
- SV SuperVisor

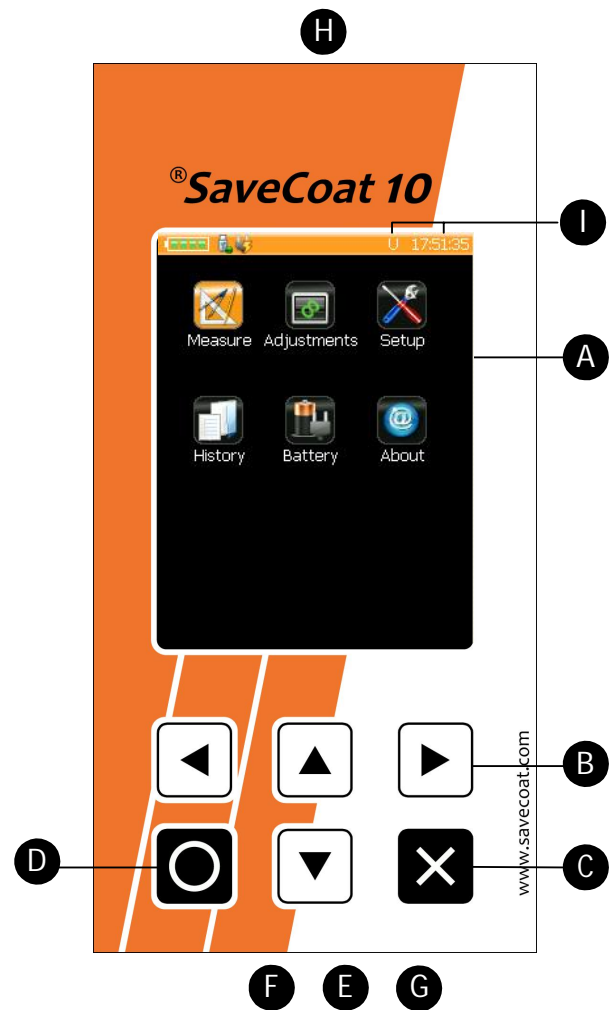
The shorts are also added to the titles of this manual to indicate the corresponding mode of use!





To change mode of use back and forth just press left, up and right arrow keys simultaneously (upper row of keys).

Powering on ®SaveCoat 10 starts in the mode User!

In this manual we first start describing and instructing the mode of use User. In a second part we add the description of the additional features in the enhanced mode of use SuperVisor. Intentionally we do not repeat features already explained in the mode User!

4 Overview SaveCoat 10

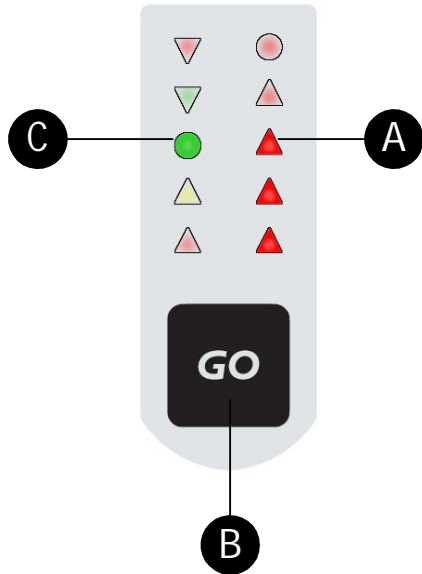


- A Menu Items/Icons
Information on the individual item of different modes see below
- B Navigation Buttons
left/right up/down  
arrow keys for navigation between menu items,
up/down   arrow keys also in- /decrease settings
- C Off/Escape Button
Off -> Press button for 5 seconds; to escape menu / submenu items
- D ON/Enter Button
ON-> Press button for one 1

