

DUALSCOPE® H FMP150

DUALSCOPE® FMP100



with and without option
Bluetooth® module

DUALSCOPE® FMP100

DUALSCOPE® H FMP150

Instrument for coating thickness measurements.

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Quality Assurance System of the Helmut Fischer GmbH

DIN ISO/IEC 17025	Calibration lab accredited for certified mass per unit area standards
DIN EN ISO 9001:2008	Management system certified by Germanischer Lloyd Systems Certification

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1 Areas of Application

The DUALSCOPE® FMP100 and DUALSCOPE® H FMP150 measuring instruments are used exclusively for coating thickness measurements and are suitable for measurements on both steel and iron substrate materials as well as non-ferrous metal substrate materials.

The two instruments differ in the number of measurement methods that can be used for the coating thickness measurements.





The following table presents a list of the measurement applications that can be measured with a respective measurement method and instrument.


FMP100	FMP150	Areas of Application	Probe type (e.g.)	Measurement method
Thickness meas. of single coatings on one type of substrate material				
●	●	NF/Fe: Determination of the thickness of non-magnetic coatings (NF) on steel or iron (Fe). E.g., chrome, copper, zinc as well as paint, varnish, enamel or plastic coatings on steel or iron	FGAB1.3	Magnetic induction method according to ISO 2178, ASTM D7091.
●	●	Iso/NF: Determination of the thickness of electrically non-conducting coatings (Iso) on non-ferromagnetic metal substrate materials (NF). Paint, varnish or plastic coatings on, e.g., aluminum, copper, zinc	FTA3.3	Eddy current method acc. to ISO 2360, ASTM D7091.
Thickness meas. of single coatings on differing substrate materials				
●	●	Dual mode in one application NF/Fe: Determination of the thickness of non-magnetic coatings (NF) on steel or iron (Fe). E.g., chrome, copper, zinc- as well as paint, varnish, enamel or plastic coatings on steel or iron.	FD10	Magnetic induction method according to ISO 2178 and ASTM D7091.
		Iso/NF: Determination of the thickness of electrically non-conducting coatings (Iso) on non-ferromagnetic metal substrate materials (Fe). Paint, varnish or plastic coatings on, e.g., aluminum, copper, zinc.		Eddy current method according to ISO 2360, ASTM D7091.


FMP100	FMP150	Areas of Application	Probe type (e.g.)	Measurement method
Measurements of thick single coatings on differing substrate materials				
	●	NF/Fe: Determination of thick non-magnetic coatings (NF) on steel or iron (Fe). E.g., chrome, copper, zinc- as well as paint, varnish, enamel or plastic coatings on steel or iron.	FN4D	Magnetic method according to ISO 2178, ASTM D7091.
	●	Iso/NF: Determination of the thickness of electrically non-conducting coatings (Iso) on non-ferromagnetic substrate materials (NF). Paint, varnish or plastic coatings on, for example, aluminum, copper, zinc, etc.		Eddy current method according to ISO 2360, ASTM D7091.
	●	Ni/NF: Determination of the thickness of electroplated nickel coatings (Ni) on non-ferromagnetic or electrically non-conducting substrate materials (NF), e.g. nickel on copper.		Magnetic method according to ISO 2178, ASTM D7091.
Measurement of duplex coatings on magnetic substrate materials				
●	●	Iso/Zn/Fe: Simultaneous measurement of the single coatings paint and zinc on steel or iron. The display shows the thicknesses of both coatings at the same time.	FDX10	Magnetic induction method acc. to ISO 2178, ASTM D7091.
	●	Cr/Cu/Fe: Simultaneous measurement of the single coating thicknesses Cr and Cu on steel rolls (gravure rolls). The display shows the thicknesses of both coatings at the same time.	FN6D	Magnetic method according to ISO 2178, ASTM D7091. Eddy current method according to ISO 2360, ASTM D7091.

2 The path to the first measurement

There are no more than 3 steps to obtaining your first measurement data.

- 1. Put the instrument in operation**, beginning at  4.
(insert batteries, connect probe and turn the instrument ON).
- 2. Set up a new file**; example beginning at  13
All relevant settings and parameters for a measuring application as well as the measurement data to be acquired are stored in a file - we speak of an application in this context.
- 3. Measure on the specimen**, for which the coating thickness shall be determined; example beginning at  15.
If necessary, adjust the instrument with the connected probe to the material properties of the specimen, beginning at  25. This procedure is referred to as calibration.

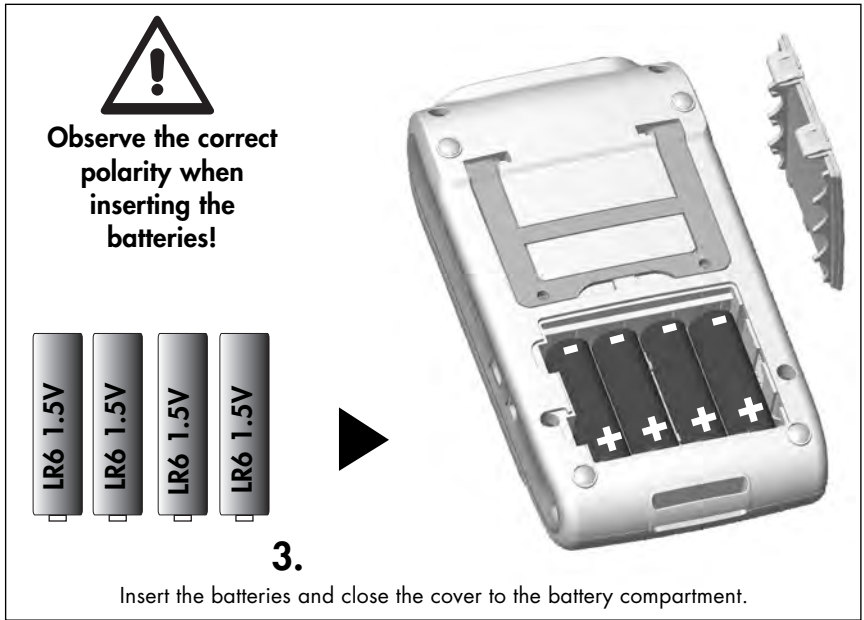
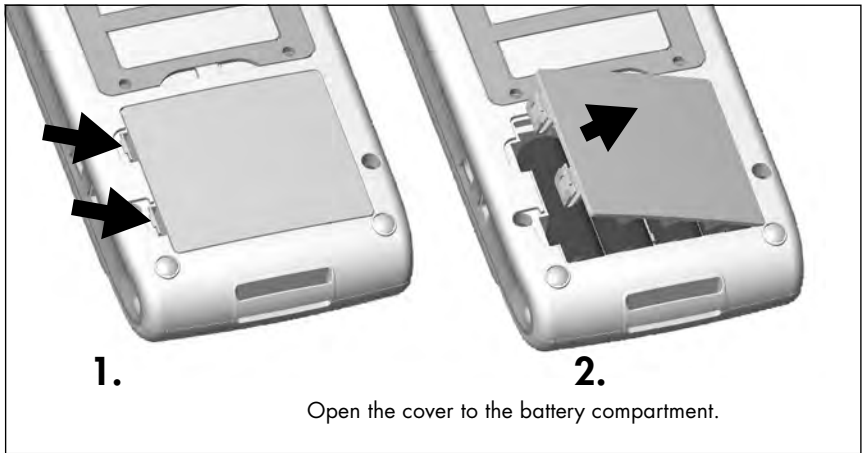
i *There are no verified instruments available for measuring the coating thickness, as is the case for the weight measurements with balances. Rather, the measurement results for the coating thickness are influenced by the materials and the shape of the specimen. However, you can measure these individual influences of your respective specimens using appropriate calibrations,  25.*

i *For first experiences with the DUALSCOPE instrument we recommend the introductory example in Chapter "Getting to Know the Instrument - First Steps",  13.*

3 Inserting/Replacing the Batteries

Batteries: 4 x MIGNON, 1.5 V, LR6 - AA - AM3 - MN1500

Rechargeable batteries: 4 x NiMH Mignon, 1.2 V, HR6 - AA



**Do not use damaged batteries.**


- Use only the following types of alkaline batteries: Mignon, 1.5 V, LR6 - AA - AM3 - MN1500
- Use only the following types of the NiMH rechargeable batteries: Mignon, 1.2 V, HR6 - AA.

Doing otherwise may cause damage to the instrument.

ATTENTION**Recharge batteries in the instrument are not possible**

Rechargeable batteries are not rechargeable in the instrument by using the AC adapter.

- Use a battery recharger for recharging batteries.

Flashing 

Display for replacing the batteries. Batteries should be replaced.



If the battery voltage is too low, the instrument will shut down automatically without prior saving of the data!



Disposal: **Do not dispose of batteries with the household waste!**

Place damaged or dead batteries in the designated collection containers! Please follow the instructions in your region for proper disposal of waste electrical and electronic equipment and accessories.



A description for using the optional rechargeable battery pack or the AC adapter can be found in the operating instructions.

