

## Paint thickness gage FSC1/7

### Instruction manual

#### 1 Scope of supply



Figure 1: Measuring system FSC1/7

Figure 1 shows the measuring system FSC1/7, consisting of a control and display module with a first rechargeable battery pack inside and a belt clip, a hand-held module, a connection cable, a battery charger, a second rechargeable battery pack, a box with calibrations foils, a bag with a headphone, and a case for the equipment.

The FSC1/7 is suitable to measure the paint thickness on CFRP without and with lightning protection as well as on metal.

## 2 Handling of the battery packs

- Plug in a rechargeable battery pack into the control and display module, with the connectors to the top side, see Figure 2.



Figure 2: Control and display module

- Battery change: Compress the lock at the bottom of the control and display module and pull out the battery pack.
- Battery charging: Plug in the rechargeable battery pack into the battery charger. The red LED on the battery charger being on signals the charging procedure and the green LED signals that the battery has full charge.
- The charging status of the rechargeable battery pack in use is displayed in the bottom left corner on the control and display module, see Figure 3. The status of charging is given as green from 20 to 100 percent and red for lower than 20 percent. When the status is 0 percent then the control and display module is shutting down.
- The charging status is displayed 10 minutes after turning on the display module.

## 3 How to use the FSC1/7

### 3.1 Start of the Program

- Start the control and display module (press the button on the top). The control LED in the top right corner has to be on. The desktop display will be of the following type.

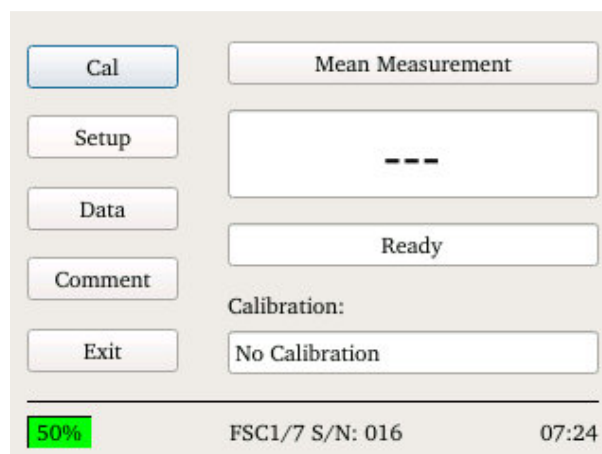


Figure 3: Desktop of control and display module

- Plug in the connection to the hand-held module at the USB port on the top of the control and display module.
- If the connection to the hand-held module was not realized a text according Figure 4 appears.



Figure 4: Note to plug-in the hand-held module.

- Plug in the connection to the hand-held module.
- The connection to the hand-held module is realized, when at the bottom of the display the serial number of the hand module is shown (see Figure 3). Then the system is ready to use.

### 3.2 General Operating Instructions

Generally: The control and display module can be operated by using the touch screen or the keyboard. The touch screen is a resistive touch screen, which also can be used with gloves and a blunt pen. ATTENTION: Do not use sharp objects on the touch screen.

Keyboard:

- The menu navigation is performed with the arrow "UP" and "DOWN" keys. The key "ENTER" activate the next menu. The key "ESC" activates the last menu.
- The number pad of the keyboard is lettered as on the telephone. It can be used e.g. to insert a comment for a measurement or a name for a calibration.



Figure 5: Control and display module keyboard

- To avoid drift effects let the FSC1/7 warm up for about 15 minutes.

### 3.3 Setup

- In the menu setup (see Figure 6) you can set the measurement unit “ $\mu\text{m}$ ” or “mils” in the pull down menu and activate / deactivate the speech output. If headphones are plugged in, the system will speak the measurement results. The headphone connector is on the top of the control and display module.

Figure 6: Menu Setup

- In the Menu Setup the button “Buzzer output” can be set “on” or “off” for the loud beep which indicates a successful measurement.
- In the “Date/Time” menu the date and the time can be set. If you synchronize the data between your computer and the FSC, be aware the time zone of the FSC is UTC. See Figure 7.

