Operator's Manual

MMS® Inspection SPG

Gage type High

Coating Thickness | Material Analysis | Nanoindentation | Material Testing

MMS® Inspection SPG
Gage type High

Instruments for surface profile measurements according to ASTM D4417, Method B

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Manufacturer

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On our home page www.helmut-fischer.com you will find the addresses of our sole agencies and subsidiary companies around the globe.

Quality Assurance System of the Helmut Fischer GmbH

DIN EN ISO/IEC 17025	Calibration lab accredited for certified mass per unit area standards
DIN EN ISO 9001:2015	Management system certified by Swiss Association for Quality and Management Systems (SQS)

1 Safety information

If you use the gage as intended and observe the safety information, it will not present any danger.

Please read and follow this Operator's Manual and observe the safety information. Also observe generally applicable safety and accident prevention regulations.

1.1 Intended use

The gage is intended solely for surface profile measurements according to ASTM D4417, Method B.

Any use beyond this is not the intended use. The risk of damage ensuing therefrom is borne solely by the user.

Only accessories approved or recommended by the manufacturer may be connected to the gage.

1.2 Environmental conditions

Ambient temperature during operation: 0°... +40 °C

Storage and transport temperature: 0 ... +60 °C

Temperature

When exposed to sunshine, the areas behind glass windows (e.g. in an automobile) can easily reach temperatures in excess of +60 °C. This can cause damage to the gage.

- Do **not** keep or store the gage and accessories behind window panes, or near to heat sources such as radiators etc.!

Acid

The gage and accessories are **not** acid-proof.

- Do **not** place the gage or accessories in contact with acids or liquids which contain acid!

Potentially explosive environment

The gage and accessories are **not** suitable for use in potentially explosive environments.

- ▶ Operate the gage and accessories only outside of potentially explosive areas!

Danger of injury at the measuring tip

You can easily injure yourself at the thin measuring tip.

- ▶ Always keep the measuring tip away from the body.
- ▶ Keep the device in a box or protective cover.

1.3 Safety of the electrical equipment

Only accessories approved or recommended by the manufacturer may be connected to the gage!

USB cable

Damaged USB cable

Kinking or pinching the USB cable can result in a broken wire. Data transmission is then no longer possible.

- ▶ Connect only an undamaged USB cable with a max. length of 3 m to the gage.
- ▶ Always coil up the USB cable for storage.

Batteries/rechargeable batteries

- Use the following alkaline or lithium battery type: Mignon, 1.5 V, LR6 - AA

or

- Use the following NiMH rechargeable battery type: Mignon, 1.2 V, HR6 - AA

Servicing and repairs

Modifications, repairs as well as maintenance and service work on the gage and accessories may be carried out only by service personnel authorized by the manufacturer.

Exception: Changing the batteries/rechargeable batteries.

2 Description

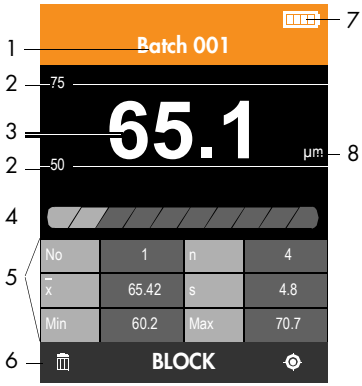
The gages in the MMS Inspection SPG series measure the surface roughness of blasted surfaces easily, quickly and in a nondestructive manner. Gage construction with an integrated measuring probe allows single-hand measurements on flat samples.