4 Connecting the probe to the instrument

To make coating thickness measurements, a probe must be connected to the measuring instrument. The measuring application, or the respective substrate material, respectively, determines the type of probe that is to be connected.



Connect or plug in probes only when the instrument is switched off!

- ▶ To turn the instrument off: Press the ON/OFF key on the right side of the control panel for about 1 sec. The display is not lit up and no characters are visible.

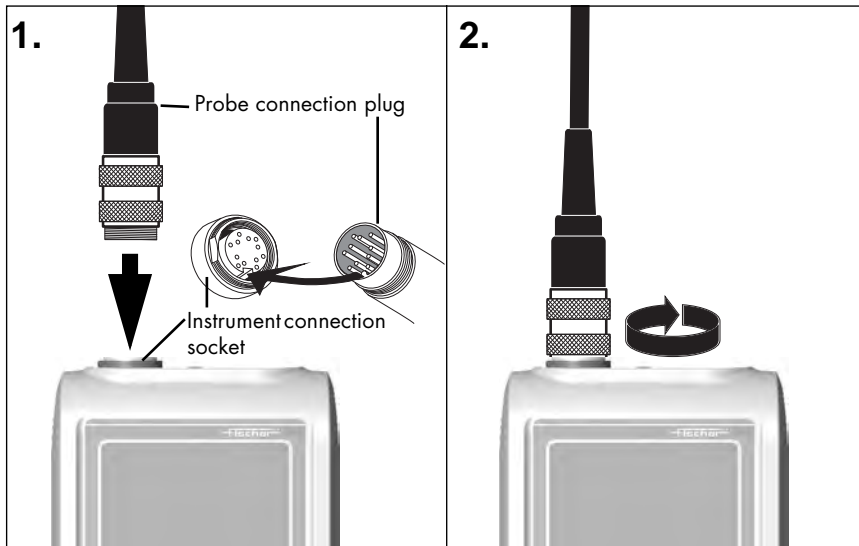


Protect instrument and accessories from static charges!

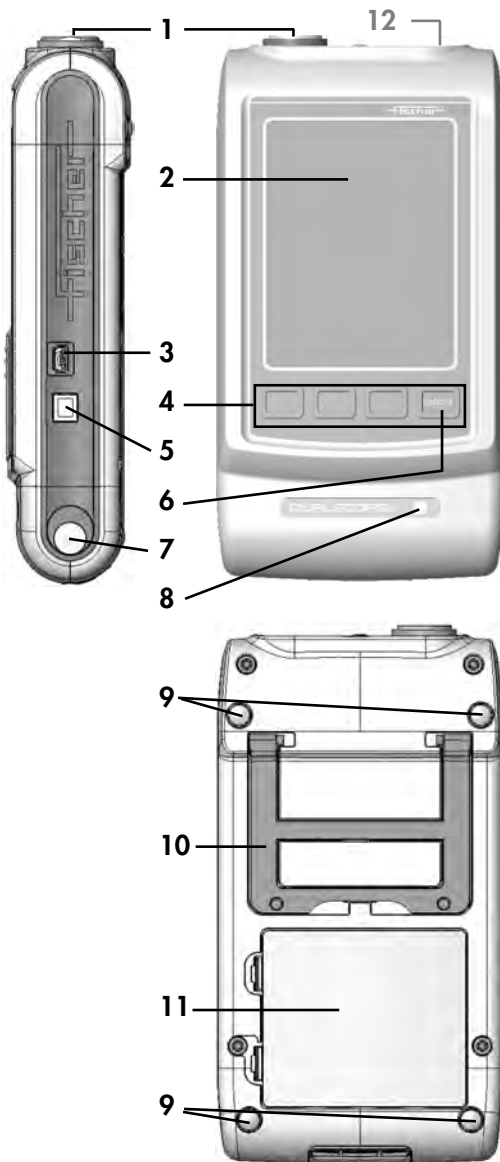
Electrical discharge can damage internal components or delete internal instrument memories.






Such discharges can occur, for example, when connecting the probe to the instrument.

- ▶ When connecting the probe, ensure that the person connecting the probe is grounded.
- ▶ It is recommended to store the instrument with the probe connected.

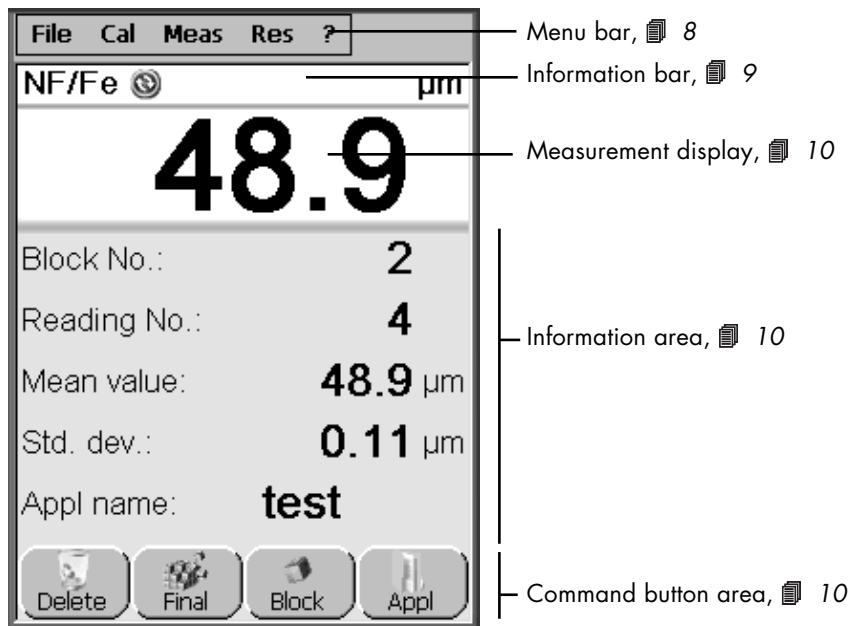


5 Description of the Instrument




- 1 Probe connection socket,  6
- 2 Pressure-sensitive display = Touchscreen
- 3 USB port for connecting a printer, PC, PC keyboard or USB-sticks
- 4 Keys for calling up menus directly or for functions,  10
- 5 Socket for the AC adapter (included with instrument)
- 6 ON/OFF key, to turn the instrument on or off press this key for at least 1 sec,  12
- 7 Stylus for operating the touchscreen, to tap command buttons and select parameters.  11
- 8 Indicator light that lights green when power is supplied via the AC adapter.
- 9 Non-slip rubber pads
- 10 Fold-out device stand
- 11 Battery compartment,  4
- 12 Option Bluetooth module, built-in in the factory only

5.1 Display



Example for the measurement display mode “Statistics display” (standard setting). The shown information should be considered examples for such a display type.

 You can find additional measurement display modes in the Operators Manual.

Menu bar





The instrument functions are arranged under the topics **File**, **Calibration** (adjustment of the instrument to a reference part), **Measurement** and **Evaluation**.




 An overview list and a description of the individual instrument functions can be found in the Operators Manual.

Information bar

This bar displays information symbols, the set unit of measurement and the name of the probe or the measuring application (measuring method) that can be measured using the open application and the connected probe.

Displ. (e.g.)	Measuring application - Measuring mode or Probe name
NF/Fe	Measurable: Thickness of a non-ferromagnetic coating material (NF) on a ferromagnetic substrate material such as steel or iron (Fe). Depending on the probe type, the magnetic induction or the magnetic measuring method is used,
Iso/NF	Measurable: Thickness of an electrically non-conducting coating material (Iso) on a non-ferromagnetic metal substrate material (NF).
Iso/Zn/Fe	Measurement of duplex coatings. Simultaneous measurement of both coating thicknesses with two measuring methods.
Cr/Cu/Fe*	Examples: * only FMP150 - Paint-Zinc coating system (Iso/Zn) on a ferromagnetic substrate material such as steel or iron (Fe). - Chrome-copper coating system (Cr/Cu) on iron rollers (Fe) (press rollers).
FGAB1.3 FN4D*	The probe name can also appear instead of the measuring application. Typically, this is the case directly after setting up a new application when measurements have not yet been made. * only FMP150

Information symbols	
	Warning that the open application has not been set up with the connected probe! A measurement is not possible!
	Information that the open application is secured. Depending on the settings, deleting, a normalization, a corrective calibration may not be performed and/or access to the menu for setting the measuring application properties may be locked.
	Flashing display for low battery voltage. The batteries should be replaced. ▼ <i>Too low battery voltages can lead to data loss!</i>
	Information that this measurement is used to conclude a block. The group generation of a measurement block is concluded.


Information symbols	
	Information that limit value monitoring is enabled for this application and that limit values have been defined.
	Connection to the PC via virtual COM-Port (RS232 interface). Symbol colored: Connection enabled; Symbol grayed: Connection disabled
	Connection to the PC via Active Sync. Symbol colored: Connection enabled; Symbol grayed: Connection disabled

Unit of measurement	
µm, mm	On SI base unit, meter-referenced units of measurement.
mils, inch	Unit system used primarily in the Americas


Measurement display

Measurement display in large numerals.