Figure 7: Menu Date/Time setup

- In the menu “Trigger”, see Figure 8, you can set the Trigger option to start the measurement in the following three modes:  
 Button: triggered by the button on the hand-held module  
 Key: triggered by the key 1, key 2 or key 3 of the keyboard on the display module  
 Both: triggered by button or key 1 to 3

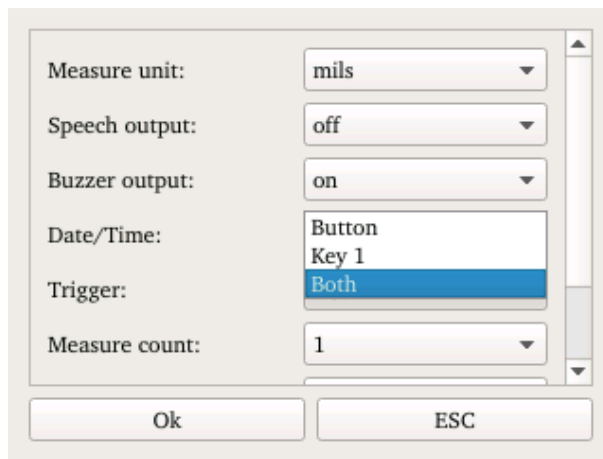


Figure 8: Menu Trigger

- The settings for the lift-off prevention are in the following menus; see Figure 9 to Figure 11.

In the menu “Measure count” you can set the number of measurements for the lift-off prevention. If “Measure count” 1 is selected, the lift-off prevention is disabled.

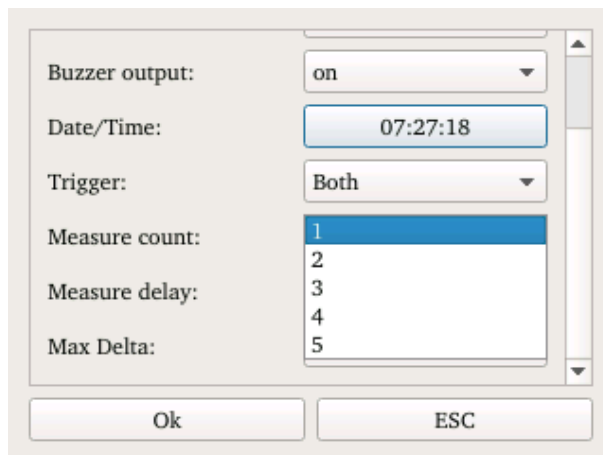


Figure 9: Menu Measure count

- The duration of one complete measurement is up to one second. This is the minimum time difference between the results of successive measurements. In the menu “Measure delay” you can add a further delay between two single measurements of the lift-off prevention cycle.

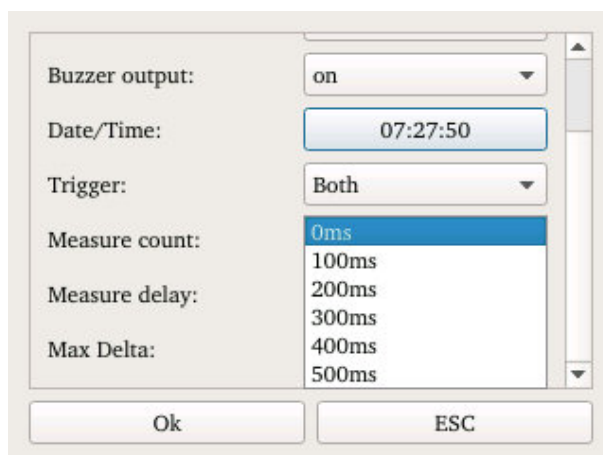


Figure 10: Menu Measure delay

- In the menus “Max Delta” you can set the maximal difference between the smallest and largest value of the successive measurements.

The screenshot shows a menu interface with the following settings:

Buzzer output:	on
Date/Time:	07:28:21
Trigger:	Both
Measure count:	1
Measure delay:	0.2 mils
Max Delta:	0.3 mils
	0.4 mils
	0.5 mils

At the bottom of the menu are two buttons: "Ok" and "ESC".

Figure 11: Menu Max Delta

When restarting the control and display module it will always fall back to the factory settings of the lift-off prevention. The following values are set.

Measure count: 3

Measure delay: 0 ms

Max Delta: 5 $\mu$ m (measure unit  $\mu$ m) / 0.2 mils (measure unit mils)

### 3.4 Calibration

- In the “Cal” menu you can load and manage existing calibrations and generate new calibrations.