second; to enter menu / submenu items

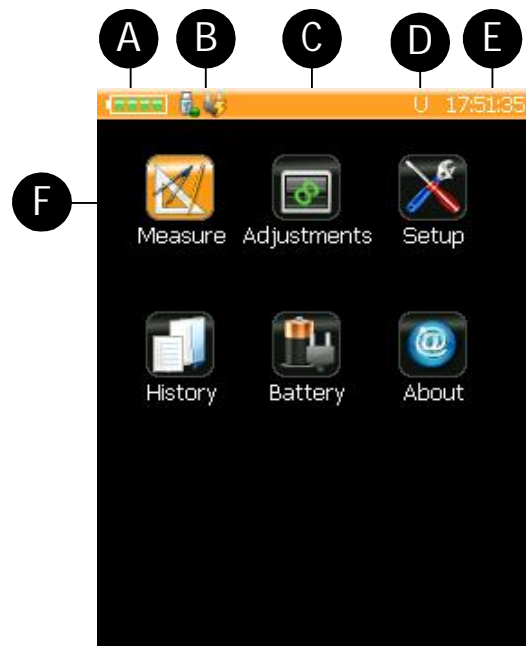
- E Reset Button
- F USB Connector
- G Power Supply Connector
- H Sensorgun-Gauge Connector
- I Mode Indicator / Time



Sensorgun




- A Energy LEDs
Energy LEDs indicate the relative energy level of the measured US-echo. While device is off, energy led will show battery charge status
- B On/Enter Button
ON-> Press button 1 second; enter button to start / stop measurement
- C Distance
Distance LEDs indicates the distance from the sensor gun front to the surface of coating / object under concern. The optimal measuring distance range corresponds to the green and yellow LEDs.

5 U Display, Menu Icons



- A Relative Battery Capacity
- B Active USB Connection
Power Supply
Battery Fault
- C Menu Indicator
- D Operation Mode Indicator
- E Time
- F Menu Icons
(Mode dependent)
Press  to enter menu.
Press  to leave / escape menu or submenu

6 U Setup Menu

In the Setup Menu of the user mode User you find the three submenus Gauge, Distance and Time-Date. Selecting corresponding submenu by right and left arrow keys and press  to enter the submenus. In the submenu you adapt your gauge to your preferences selecting and changing settings with up and down arrow keys:

6.1 U Setup / Gauge



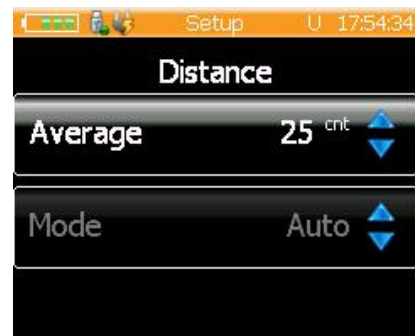
In the Setup submenu Gauge you select and set:

Backlight	low / mid / high
Timeout	in minutes (0 means no timeout!)
Sound	on / off
Units	um / mils

6.2 U Setup / Time-Date

In the Setup submenu Time-Date you select and set system time and date.


6.3 U Setup / Distance



In the Setup submenu Distance you select and set the number of measurements being averaged to calculate one displayed reading as well as the mode of operation:

Average	1...100...
Mode	Auto / Manual

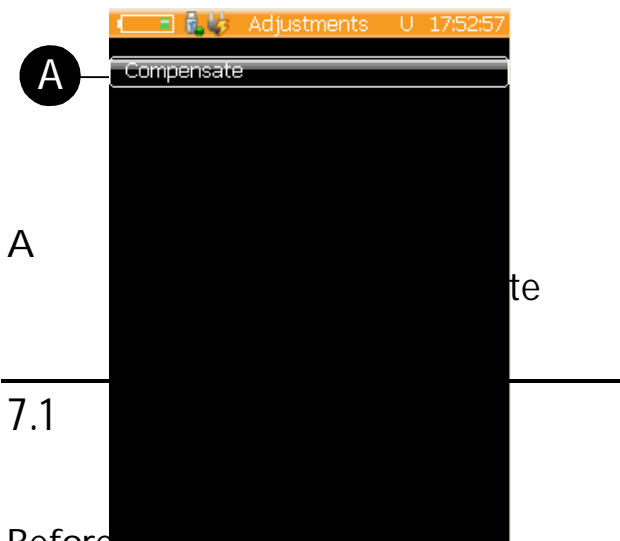
In the mode of operation Auto all sensor readings enter the processing and sliding averaging process.

In the operation mode Manual SaveCoat 10 only evaluates and ranks electromagnetic (EM) and ultrasonic (US) readings / signals between a start and stop given through  and/or Go button on the sensor gun. The final distances and/or coating thicknesses is processed using sophisticated artificial intelligence based filter techniques.