Information area

Various information is displayed in this area such as file name (= application name) and characteristic statistical parameters (mean value, standard deviation, etc.). This information can be compiled individually,  *Operators Manual*.

Command button area

Command button for calling files, instrument functions or menus directly. A maximum of 12 command buttons can be compiled individually,  *Operators Manual*.

5.2 Keys

The 4 keys under the display are always assigned to the same functions as the (bottom) command button row on the display. In this manner, the functions of the button row at the lower display edge can be called directly using the keys without a stylus.

6 Operation of the Touchscreen (Display)

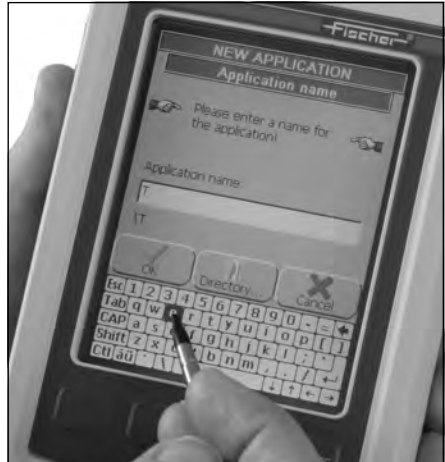
Essentially, the instrument is operated using a stylus on the touchscreen. The stylus is inserted in the lower right part of the instrument housing.



The pressure-sensitive display recognizes the position of the stylus and thus enables the navigation on the screen.

Procedure

Tap with the stylus directly on the display surface or drag the stylus across the display surface without lifting it off. To select a character or to activate a command button, press the stylus slightly onto the display.

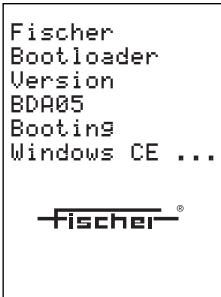


Example for entering a file name (= Application name). Use the stylus to tap on the desired letters.

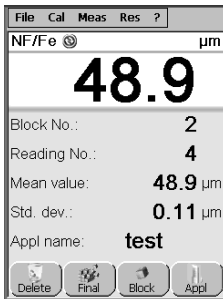
7 Turning the Instrument on/off



Press the ON/OFF key for approx. 1 second to turn the instrument on or off.

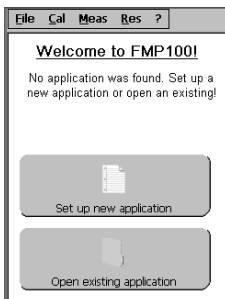


A sound will signal the start of the instrument's power-up routine. The power-up routine takes about 17 seconds.




Upon the conclusion of the power-up routine, the measuring application file (application) that was used last with the connected probe will open automatically.

Left display image: Example of a measuring application (= Application) with measurement data.



The display shown on the side will appear if an application has not yet been set up in the instrument or if a probe is connected to the instrument for which an application does not exist.

If this is the case, tap the button **Set up new application** directly on the display using the stylus.  Continue with Step 2. on Page 13 or 18.

8 Getting to Know the Instrument - First Steps

A quick introduction to making coating thickness measurements using the DUALSCOPE instrument is done based on an introductory example. The metal plate and the standards (foils) supplied with the probe are used.

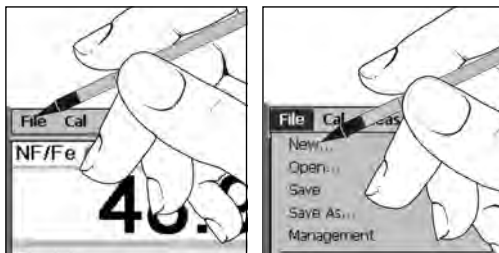
i *This introductory example is about the basic procedure. For correct measurements on your specimen, please be sure to observe Chapter "Correct Measurements on Your Specimen".*


All relevant settings and parameters for a measuring application as well as the measurement data to be acquired are sorted in a file - we speak of an application in this context.

8.1 Setting Up An Application (Measuring application file)

1. Open the submenu "New":

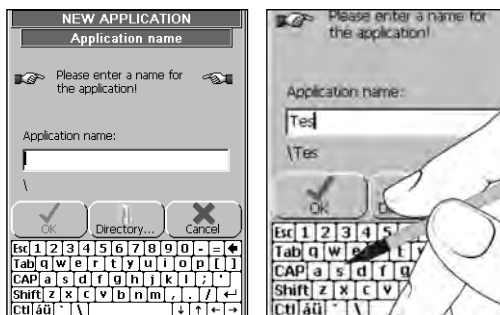
Tap the **File** menu and the command **New** with the stylus directly on the display.



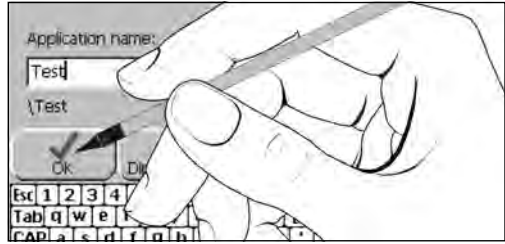
 For the operation of the touchscreen see also Page 11.

2. Enter the name for the application (file):

- Use the keypad on the display. Use the stylus to tap the individual letters in succession, e.g., Test.



- ▶ Use the stylus to tap the **OK** button when you are finished entering the name.
This sets up a file with the entered name in the instrument.



3. Calibration

- If a duplex or dual probe is connected to the instrument, select the measurement mode x/NF or NF/Fe ($x = Iso$ or Ni).
- Perform 5 measurements on the metal part that was supplied with the probe. This metal part is used here only for purposes of demonstrating the calibration. Normally, it is used for operational checks only and is designated with "NF/Fe", "ISO/NF", "Cu Saet.", "Ni Saet." or similar.
- Use the stylus to tap the **OK** button.

Alternatively, if the **OK** button is not available:
Use the stylus to tap **Continue** and then **Cancel**.

There are no verified instruments available for measuring the coating thickness, as is the case for the weight measurements with balances. Rather, the measurement results for the coating thickness are influenced by the materials and the shape of the specimen. However, you can measure these individual influences of your respective specimens using appropriate calibrations. The calibration procedures are different depending on the connected probe or the measurement method in use. For this reason, the calibration procedure is terminated here because this introductory example is about the basic operation of the instrument with your available probe and not yet about correct and accurate measurements.

In the next chapter you can obtain initial measurement experiences with this instrument using an exemplary measurement.

i For your concrete measuring application, be sure to observe the description in the Chapters starting on Page 17.

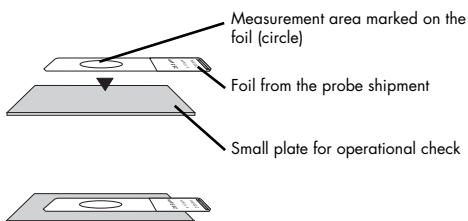
8.2 Performing the First Exemplary Measurement

After setting up an application, the measurement system (instrument and probe) is prepared to make measurements on specimens that have the same substrate material and the same geometry (shape) as the reference part that has been used for the calibration. In this introductory example, this is the metal part for the operational check that was supplied with the probe.

Following, the small metal plate (metal part) supplied with the probe (e.g., probe FGAB1.3) will be used as a representative sample. The coating to be measured is simulated using a foil that was supplied with the probe. Place one of the foils supplied with the probe on the small metal plate. For the FGAB1.3 probe, the supplied foil thicknesses are about 25 μm and 950 μm , for the FTA3.3 probe, they are about 24 μm and 675 μm and for the FD10 about 13 μm , 24 μm , 525 μm and 675 μm .

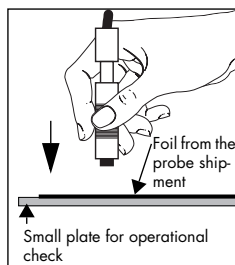
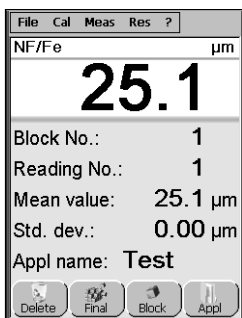
Procedure

1. Place the foil, for example, with a target value of 25.5 $\mu\text{m} \pm 1.0 \mu\text{m}$ on the small plate.



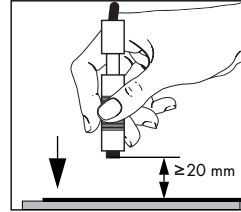
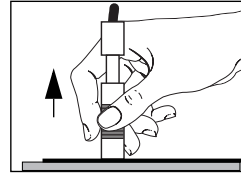
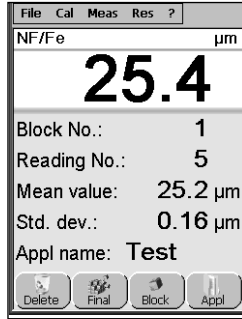
2. Measure 5 times on the foil.

- Place the probe inside the circle (measurement area) on the foil.



- ▶ Place the probe with a slight and uniform pressure vertically on the calibration foil and then lift it at least 20 mm off the foil.