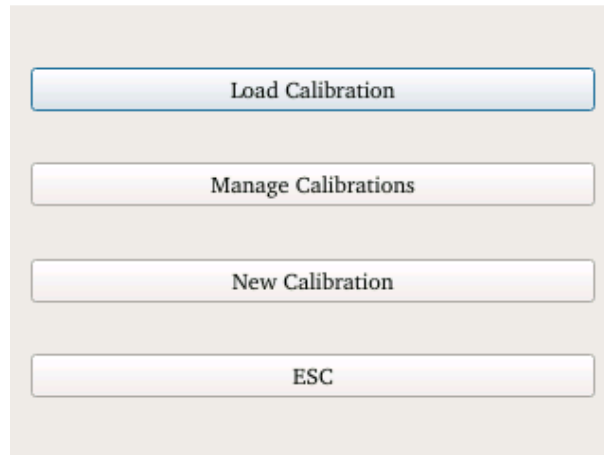


Figure 12: Menu Calibration

- If you have already a calibration which you want to use, choose “Load Calibration”, select the calibration file and continue with section 3.5 Measuring.
- For the use of the system on different substrate materials, the instrument offers a way of calibration by the user. In the “New Calibration” the user has the option to use insulating thickness standards (foils) of his own choice. Substrates can for example be metal, CFRP or CFRP with metallic mesh.
- The window according Figure 13 opens with the text “Ready”. The calibration can start.

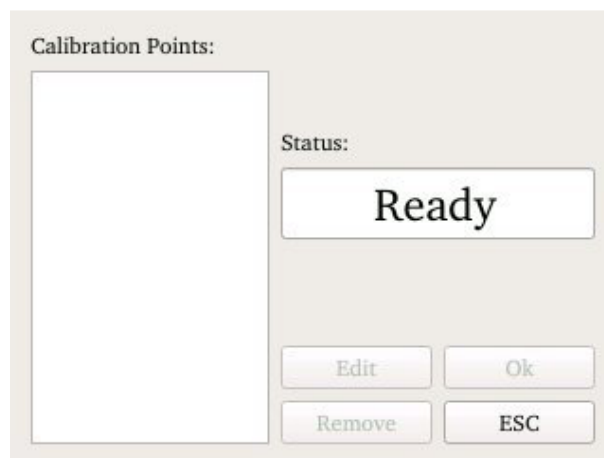


Figure 13: Calibration mode “Ready”

#### 3.4.1 Calibration Procedure

- A minimum of two different calibration foil thicknesses of the user’s choice have to be used when performing this calibration, e.g. 0µm and 100µm.
- Place the calibration foil on the substrate. Press the measurement button on the hand-held module. After measuring write the foil thickness into the field “Thickness”, see Figure 14.



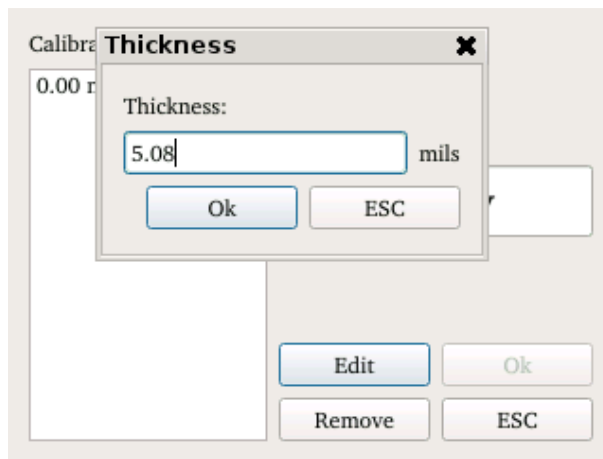


Figure 14: Foil thickness

- Repeat this for as many calibration foils of different thickness as you want. Use always the same place on the substrate.
- When all calibration points are realized, press the button “Ok” to start the saving process of the calibration, see Figure 15.