To improve the readings in the manual mode you need to slightly vary distance and incidence angle. Exercise will speed you up to get good and accurate readings!

7 U Adjustments Menu



7.1



Before starting accurate measurement readings the EM-Channel has to be compensated. Therefore select submenu Compensate by arrow keys and press .


As required make sure that the front part of the sensor gun is at least at a distance of 100 mm from any metallic and press  again.



The Gauge gives you progress information



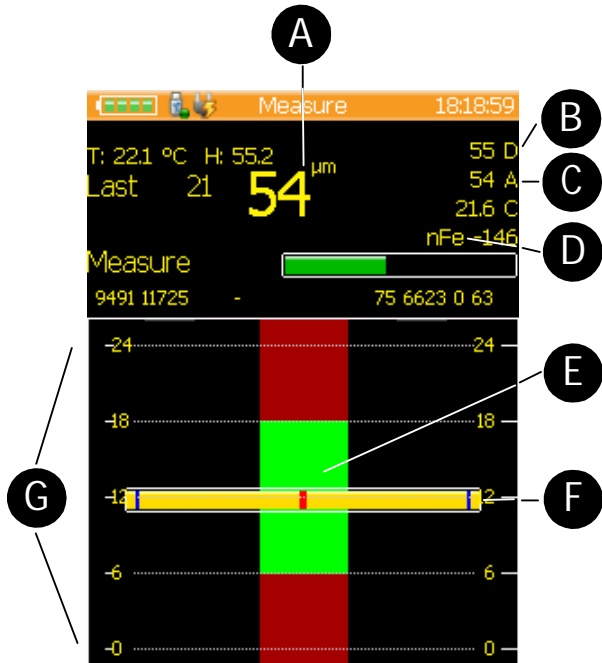
After completed compensation you might repeat it pressing  again to check if compensation values are stable or you leave the compensation menu and the adjustments menu pressing  twice.

 A wrong compensation will affect the measurement accuracy. Compensation therefore should be repeated from time to time since temperature changes affect the EM-Channel!

8 U Measure Menu

With highlighted Measure icon press

 to enter Measure Menu.



- F Distance Indicator Bar with rel. energy indicator (dist. of blue vertical marks)
- G Measuring Distance Range (from sensor gun front to top surface), scalable by selection of different sensor gun type

To get meaningful readings first select correct carrier / reference distance curve selecting it by left / right arrow keys. Then hold the front of the sensor gun in the green distance range of the on-screen guidance graph. The green range is corresponding to yellow and green handle LED's. Try to hold the gun perpendicular to metallic carrier / reference (Optimize energy of reflected US-signal, indicated by width of 2 blue vert. marks in horizontal yellow distance bar).

- A Averaged and Filtered Thickness Reading (in use mode Manual only signals between start and stop are processed)
- B Actual Thickness Reading (e.g. layer of Scotch tape)
- C Averaged Thickness Reading
- D nFe / Fe / usr indicates name of activated distance curve your Supervisor already has adapted and prepared (metallic carrier reference type, use left and right arrow keys to select)
- E Optimal Distance Indicator coating thickness is already taken in account!




In addition to the optical feedback as they are on-screen guidance graph and handle LEDs a third and a fourth guidance system are implemented by a loud sound system as well as a Laser Guiding and Targeting System (LGTS). All systems give an intuitive real time feedback on the quality and the target of the actual sensor readings (e.g. distance, relative reflected energy etc.)

For Offset correction respectively zeroing *just press up or down arrow key while your gauge is measuring.*