This ends the brief introduction to the instrument.



Refer to the next chapters on how to perform a correct measurement on your specimens.

9 Setting Up An Application (Measuring application file)

A file - called application - must be defined before making measurements with the instrument. An application contains all data relevant for a measurement application. A measurement application is not only characterized by the material properties and the geometric shape of the specimen but also by probe type (measurement method, serial number of the probe). A new measurement application is present if one of these quantities changes and a new application must be set up.

The material properties and the geometric shape of the specimen (captured by a normalization or corrective calibration), the probe type used and a few application-specific settings are pre-defined and the measurements are stored in an application file.

A calibration is necessary when setting up an application. For this purpose, an uncoated specimen must be taken from the production. This part becomes the substrate material reference part that is required for the calibration.



Do NOT use the small function control board/metal part shipped with the probe.

Doing so would lead to erroneous readings because as a rule the material properties of the small board/metal part do not correspond to those of your specimen.



If an uncoated part is not available, you can also create a substrate material reference part using a coated specimen. To do this, remove the coating in that area where the coating thickness is to be measured on the specimen. In the most simple case this can be done by grinding. The area stripped of the coating should exhibit an essentially smooth surface.



Duplex probes (e.g., FDX10, FN6D): The respective measurement method must be selected prior to the actual calibration. Observe the information regarding calibration/adjustment in the probe information sheet (included with probe).

Procedure

1. Open the submenu "New":

Tap the **File** menu and the command **New** with the stylus directly on the display.



For the operation of the touchscreen see also Page 11.

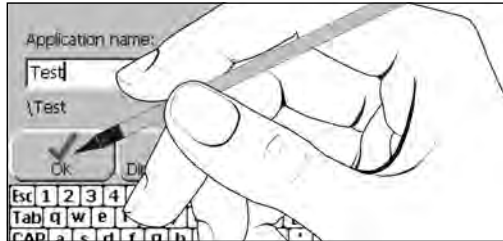
2. Enter the name for the application (file):

- ▶ Use the keypad on the display. Use the stylus to tap the individual letters in succession, e.g., Test.



- ▶ Use the stylus to tap the **OK** button when you are finished entering the name.

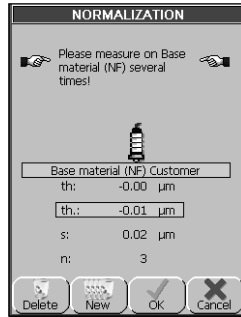
This sets up a file with the entered name in the instrument.



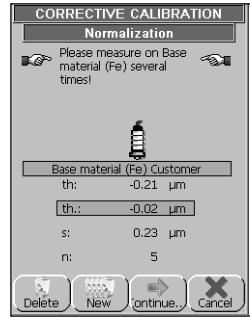
3. Calibration

Adjustment of the measurement system to a reference point or the specimen (material, shape and surface conditions) and the ambient conditions. This adjustment is performed on one or more reference parts named base material, CAL-rated value or saturation material.

The calibration procedures are different depending on the connected probe or the measurement method in use. They are called Normalization or Corrective Calibration.



Example of display instructions for a normalization.



Example of display instructions for a corrective calibration.

- ▶ Perform the calibration by following the display instructions.
- ▶ Measure 5 to 10 times on each specified reference part (base material/saturation material, CAL-rated value (calibration foil/coated reference part)).

Different display instructions will appear corresponding to the connected probe.

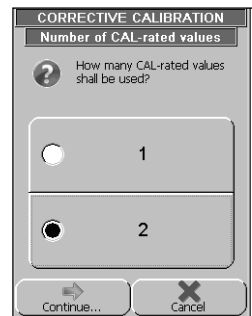
They indicate:

- Window **“Number of CAL-rated values”**:

Number of reference parts that shall be used in addition to the reference part base material or saturation material, respectively for the corrective calibration.

1: Adjustment for a small coating thickness range around the target value of a calibration foil or a coated reference part.

2: Adjustment for the entire measurement range or of a coating thickness range between 2 calibration foils / coated reference parts.



● Window **“Normalization”**

Base material (xx) Customer: reference part without the coating to be measured from customer’s production.

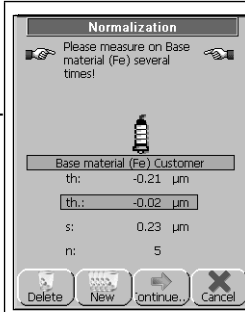
Saturation material (xx) Customer: coating material only, material of the coating to be measured

xx stands for the material code.

Fe: magnetizable material, e.g., iron, steel;

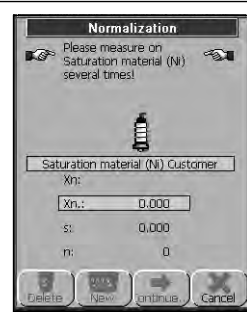
NF: non-magnetizable, electrical conductive metal;

Ni: Nickel; Zn: Zinc; Cu: Copper



Display information:

th: meas. thickness value
d.: Mean value of the measured thickness values



s: standard deviation
n: Number of readings

Example for a normalization on a magnetizable substrate material.

Example for a normalization on the coating material (nickel) only.

Window **“1. (2.) CAL-rated value”**:

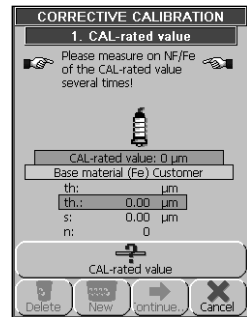
Reference part with known coating thickness (target value). The material of the reference part depends on the used probe and test method.

CAL-rated value (xx):

Coated part from the production with known coating thickness in the range of the coated parts to be measured and which corresponds to the substrate and coating material of the parts to be measured.

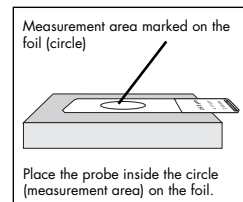
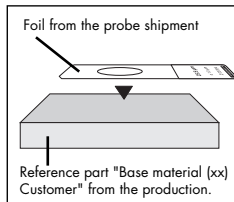
xx stands for the material code.

Ni: Nickel; Zn: Zinc; Cu: Copper



Example for a corrective calibration with a calibration foil on a magnetizable metal substrate material (Fe).

CAL-rated value: Calibration foil(s) supplied with the probe Place the foil directly on the substrate material (ref. figures on the right).



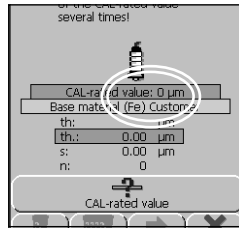
Button “CAL-rated value...”:

Enter/Edit

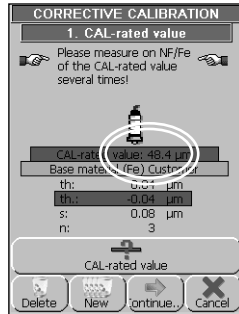
- the thickness of the calibration foil from the probe shipment

or

- the coating thickness of the coated reference part in use.



- ▶ Enter the foil/coating thickness as CAL-rated value. To do this, tap the **CAL-rated value...** button using the stylus. Enter/edit the respective target value via the display keypad (Example 48.4).

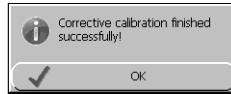


Left Fig:
Display CAL-rated value after entering the foil/coating thickness.

- **OK** button:
Finish/exit the calibration routine.

The measurement reading appears on the display.

The new application “Test” (example) is set up in the instrument. It is now ready to make measurements.



Top:
Message about the success/failure of the normalization or corrective calibration, respectively.

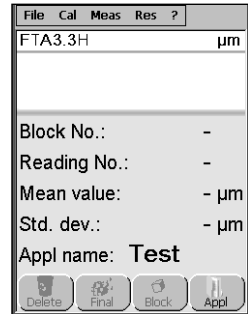
- **Continue...** button:
Continue to the next calibration step.

- **New** button:


Discard the measurements made thus far to perform new measurements on the reference part/foil.

- **Delete** button: Deletes the last reading.

Right:
Example of a measurement display for a newly set up application named “Test”, set up using the probe FTA3.3H.



- **Cancel** button:
Cancels the calibration procedure. Returns to measurement display.

i **DUAL probes (e.g., FD10, FD13):** *When using a dual probe, the application is initially set up only for one of the two measurement methods. Before this application can measure the coating thickness using the other measurement method, the application must be calibrated for the other measurement method as well,  25, Calibration.*

i **Duplex probes (e.g., FDX10, FN6D):** *When using a duplex probe, the application is initially set up only for one of the two measurement methods. Before this application can measure the coating thickness, the application must be calibrated for the other measurement method as well. The respective measurement method must be selected prior to the actual calibration. Observe the information regarding calibration/adjustment in the probe information sheet (included with probe).*

Once the calibration is finished, the application “Test” is set up.

The instrument is now ready to make coating thickness measurements on specimens that have the same substrate material and the same shape as the reference parts that have been used for the calibration.