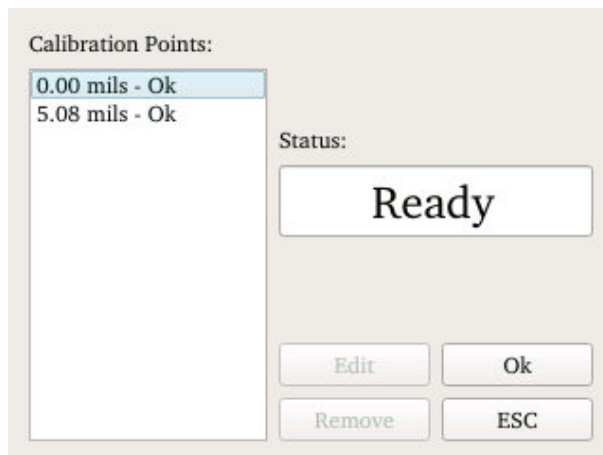


Figure 15: Calibration Points

- Write a filename into the field “Save Calibration Data”. After using the “Save” button the calibration data will be stored using this name. Then the calibration mode is finished and the measurement mode is started.
- If you want to check the calibration data please see sections 3.4.3 and 3.4.2.

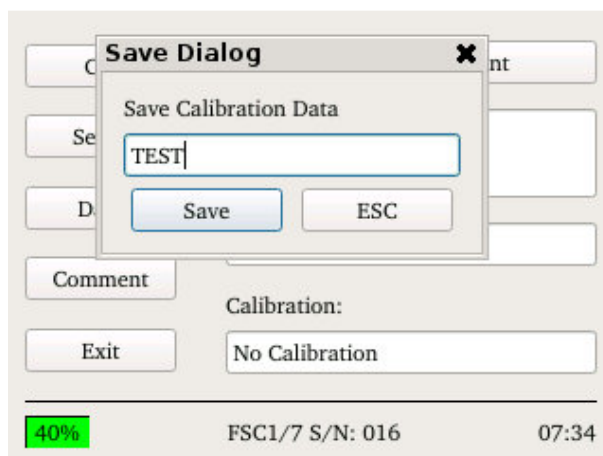


Figure 16: Save Calibration Data



- If the lift-off prevention is enabled, it is also used in the calibration mode. If the measurement was not successful, the system gives a message as shown in Figure 17.

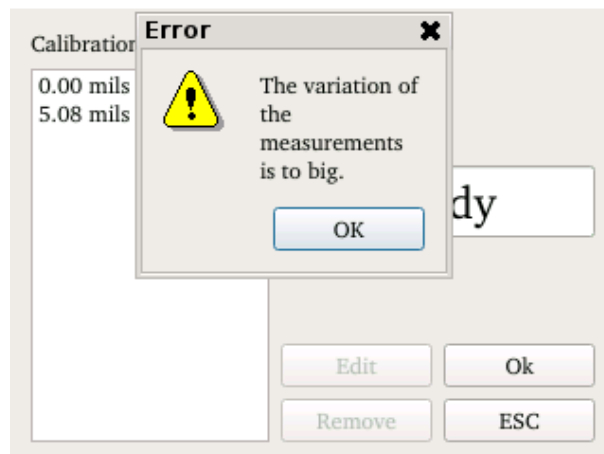


Figure 17: Measurement Variation to big

### 3.4.2 Remove or Edit calibration points

- Select a calibration point and then remove this calibration point using the button "Remove" or edit this calibration point using the button "Edit", see Figure 18.

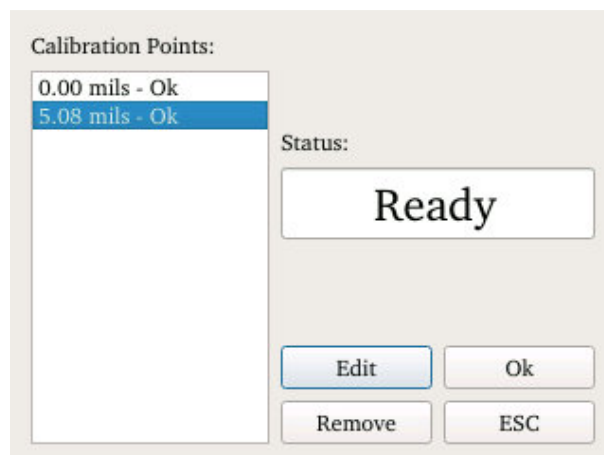


Figure 18: Select calibration points

### 3.4.3 Test of calibration data

- After performing the calibration you have the option to test it. Therefore perform a measurement. Press the button "Test Value" see Figure 19 and compare it with the expected result see Figure 20.