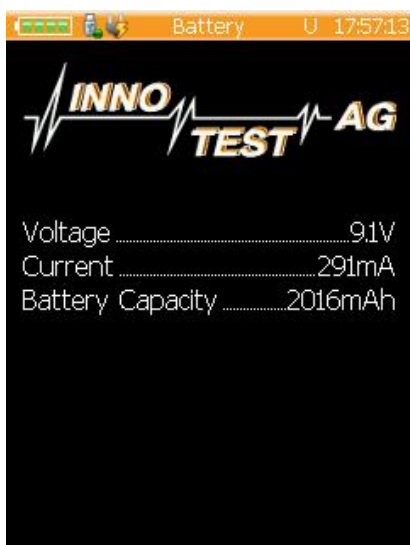
9 U History Menu



Index	Time	Date	Voltage
1	9:08:02	28.01.2016	3825µm
2	9:07:45	28.01.2016	7859µm
3	9:06:40	28.01.2016	57µm
4	9:06:27	28.01.2016	114µm
5	9:06:14	28.01.2016	172µm
6	9:06:05	28.01.2016	55µm
7	9:05:34	28.01.2016	7862µm
8	9:05:21	28.01.2016	5895µm
9	9:04:52	28.01.2016	5897µm
10	9:04:24	28.01.2016	7856µm
Avg			3959µm

The History menu shows the last 200 readings with the affiliated time stamp and the average of the displayed 10 readings. Press   button to go through the measurements. The history can be deleted pressing the  button.


10 U Battery Menu




Parameter	Value
Voltage	9.1V
Current	291mA
Battery Capacity	2016mAh

The menu Battery shows the actual voltage, the current of the battery and the remaining battery capacity

relative to the full charged battery as it is in use.

 Device switches off when voltage is below 6.5 Volt.

Please note that the absolute battery capacity degrades while the battery gets older. Once you notice a very short lifetime under operation you should check if you probably have to get a new battery pack to get initial lifetime of about 5 hours!

 To get a good estimation on the relative Battery Capacity info and lifetime, you should run a full battery cycle from time to time. This helps to expand battery lifetime as well!

10.1 Batt. state Item


This menu item is only shown after a hardware reset (e.g. after pressing the reset button with a paperclip) or after a battery pack replacement with disconnected power supply.



The item settings allows the implemented self-learning energy management and lifetime estimation tool to start with best available

estimation of the condition /capacity of the battery pack.

Bad means 25%, middle means 50% and high means 75% of the maximum battery capacity of a best conditioned new battery pack.

 Once a new ®SaveCoat 10 device is set into operation for the first time it is recommended to fully charge the new battery and to set the Batt. State to high.

11 U About Menu



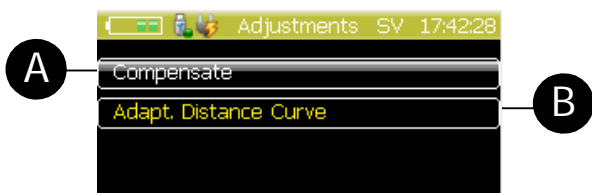
The About menu shows the device serial number and the associated sensor and software versions.

12 SV Display, Menu Icons

In the mode of use Supervisor (mode is changed pressing left, up and right arrow key at once) there are additional menus US-Graph, EM-Graph as well as some additional submenus and items in the Menu Items Adjustments and Setup.



13 SV Adjustments Menu



A Compensate
Submenu to compensate EM- Channel
->see mode of use User

B Adapt. Distance Curve
Submenu to adapt NFe, Fe and usr distance curve

13.1 Adapt. Distance Curve

EM and UT channel have to be synchronized and adapted for distances covering at least the distance measurement range of 6 to 18 mm from metallic carrier/reference level. With some tolerances on both side it is recommended to adapt at least from 4- 20 mm real distance.

®SaveCoat 10 comes with workwise adapted Distance-Curves NFe (Al) and Fe (Carbon steel).

The actual gauge holds 3 distance-curves in the flash memory.



Corresponding to their use there are:

- NFe, non-ferritic (from work adapted on Aluminium)
- Fe, ferritic (from work adapted on carbon steel)
- usr, User defined (not adapted from work)


To get highly accurate readings and to overcome misadjusted gauges it is necessary to adapt distance curves for specific carrier/reference metallic material under concern. While Innotest's engineers work on alternative and faster procedures to adapt distance curves (2 to 3 point adaption etc.) the use of the ®SaveCoat V100 jig (SC Jig V100) is highly recommended.

⚠ Right before adapting any distance curves do a compensation of the EM Channel
-> see mode of use user!

Using the SC Jig V100 you fix the sensor gun in the corresponding holder (see jig manual).
 Select the distance curve named NFe, Fe or usr you want to adapt in the Measure menu using right or left arrow key.