▼ **Please note that it is imperative to use uncoated parts (= reference parts) from your own production for the calibration of your specific measuring applications!**


Refer to the next chapter on how to perform a correct measurement on your specimen.

10 Correct Measurements on Your Specimen


After you have become familiar with the basic handling of the instrument based on the introductory example and have set up an application for your current specimen according to the information in the previous chapter, this chapter continues with the basic procedures for measuring the coating thicknesses on your specimens correctly.


10.1 How do I arrive at a correct measurement


Before you start

- The probe is connected to the instrument.
- The instrument is powered up.
- The application for the specimen is open,  41.

Procedure

1. Measure on the specified measurement location of the specimen.
 See Section "Making Measurements - Probe Handling".

The measurement system must be adjusted to the properties of the respective specimen if the specified trueness is not attained. This is done with a calibration, beginning on  25.

2. Evaluate, print, or transfer the measurement data to a PC, etc.  See respective sections in the *Operator's Manual*.

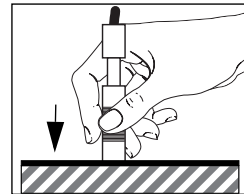
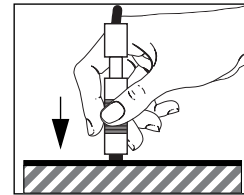
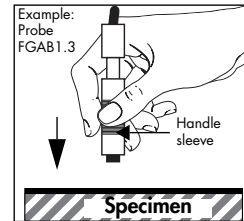
10.2 Making Measurements - Probe Handling

Before you start

The measurement area on the specimen must be at the same location as the measurement area on the substrate material reference part. Reference part and specimen are identical except for the coating.

Procedure


- Always hold the probe at its handle sleeve (right Fig.).
- Always place the probe softly and perpendicular to the specimen surface onto the marked measurement area.
- Push the handle sleeve to the specimen surface such that the handle sleeve rests on the specimen surface (right image center and bottom).
- In the standard display mode, the measurement acquisition is signaled by a peep tone.
- For the next measurement lift the probe at least 20 mm off the specimen.



▼ **Avoid impacts.**

▼ **Do not allow the probe to hover directly above the surface! Doing so will cause erroneous measurements!**

▼ **Do not bend the probe connection cable! Doing so could lead to breaks in the conductor!**

- The measurement system must be adjusted to the properties of the respective specimen if the specified trueness is not attained. This is done with a calibration,  next Chapter.

10.3 The specified trueness of the measurement data cannot be reached

In such a case, the measurement system must be adapted to the properties of the respective specimen. This is done with a calibration. During the calibration, one or several reference parts are used to measure the material properties of the specimen in order to take them into account in future measurements. In calibrating, a differentiation is made between a normalization and a corrective calibration. Depending on the degree of deviation, a normalization or a corrective calibration will be required. Start first with the normalization.

10.3.1 Normalization

Adaptation of the measurement system to the substrate material and the shape of the specimen.

A normalization is performed for the respective open application. The correction factors determined in this step are stored in the open application.

When should it be performed

- Always when the specimen changes (different shape, other substrate material, etc.)

▼ Please note that often the substrate materials of different batches exhibit differing magnetizabilities (permeabilities) or electrical conductivities. For this reason, the measurement system must always be adapted to the changed material properties before making measurements on production parts from a new batch. To do this, a new reference part must be made from the new batch.

- When setting up a new application (when using the amplitude-sensitive eddy current method).

Required materials (probe-dependent)

Reference part Base material: Uncoated part from the production = Speci-

men without the coating to be measured.



Do NOT use the small function control board/metal part shipped with the probe.

Doing so will lead to erroneous readings because as a rule the material properties of the small board/metal part do not correspond to those of your specimen.



If an uncoated part is not available, you can also create a substrate material reference part using a coated specimen. To do this, remove the coating in that area where the coating thickness is to be measured on the specimen. In the most simple case this can be done by grinding. The area stripped of the coating should exhibit an essentially smooth surface.



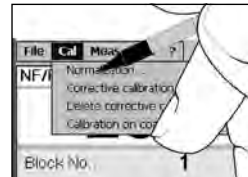
Duplex probes (e.g., FDX10, FN6D): The respective measurement method must be selected prior to the actual calibration. Observe the information regarding calibration/adjustment in the probe information sheet (included with probe).

Normalization procedure

Shown using the example of a reference part Base material made of iron and the probe FGAB1.3.

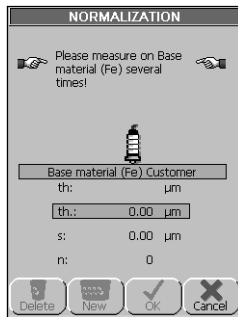
1. Cal / Normalization...

use the stylus to tap the buttons in succession on the display.



2. Measure 5 times on the reference part Base material.

- ▶ Place the probe inside the marked measurement area of the reference part.
- ▶ Place the probe with a slight and uniform pressure perpendicular to the surface, and then lift it at least 20 mm off the reference part.



Command buttons:

Delete:

Delete the last reading.

New:

Discard measurements. Perform a new measurement series on the reference part.

OK:

Accept the measurements and conclude the normalization. Returns to measurement display.

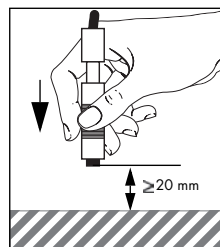
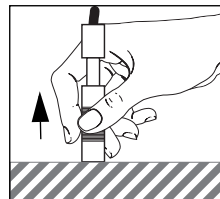
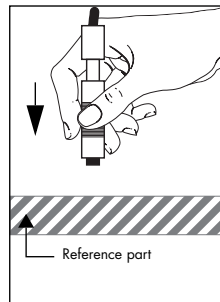
Cancel:

Cancel the normalization. Returns to measurement display.

Graphical presentation:

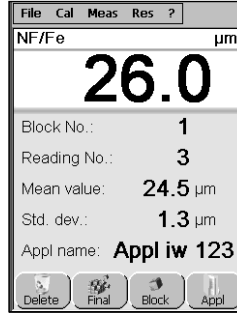
Base material (Fe)

Customer: Reference part from your production.
 th: Measured thickn. value
 th.: Mean value of the measured thickness values
 s: Standard deviation
 n: Number of readings



- Use the stylus to tap the **OK** button.

The measurement reading appears again on the display.



This ends the normalization.

DUAL probes (e.g., FD10): *The normalization must be performed for both measuring methods if measurements are to be made with both measuring methods in this application. That is, the normalization must be performed once with the substrate material of magnetizable metal and again a second time with the substrate material of non-magnetizable metal.*

Duplex probes (e.g., FDX10, FN6D): *When using a duplex probe, the application is initially set up only for one of the two measurement methods. Before this application can measure the coating thickness, the application must be calibrated for the other measurement method as well. The respective measurement method must be selected prior to the actual calibration. Please observe the information regarding calibration/adjustment in the probe information sheet (included with probe).*

- Delete the measurement data: **Res / Delete all readings** use the stylus to tap the commands in succession on the display.
- Perform a new measurement.
If the mean value is still outside the specified tolerance range, perform a corrective calibration as described in the following section.

10.3.2 Corrective calibration

When performing a corrective calibration, the adaptation is carried out not only to the substrate material (or possibly also the coating material) but to 1 to 2 coating thickness values using calibration foils (included in shipment) or on self-made coated reference parts. A corrective calibration is performed for the respective open application. The correction factors determined in this step are stored in the open application.

When should it be performed

- If the normalization does not reach the specified trueness of the measurement data.

⚠ Please note:

- **The substrate material from different batches will have different permeabilities or electrical conductivities. This means that the measurement system must be adapted to the changed material properties before making measurements on specimens from the new batch. For this purpose, the Base must be set up from the new batch!**
-

Required materials (probe-dependent)

Reference part Base material: Uncoated part from the production = specimen without the coating to be measured.

-
- ⚠ **Do NOT use the small function control board/metal part** shipped with the probe.

Doing so will lead to erroneous readings because as a rule the material properties of the small board (metal part) do not correspond to those of your specimen.

- 🗉 **If an uncoated part is not available**, you can also create a substrate material reference part using a coated specimen. To do this, remove the coating in that area where the coating thickness is to be measured on the specimen. In the most simple case this can be done by grinding. The area stripped of the coating should exhibit an essentially smooth surface.
-

- i Duplex probes (e.g., FDX10, FN6D):** The respective measurement method must be selected prior to the actual calibration. Observe the information regarding calibration/adjustment in the probe information sheet (included with probe).

Calibration foils: Included with the probe shipment.

or

Coated reference parts (for duplex probes, probes to measure nickel coatings): Self-made from the production.



Information for creating coated reference parts can be found in the Operator's Manual.

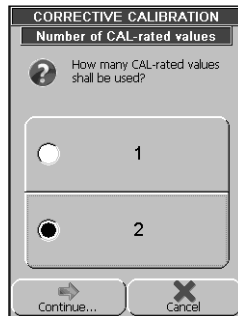
Corrective calibration procedure

Shown using the example of a reference part Base material made of iron and the probe FGAB1.3.