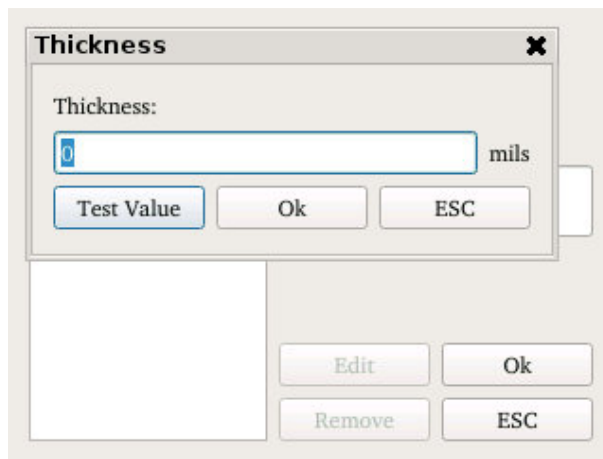


Figure 19: Test Value

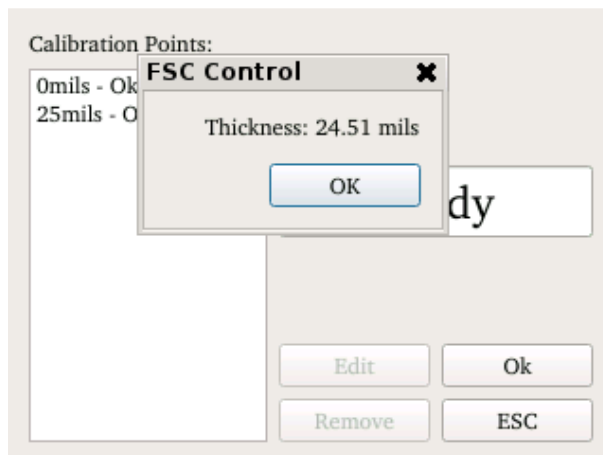


Figure 20: Result Test Value

- If the comparison is not satisfying remove the checked calibration point according to 3.4.2 and generate it again.

#### 3.4.4 Exit from the calibration mode

- By using the button “ESC” you can also leave the calibration mode. In this case the current calibration will be used in the following measurements, even if it is not saved. This is realized by using the “Yes” button.
- Using the button “No” you will leave the calibration mode and the current calibration data are discarded.

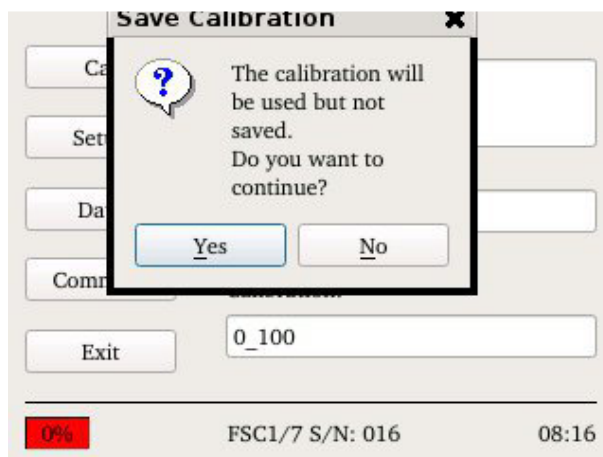


Figure 21: Exit Calibration mode

### 3.4.5 Manage Calibrations

Here are the following options, see Figure 22

- Sync: copy the selected calibration file to a USB-Mass storage
- Del: delete the selected calibration file
- Open: load the selected calibration file (it is equal to “Load Calibration” see Figure 12)

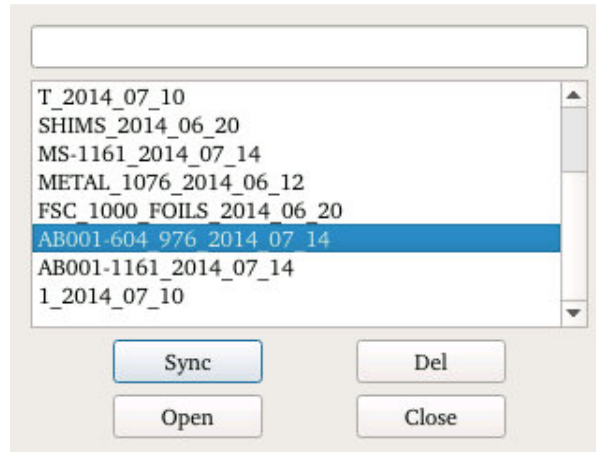


Figure 22: Mange Calibration menu

### 3.5 Measuring

- Load the calibration to be used.
- For measuring the thickness, place the green bottom plate of the hand-held module without tilting on the surface of the sample and press the button on the side of the hand-held module, see Figure 23. The measurement is started 300 milliseconds after the button is pressed. The thickness is measured and displayed, see Figure 24.