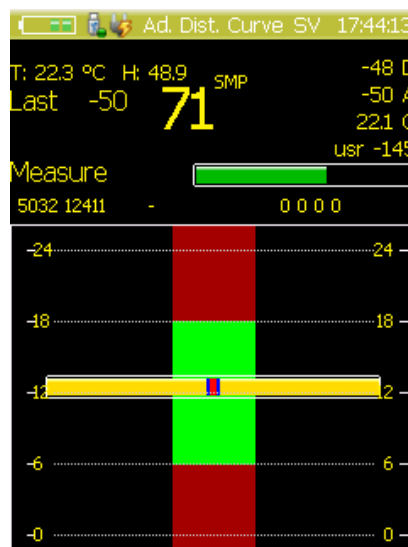
Escape Measure Menu pressing .
 Enter Adjustments menu, select Adapt. Distance Curve with arrow keys and pressing .



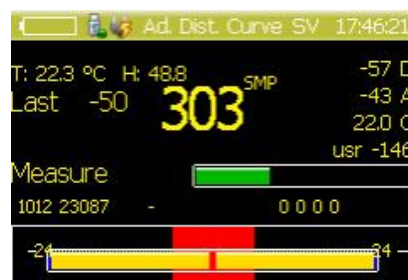
Press down the lever arm to get minimal distance from sensor gun to the clean coating free flat metallic carrier/reference plate ($\approx 4\text{mm!}$ vert. position of bar indicator – please check!). The background of on-screen guidance graph might start flashing in orange warning that you are close to hit the surface!
 Holding this position check again the distance curve to be adapted (NFe, FE, usr) and then start process pressing  button (up arrow key).


Smoothly give the lever arm free. The spring loaded lever mechanism of the jig will now automatically and steadily

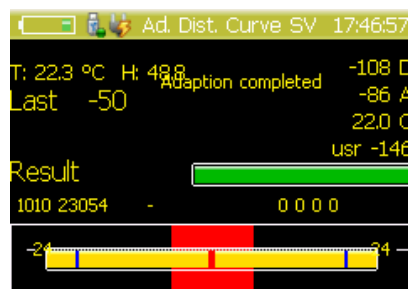
move the sensor gun from most down to most up position. Doing so distance readings will be collected and number of adaption readings (samples) is displayed on top of the screen.



After most top position is reached ($\approx 24\text{ mm}$, you should have about 300



samples) press  button to stop curve adaption. SC 10 then ranks the adapted samples and return message "Adaption completed".



14 SV Setup Menu

In the Setup Menu of the Supervisor user mode you find an additional submenu Gauge2.



14.1 SV Setup / Gauge2


In the submenu Gauge2 the Language and the USB-Mode are selected as well as the LGTS (Laser Guiding and Targeting System) is switched on or off.



Language	Select the language of your device
LGTS	Laser Guiding and Targeting system on/off
USB Mode	Gauge/Mass Mode
Gauge-Mode	the Device can be controlled with a

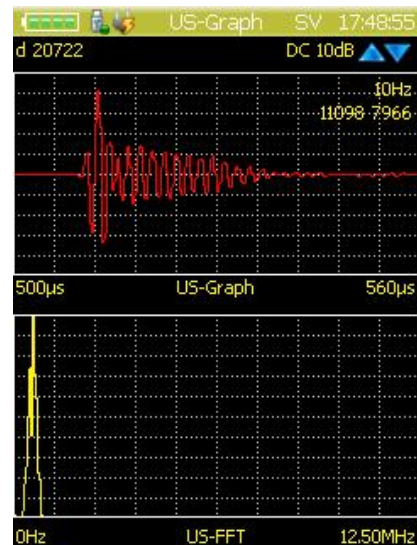
special software.
(Need of a device driver!)

Mass-Mode the Device behaves like a mass storage device (standard, all new operating systems)


 To become active the change of the USB mode requires a restart of the gauge (switch off and on again)!


15 SV US-Graph Menu

In Menu US-Graph an alive Ultrasonic Signal (A-Scan) with fixed time gate and its Fast Fourier Transform (FFT) are displayed (Check of running US!).