1. Use the stylus to tap **Cal** / **Corrective calibration...** in succession on the display.



2. Select the number of **calibration foils** that are to be used for the corrective calibration.

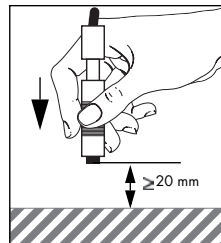
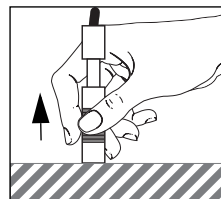
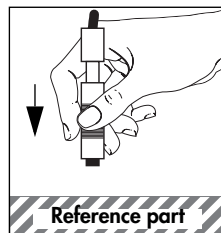
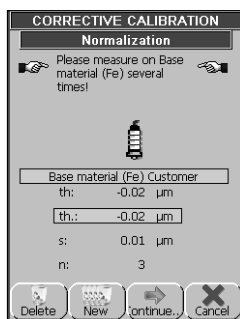
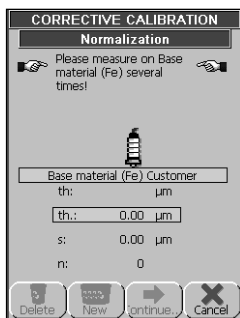


- ▶ Use the stylus to tap **2** in order to achieve the best measuring precision over the entire measurement range of the probe.

- ▶ Use the stylus to tap the **Continue** button.

3. Measure 5 times on the reference part substrate material.

- ▶ Place the probe inside the marked measurement area of the reference part.
- ▶ Place the probe with a slight and uniform pressure perpendicular to the surface, and then lift it at least 20 mm off the reference part.
- ▶ Use the stylus to tap the **Continue** button.

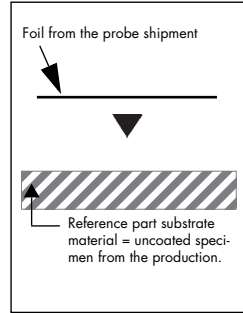
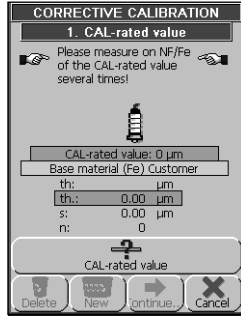


Description of the display Normalization

<p>Delete: Delete the last reading.</p> <p>New: Discard measurements. Perform a new measurement series on the reference part.</p> <p>Continue...: Continue to the next step in the corrective calibration.</p> <p>Cancel: Cancel the corrective calibration. Returns to measurement display.</p>	<p>Substrate material (Fe) Customer: Reference part = uncoated specimen from the production.</p> <p>th.: Measured thickness value</p> <p>th.: Mean value of the measured thickness values</p> <p>s: Standard deviation</p> <p>n: Number of readings</p>
--	--

4. Place the calibration foil on the reference part substrate material.

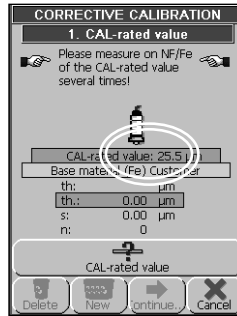
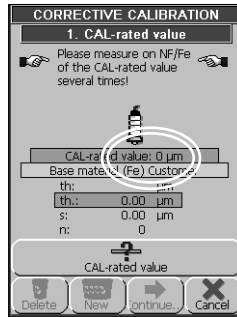
The circle of the calibration foil must be on the marked measurement area of the reference part. It does not matter which foil you use first.



5. Checking/entering the Cal-rated value.

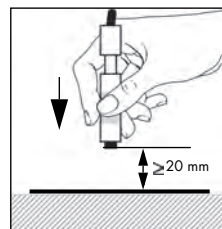
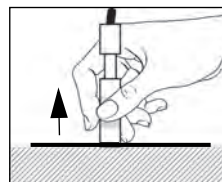
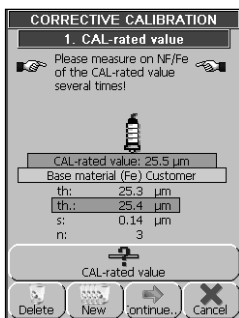
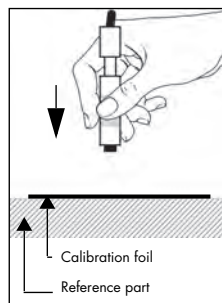
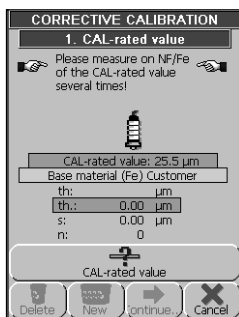
Does the displayed CAL-rated value correspond to the used foil thickness?

- No: Enter the foil thickness that is stated on the calibration foil as the CAL-rated value. To do this, tap the **CAL-rated value...** button using the stylus. Enter the respective rated value via the display keypad (Example 25.5).
- Yes: Continue with step 6.



6. Measure 5 to 10 times on the calibration foil.

- ▶ To do this, place the probe each time inside the circle on the calibration foil.
- ▶ Place the probe with a slight and uniform pressure perpendicular to the surface, and then lift it at least 20 mm off the reference part / foil.



Description of the display 1st CAL-rated value

Delete:

Deletes the last reading

New:

Discard measurements. Perform a new measurement series on the calibration foil.

Continue...:

Continue to the next step in the corrective calibration.

Cancel:

Cancel the corrective calibration. Returns to measurement display.

CAL-rated value:

Thickness of the calibration foil that has been placed on the reference part.

Substrate material (Fe)

Customer: Reference part from your production.

th: Measured thickness value

th.: Mean value of the measured thickness values

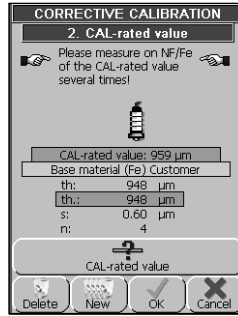
s: Standard deviation

n: Number of readings

- Use the stylus to tap the button **Continue... (OK)**.

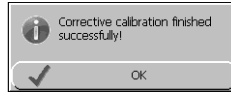
7. Measure on the second calibration foil.

Take the first calibration foil off the reference part substrate material and perform steps 4. to 6. using the second calibration foil. Then continue with step 8. .



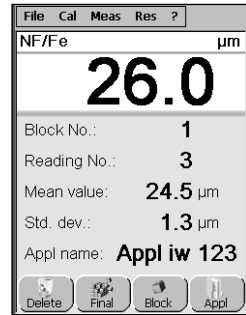
- 8. Use the stylus to tap the **OK** button in order to confirm the message.

The measurement reading appears again on the display.



Message about the success/failure of the corrective calibration.

This ends the corrective calibration.




-
- i DUAL probes (e.g., FD10):** The corrective calibration must be performed for both measuring methods if measurements are to be made with both measuring methods in this application. That is, the corrective calibration must be performed once with the substrate material of magnetizable metal and again a second time with the substrate material of non-magnetizable metal.
-

i **Duplex probes (e.g., FDX10, FN6D):** *When using a duplex probe, the application is initially set up only for one of the two measurement methods. Before this application can measure the coating thickness, the application must be calibrated for the other measurement method as well. The respective measurement method must be selected prior to the actual calibration. Observe the information regarding calibration/adjustment in the probe information sheet (included with probe).*

The instrument is now ready to make coating thickness measurements on specimens that have the same substrate material and the same shape as the reference part that has been used for the corrective calibration.

- Delete the measurement data: **Eval / Delete all measurements** use the stylus to tap the commands in succession on the display.
- Perform a new measurement.

If the mean value is still outside the specified tolerance range, check the calibration through a reference measurement. It is possible that the corrective calibration had errors.  *You can find additional information in the Operator's Manual.*

If the mean value is within the specified foil tolerance range, delete the readings of the reference measurement before starting with the actual measurements on your specimens.

i *Delete the readings of potential check measurements before starting with the measurements on your specimens.*

11 Measurement Settings

The following list provides you with a selection of setting options for measurement capture and for the instrument settings. Simply give it a try and specify, for example, the block size and the specification limits for the newly set up application.

The following table shows the path to the settings dialog windows in a shorthand description. For example, **File / Properties**, button **Measurement** refers to: Use the stylus to tap the **File** menu, and then from the pulldown menu tap the command **Properties**. This is the same procedure that you already followed when setting up a new application. Then use the stylus to tap the **Measurement** button from the appearing display screen.