Figure 23: Starting the measurement by pressing the button on the hand-held module

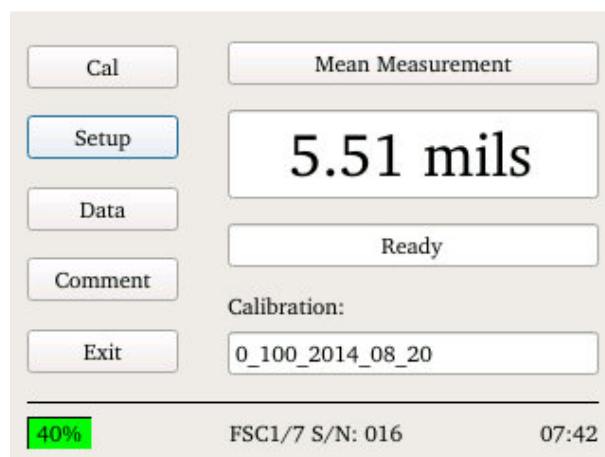


Figure 24: Measurement result

- Using a calibration, thicknesses can be measured between approximately 50  $\mu\text{m}$  less than the smallest calibrated thickness up to approximately 50  $\mu\text{m}$  more than the largest calibrated thickness.
- If the paint thickness is beyond the calibration range “out of range” is shown“, see Figure 25.

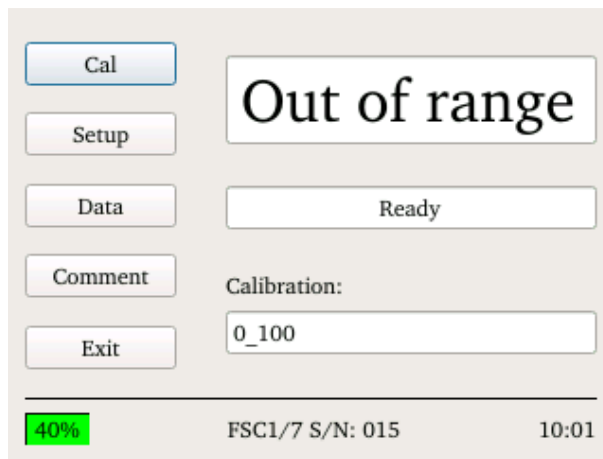


Figure 25: Out of range

- Using the lift-off prevention, can lead to two different result types:
  1. If the measurement was successful, the system will calculate the mean of the single results and show it to the user, see Figure 24. The single results are not shown to the user.
  2. If the measurement was not successful, the system gives a message as shown in Figure 26.

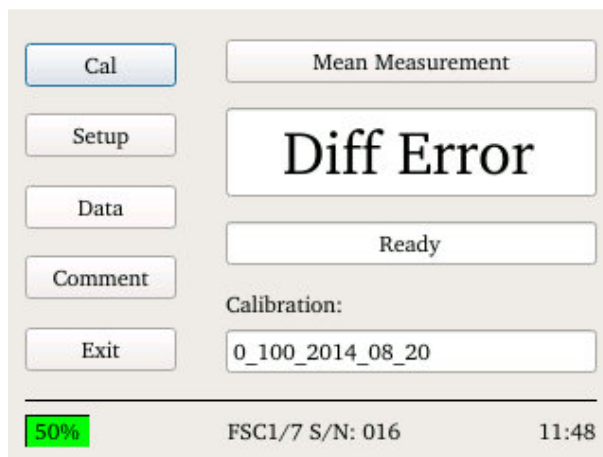


Figure 26: Diff Error

- Menu "Comment": Here you can insert a comment to a measurement result or the like, see Figure 27. These comments are stored in the current "measure\_data" file, see Figure 28.