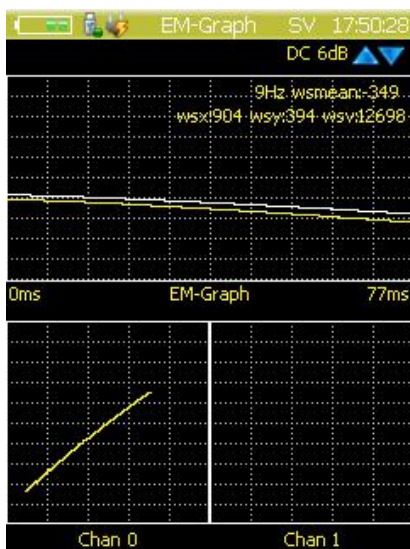
The gate is set to display an US-pulse of a plane reflector in about 12-16 mm distance from the front of the sensor gun (e.g. zeroing cap, table plate, ...). Using up and down arrow keys the Graph's video amplification (DC Gain) can be modified (dB scale).


Pressing  Button you might freeze actual signal (white colour) and


compare it to the alive signal. Pressing  Button again, frozen signals are erased.

16 SV EM-Graph Menu

In Menu EM-Graph alive EM-Signals are displayed (Check of running EMI!) either in the time versus X- and Y-amplitudes plot (top, fixed 77 ms long gate) or in the "impedance" plane itself (bottom).





Pressing  Button you might center the impedance plane.

Holding the sensor gun front in the air pressing  Button and draw the front of the gun closer to a metallic surface you should notice a displayed curve of about -45° of inclination (top right to bottom left) in the channel 0 "impedance" plane!

Using up and down arrow keys the Graph's video amplification (DC Gain) is modified (dB scale).

17 Error Handling



The device does not start when pressing the  button:

- press  button for 5 seconds and press  to turn the device on.

The device does not start or turns off while measuring:

- Battery is low, recharge battery

The device hangs:

- press  button for 5 seconds until the device turns off, press  to turn the device on.

The device still hangs:

- press reset button with a paperclip (see Chapter 3).

Distance display is not in the green area while measuring:

- hold sensor vertical to the surface
- Distance to the surface is not correct (18 mm)

18 Measurement specifications

Measurement method

airborne ultrasonic

Measurement units

metric / USCS selectable

Resolution

1 micron (ca. 0.04 mils)

Calibrated measurement range

0- 8000 μm

(ca. 0 – 315 mils)

Accuracy

max \pm ($\pm\mu\text{m}$; $\pm 0.5\%$ of d)

d = coating thickness itself

19 Device specifications

Data Storage

non-volatile memory storage of all data, storage of ~200 measurements.

Power

7.2V Ni-MH rechargeable battery, ca. 5 hours on battery,

2.5 hour recharge time, 100-240V AC; 50-60Hz power supply included.

Dimensions

115mmx185mmx35mm
(4.6" x 7.4" x 1.4")

Weight: 0.9kg (1.9 lbs) with battery pack

Environmental

Operation temp: 10° C to 35° C
(50-95° F)

Humidity: <85% at all times

Case

extruded aluminium (IP 54)

20 Enhanced Functionality

The ®SaveCoat 10 provides some enhanced functionality.

20.1 Remote control

For automatic measurement with a robot or another manipulator, the SaveCoat7 has the capability to be fully remote controlled over the USB interface.

The following commands are available:

1. Start acquiring signals
2. Stop acquiring signals
3. Calculate the thickness of the cured powder coating

A WinXP, Win7 driver (DLL) is available, other systems may also be supported.

20.2 History / Documentation

In USB Mass-Mode the History (last 200 readings with time stamp) can be seen like a normal file on a memory stick.

Just connecting the unit to a PC using an USB cable and copy/paste the history to a folder of your choice.

The 200 readings in the tab separated file (*.xls) can be analysed and processed straight forward using

standard programs (e.g. EXCEL) or customized documentation tools.

21 List of Error Codes

List of error codes
(Measure Menu)

1	A
4	B
10	C
20	D
255	E

20.3 Firmware update

To get the latest improvements of the ®SaveCoat 10 an update mode is available. For that you need to copy (copy/paste) the latest “SAVECOAT10.LDR” file on the mass storage device of the ®SaveCoat 10 and disconnect it from the USB. The ®SaveCoat 10 will now update and restart the device automatically.