Settings for measurement capture

Function / What for	The path there
Generate the average display value from several individual readings. <i>Useful for measurements on rough surfaces.</i>	File / Properties , Button Measurement
Grouped measurement capture = automatic block creation during the measurement. <i>This is necessary when the measurements are to be used to monitor the production process (process capability). E.g., several readings per specimen in one block (group) or all readings of one batch, drum, lot, etc. in one respective block (group).</i>	File / Properties , Button Measurement
Enable outlier rejection. <i>Avoids a falsification of the evaluation, e.g., through erroneous measurements. Readings that deviate significantly from the mean value do not enter the statistical evaluation.</i>	File / Properties , Button Measurement

Settings for measurement capture

Function / What for	The path there
Enable specification limit monitoring and set specification limits. <i>Simple monitoring to check if the readings are within preset specification limits.</i>	File / Properties, Button Specification limits
Delete measurements	
- all readings of the application	Res / Delete all readings
- delete the last reading	Delete button

Instrument settings

The instrument settings are password-protected. The factory default password is 159. You can change the password at will.

Function	The path there
Set the language	File / Supervisor , Enter password, Button Control Panel , Button Language
Set date and time	File / Supervisor , Enter password, Button Control Panel , Button Date/Time
Select the proper printer model	File / Supervisor , Enter password, Button Control Panel , Button Printer
Touchscreen calibration	File / Supervisor , Enter password, Button Calibrate touch

i *The green menu bar on the display indicates that the Supervisor mode is still active. In this case, the functions in the Supervisor mode are freely accessible without being prompted to enter a password. The Supervisor mode is disabled automatically after 3 minutes. It can be disabled manually as well by tapping **File / Quit Supervisor mode** on the display.*

12 Evaluating Measurement Data

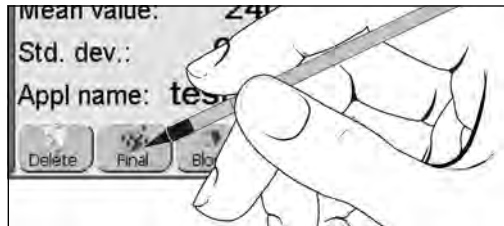
The instrument saves the user from having to perform the at times complicated and extensive mathematical calculations for the statistical evaluation of the measurement data. The evaluation is performed for the respective currently open application. The measurement data can be displayed and printed in various forms of presentation: Listed as characteristic statistical parameters or graphically, for example in a sum frequency chart or as a histogram.

The evaluation occurs automatically in the background after every measurement acquisition.


Procedure

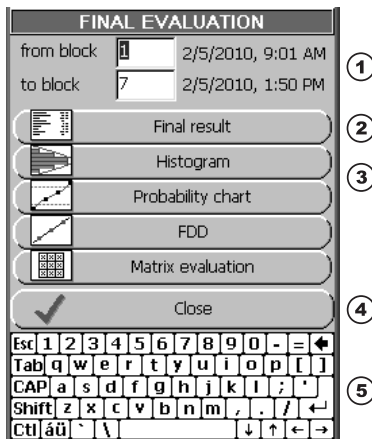
Shown on the example of a specimen, where the coating thickness has been measured using the FGAB1.3 probe.

1. Use the stylus to tap the **Final** button.



The display window **FINAL EVALUATION** opens.

-  The description of the display window is found on the next page. For detailed information on the evaluation options of the instrument see the chapter Evaluation in the Operator's Manual.



Description of the Dialog Window FINAL EVALUATION

- ① Number of the first and last measurement data block that are to be included in the evaluation. If necessary, enter the desired block number.
- ② Command button for calling up the final result with the characteristic statistical parameters such as mean value, standard deviation, etc.
- ③ Command button for calling up various measurement data presentations. Histogram and sum frequency chart provide a quick overview about the presence of systematic influences.

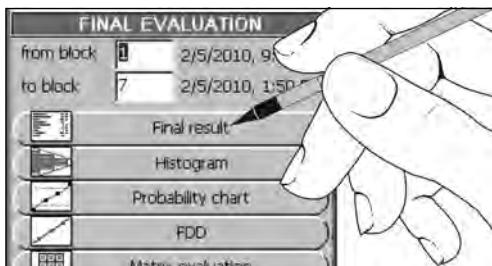
FDD®: The Factory Diagnosis Diagram provides a quick overall overview of the scatter and the distribution of the coating thickness, within specified tolerance limits. In addition, individual comparisons of measurement blocks are possible. Colors identify differences in the measured areas.

Matrix evaluation: Variance-analytical evaluation with information about the presence of systematic differences in the longitudinal and cross direction within the measured surface region.

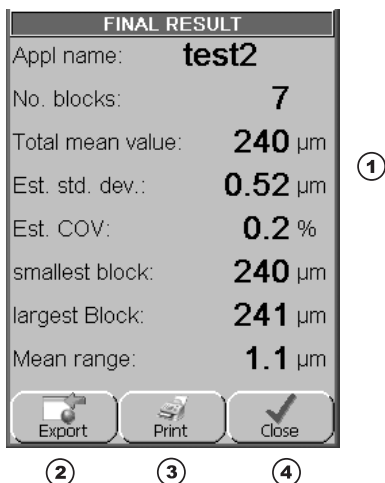
i *The button appears only if the Matrix Mode is set for the open application. A description of the Matrix Mode can be found in the Operator's Manual.*

- ④ Command button to exit the dialog window.
- ⑤ Display keypad to enter the block numbers.




2. Use the stylus to tap the **Final result** button.



The dialog window FINAL RESULT opens with the characteristic statistical parameters such as mean value, standard deviation, etc.



Description of the Dialog Window FINAL RESULT

- ① List with the application number and the characteristic statistical parameters. The display presentation shows the standard setting of the instrument. The user can compile the display parameters also according to custom requirements.  A description is found in the Operator's Manual.
- ② Command button to export the displayed parameters to a pdf file.  A description for the data export can be found in the Operator's Manual.
- ③ Command button to print the displayed parameters on a printer (connected to the USB port of the instrument).  A description for printing can be found in the Operator's Manual.
- ④ Command button to exit the dialog window.

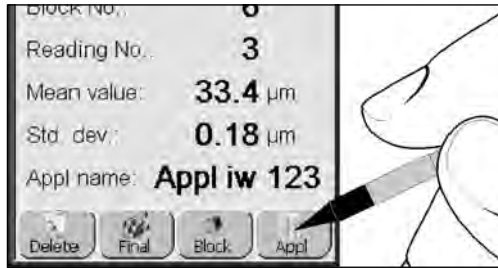
3. Always tap the **Close** button to exit the evaluation menu.

13 Opening an Application (Measuring Application File)

Opening of an already set up application

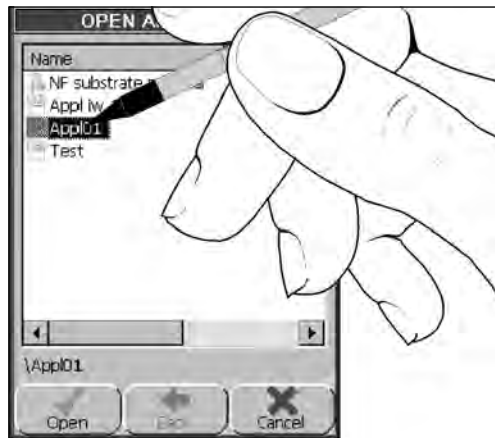
Procedure

1. Use the stylus to tap the **Appl** button on the display.



2. **Select the desired application.**

Use the stylus and tap the desired application (file).



3. Use the stylus to tap the **Open** button on the display.

The desired application opens in the measurement display function.

14 Instrument with integrated Bluetooth module — Data transfer



The "Bluetooth module FMP100/150" (604-695) enables communication with a PC via integrated Bluetooth or via a USB Bluetooth adapter. Current measurement readings and statistical characteristics, as well as those stored in the instrument, can be transferred to a PC via the module.

**Note**

The following data **cannot** be transferred via the Bluetooth connection.

- Program update for FMP instruments
- Import/export of an inspection plan and the evaluations from FISCHER DataCenter IP or IP Multi
- Files such as image files, pdf documents, etc.

As with the USB connection, a virtual COM-Port (similar behaviour to RS232) is configured in the PC via Bluetooth. Any program (e.g. PC-Datex, FISCHER DataCenter) that uses a COM port for its data transfer can communicate with the PC via this Bluetooth port. Hence, for data transfer via Bluetooth, the chapter "Data transfer per virt. COM-Port" in the main operating instructions likewise applies.

ATTENTION**Prerequisites for an optimum connection**

- Maximum distance between Bluetooth devices is 10 m.
- Neither walls nor metallic casings may disrupt the transfer path. If, for example, you cover the Bluetooth transmitter with your hand, the connection is interrupted or aborted completely.

14.1 Technical data

Bluetooth v2.0 + EDR, class 2

14.2 Bluetooth menu – Description of the setting parameters

- ▶ Call up: Select **Res/Bluetooth**.

Active

Activating the Bluetooth module. Activation means that the instrument of other Bluetooth devices can be found and the instrument can connect to other Bluetooth devices. The Bluetooth module is activated only when the Bluetooth symbol appears in the display.

Inactive:

Deactivating the Bluetooth module. When the Bluetooth module is activated, the current energy consumption of the device increases by around 15 %. It therefore makes sense to deactivate the module when it is not required for long periods of time.

Connect

Establishing a connection to another Bluetooth device (PC).