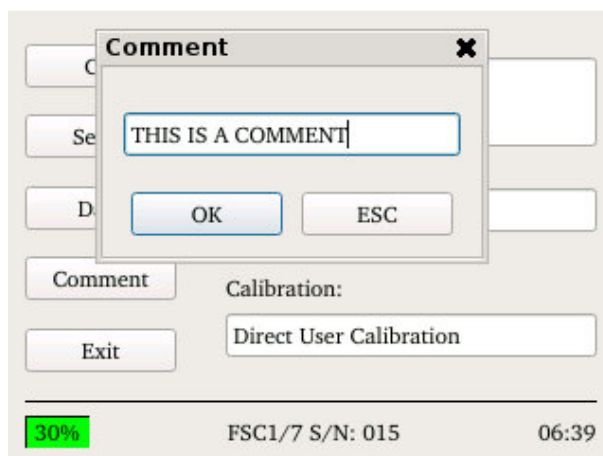


Figure 27: Menu Comment

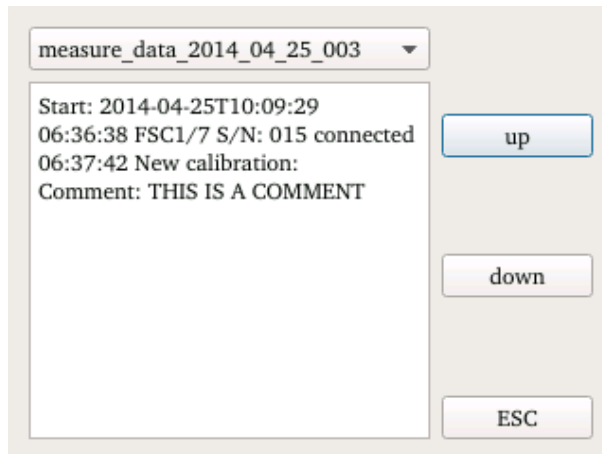


Figure 28: Displayed Comment in the current “measure\_data” file

### 3.6 Measurement Data

- The measurement data are saved in a text file, which can be opened by using the button “Data” (see Figure 25) on the touch screen or the up and down key and then press Enter. Then the menu of Figure 29 is opened.

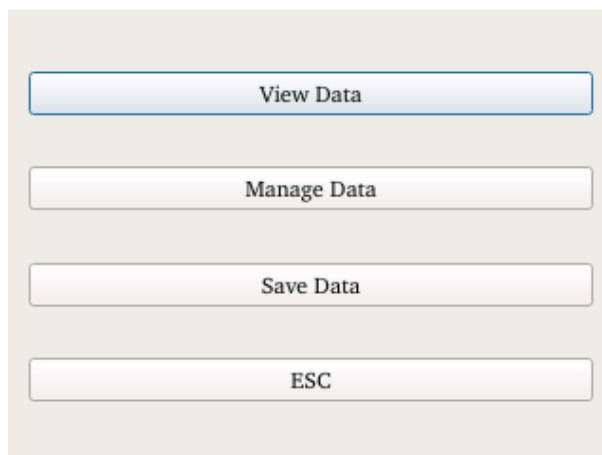


Figure 29: Menu „Data“

### 3.6.1 View Data

- In the menu “View Data” you can at first see a protocol of the present activities. Using the pull down menu you can select and open former “measure\_data” files.

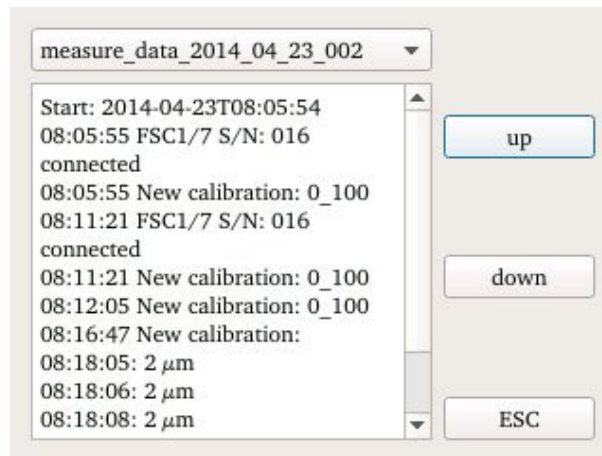


Figure 30: Measure data

### 3.6.2 Manage Data

Here are the following options, see Figure 31.

- Sync: copy the selected measure file to a USB-Mass storage
- Del: delete the selected measure file
- Open: open the selected measure file (it is equal to “View Data”)

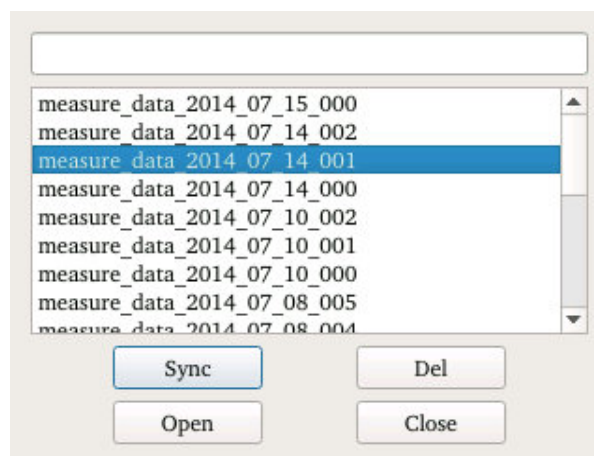


Figure 31: Manage Data menu

### 3.6.3 Save Data

- Menu “Save Data”: Plug in a USB drive. Then you can copy the measurement data onto the USB drive for further actions. You can save the data of this day, last week or all data see, Figure 32.



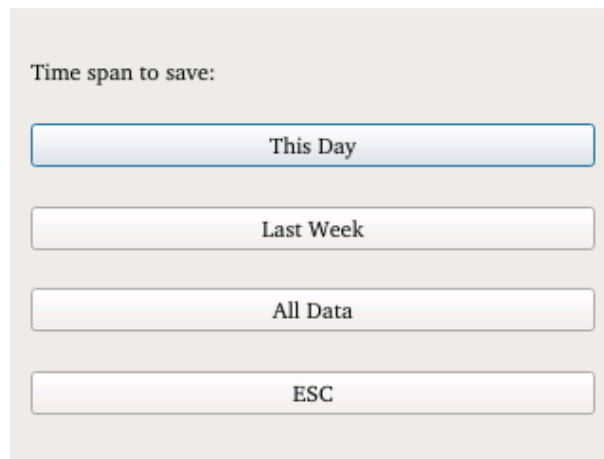


Figure 32: Menu "Save Data"

- When the save action is finished then will a window opens according to Figure 33.

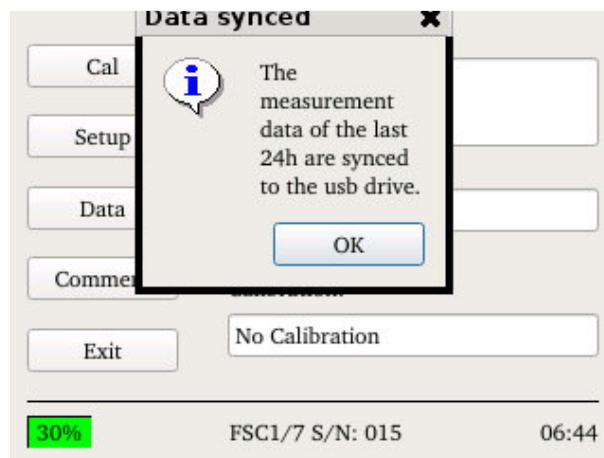


Figure 33: Save finished

- If no USB drive is connected then a window will be generated according to Figure 34.



Figure 34: No USB drive connected

### 3.7 Exit from the Program

Pressing the “Exit” button will close the measuring program and shut down the control and measuring unit. Please do not remove the battery before the red LED went off. This should happen shortly after the LCD turned black. If the red LED does not turn off within 1 min, remove the battery.

### 3.8 Miscellaneous

- The guarantee is void when the hand-held module or the control and display module are opened.
- Be sure that the bottom of the hand-held module (green foil) is clean. If necessary you can clean it with a soft moist cloth.
- The touch screen can also be cleaned it with a soft moist cloth.

## 4 Technical data of the FSC1/7

- Measurement range: 0 to 500 µm
- Measurement time: ≤ 1 sec
- Display of the measurement results: in micrometers or mils on the display module
- Measurement signal with a test frequency of about 24 GHz.
- Battery charger is working at AC 100-240V, 50/60Hz,  
Attention: Only use the enclosed battery charger or a battery charger for NiMH battery.  
battery parameters: 6V / 4500mAh

## 5 Contact:

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Email: [info@fitm.de](mailto:info@fitm.de)

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Mobile: +49 171 205 3208

## 6 Compliance with standards

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Hand-held module:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Control and display module:

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.