Disconnect

Disable the existing connection to another Bluetooth device (PC). This function can be carried out only if a connection existed beforehand, see also page 48.

Change PIN

Display/change the Bluetooth PIN code, also called coupling code. Valid values are between 0000 and 9999. The instrument never requests this PIN code while the connection is being established. The PC may request this PIN code.

Show State

Information display to the Bluetooth module

Example:


Name: FMP100 S/N:1950

Address: 10:00:E8:AB:FA:1A


Not connected

14.3 Preparations for data transfer via Bluetooth

14.3.1 Preparations on the PC

A PC with installed or integrated Bluetooth module must be available. Relevant information on the installation is provided in the Bluetooth module manual installed in your PC. If a Bluetooth module is installed on your PC, you recognise this by the Bluetooth icon  on your PC.

14.3.2 Preparations on the instrument

- ▶ Activating the Bluetooth module.
Select **Res/Bluetooth/Active**. The Bluetooth symbol  appears in the display.

We recommend deactivating automatic device switch-off, so that when searching for Bluetooth devices the instrument does not switch off automatically too quickly and the instrument cannot then be found.

- ▶ Deactivating the automatic switch-off:
 - a Select **File/Supervisor**.
 - b Enter the password **159**.
 - c Select **Control Panel/Lower & Light**.
 - d Choose "Never" from the pulldown list for the parameter **Turn Device Off**.
 - e Tap on **OK**.
 - f Tap twice on **Close** to return to the measurement value display.


14.4 Making a Bluetooth connection between instrument and PC

Before you start

- A PC with installed or integrated Bluetooth module must be available. Use the applicable instructions from the manufacturer (hardware/software). The Bluetooth symbol in the Autostart bar on the PC monitor shows that a Bluetooth module is installed in the PC.
- Instrument with Bluetooth module is required.
Activate the Bluetooth module in the device and deactivate automatic device switch-off as already described in section "Preparations on the instrument". This gives you enough time to make a Bluetooth connection.
- The PC and instrument must be turned on.

Depending on the operating system and Bluetooth program installed on your PC, you can start to make the connection from the PC or from the instrument.

14.4.1 Starting to make the Bluetooth connection from the PC

1. PC – Start the Bluetooth program: Double-click on the Bluetooth symbol.
2. PC – From the menu, select "Search for Bluetooth devices in the environment", "Add device" or similar options in the Bluetooth program window. This menu item searches the entire environment for Bluetooth devices.
3. PC – An instrument has been found (e.g. FMP100 S/N:1950): Right-click on the device name and select "Add device" (or similar) from the context menu. You may be asked for a code in the next step. Enter the code to link (pair) the FMP device with the PC. Display Code/PIN in the FMP instrument: Enter PIN code 0000 as a default code for the FMP instrument. Note the COM port numbers if they are shown while the connection is being made. You will require these COM port numbers for transferring data from certain programs, such as PC-Datex. The COM port designation can also be found in the PC Bluetooth program in "Settings" or a similar option.
4. Connection successful
 PC – The PC monitor displays a message to confirm that the connection was successful.
 Instrument – The Bluetooth symbol  appears green in the display.

The Bluetooth connection is now configured.

14.4.2 Making a Bluetooth connection from the FMP instrument

Makes sense only for data exchange via a control or terminal program. As a rule, the Bluetooth modules in the PC have two COM ports for registering the device addresses: One for the incoming communication to the PC (In) and one for the outgoing communication from PC to device (Out). If the connection to the control or terminal program is to be made from the instrument, the "Out" COM port must be set in this program. The COM port designation can be found in the Bluetooth program in "Settings" or a similar option.

Starting to make the Bluetooth connection

1. FMP instrument – Select **Res/Bluetooth/Connect**. Two options can occur:
 - The FMP instrument makes a Bluetooth connection for the first time: The FMP instrument searches for Bluetooth devices in its environment for max. 30 seconds. A list of the Bluetooth devices found appears in the display.
 - The FMP instrument has now connected with the Bluetooth module a few times: The Bluetooth device, to which the FMP instrument was last connected, is shown in the display. You can also, via **Search** button, search the environment for Bluetooth devices again.
2. Start connection: Select the required device from the list and tap on **Connect**. The FMP instrument attempts to make a connection. You may be asked by the PC whether you want to allow this connection. Confirm. The PC may ask you to input a code. Display Code/PIN in the FMP instrument: Enter PIN code 0000 as a default code for the FMP instrument.

In certain programs, such as PC-Datex, you will require the COM port number for the data transfer. The COM port designation can be found in the PC Bluetooth program in "Settings" or a similar option.

The Bluetooth connection is now configured.

14.4.3 Connecting more than one FMP instrument to the PC via Bluetooth

Should the Bluetooth program on your PC not automatically support the simultaneous connection of several devices, you can normally define several COM ports for one Bluetooth connection in the configuration menu of your Bluetooth program. Under "Local settings" or similar option you can configure additional serial COM ports. The new COM port number is fixed, the name can usually be changed. If the Bluetooth device receives the information via several COM

ports, these are displayed and the required one can now easily be selected. Experience of simultaneously connecting 2 FMP devices via Bluetooth has been garnered.

14.5 Disconnecting the Bluetooth connection

If the Bluetooth connection is no longer required, we recommend removing the connection. This is also done by switching off one of the Bluetooth devices (either FMP instrument or PC). A defined disconnection is always more reliable.



Note

Disable the connection in the same way you started it.

Example: Disable the connection via the FMP instrument, if you made the connection via the FMP device. This is the more reliable and sometimes the only way.


14.5.1 Disabling the Bluetooth connection on the FMP instrument

- ▶ Select **Res/Bluetooth/Disconnect**. The option appears only if a connection already exists.

14.5.2 Disabling the Bluetooth connection on the PC

- ▶ Right-click on the Bluetooth symbol and then on "Disconnect Serial COM-Port" or similar option.

14.6 Additional information

- The Bluetooth symbol must appear in the Autostart bar on the PC monitor.
- Two COM port numbers can be configured from both the FMP instrument (local service) and also from the PC (client applications). In order to avoid confusion, always start the connection in the same way.
- A Bluetooth environment is often installed during installation on the PC. This is a useful program window that provides information on Bluetooth devices that are already configured. When installed, this window can be opened directly from Windows Explorer via Desktop or direct from the desktop.
- The name of the FMP instrument on the PC could be "FMP100 S/N:1950". 1950 is the device serial number. The serial number permits the distinction between various FMP devices. To view the device serial number, select ? and you will see the device serial number in section *Digital board*. If you work with several FMP instruments, it makes sense to label the devices with their serial number.
- For the FMP instrument, you will find a symbol in the "Bluetooth environment" on your PC. Below the device designation (example: "FMP100 S/N: 1950"), you will also find "Unknown; Version(0) Subversion(0)". This is correct, since the FMP device is either a computer, a smartphone or another device known to the installed Bluetooth module.
- If you have a problem making the connection, re-start by searching again for Bluetooth devices.
- The Bluetooth symbol  appears in the display in different colours depending of the module state:
 - White: The Bluetooth module is activated
 - Green: The Bluetooth connection is enabled
 - Red: The Bluetooth module is deactivated

EC DECLARATION OF CONFORMITY

The manufacturer herewith declare for the products **DUALSCOPE[®] FMP100** and **DUALSCOPE[®] FMP150**, instruments for measuring the coating thickness:

The products correspond to the following directives and standards/acts:

LVD - Low Voltage Directive 2014/35/EC	EN 61010-1
EMC Directive 2014/30/EC	EN 55011
Product Safety Directive 2001/95/EC	Product Safety Act (ProdSG)

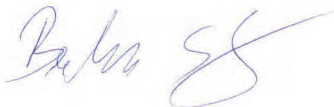
Further applied standards and regulations:

BGV A3	§5, paragraph 4 of accident prevention regulations "Electrical systems and equipment"
EMC	EN 61000-4-2
	EN 61000-4-3
	EN 61000-4-4
	EN 50082-2

This declaration will become invalid, in case of customer's own changes that have not been approved by the manufacturer.

Manufacturer: HELMUT FISCHER GMBH INSTITUT FÜR ELEKTRONIK UND MESSTECHNIK
Industriestraße 21
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Representative: Mr. Bernhard Scherzinger, Chief Engineer, Quality



(Signature)

Sindelfingen, the 29. July 2015

EC DECLARATION OF CONFORMITY

The manufacturer herewith declare for the products **DUALSCOPE[®] FMP100** and **DUALSCOPE[®] FMP150 each with a Bluetooth module (604-695) built-in**, instruments for measuring the coating thickness:

The products correspond to the following directives and standards/acts:

LVD - Low Voltage Directive 2014/35/EC	EN 61010-1
EMC Directive 2014/30/EC	EN 55011
Product Safety Directive 2001/95/EC	Product Safety Act (ProdSG)
R&TTE Directive 2014/53/EC, §3.2	EN 300220-3 V1.1.1, issue 2001-03

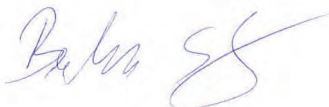
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