This operator's manual describes the following gage version in the MMS Inspection SPG series:

- High variant
  USB and WiFi interfaces, data storage for 250 000 measured readings in 2500 batches, displays the measured reading acquisition (optically and acoustically) as well as by vibrating the gage

Additional information can be found in the data sheet, page 11

2.1 Measurement view (example)



Example of Measurement view showing statistics with set specification limits

1 Batch name

2 Specification limits

3 Current measured reading

4 Progress display, number of measurements per location

5 Statistical values (Block no., block mean value ($\bar{x}$), Min.-/ Max. values, Location value (x)

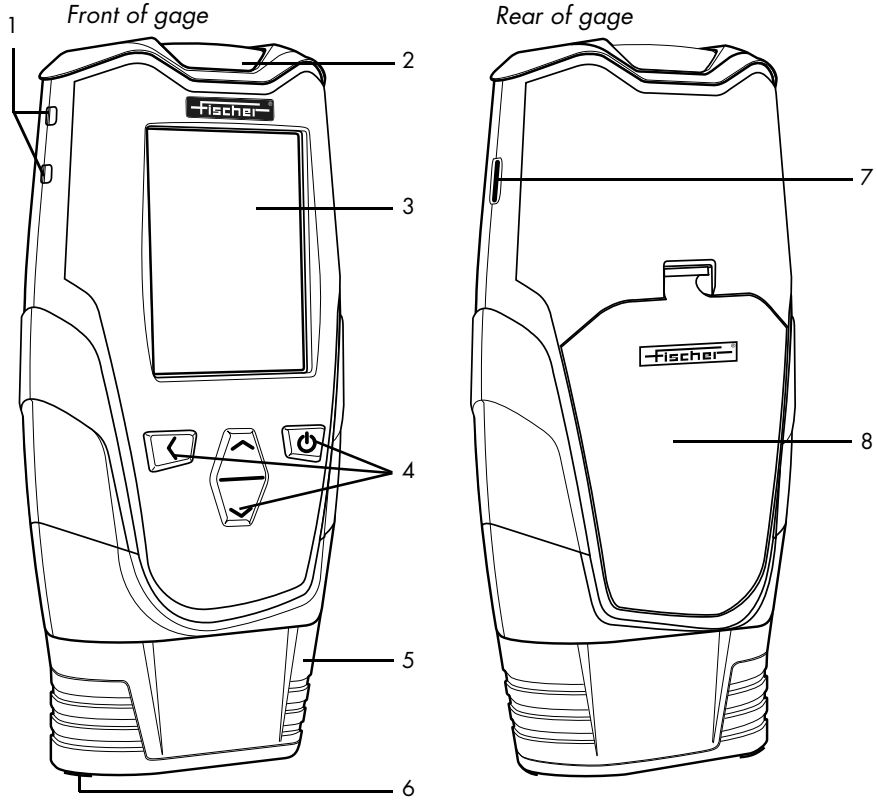
6 Key assignment line (example: delete symbol, open block statistics, symbol for opening calibration)

7 Battery indicator

8 Unit of measurement

A list of all display symbols and texts can be found starting on page 41.

2.2 Gage



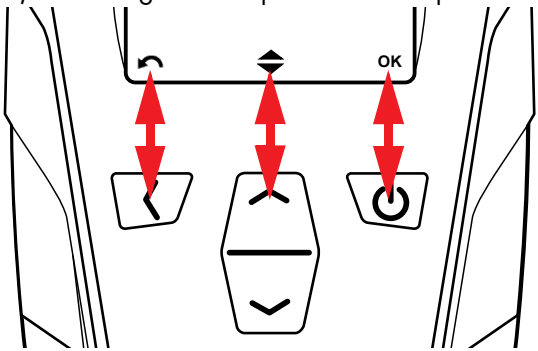
1 Eyelets for a carrying strap
2 Signal lamp to indicate measurement acquisition and limit violations
3 Display
4 Keys, On/off key, for description see page 6
5 Positioning aid for reliable placement of the gage on the surface
6 Probe tip
7 USB port
8 Battery compartment cover

Gage dimensions can be found in the data sheet, page 14

2.3 Keys

There are 4 keys for operating the gage.

The bottom line of the display always shows the functions of the 4 keys (see illustration below). The assignment depends on the opened menu page.



The function shown on the display is assigned to the key directly underneath (example).

The ⏻ key has two functions:

- It switches the gage on and off when the key is held for at least 1 s
- Function shown in the bottom line of the display

The ∨ key has two functions:

- It moves the cursor/highlight down when ⬍ is shown in the bottom line of the display
- It opens the main menu when ⬍ is **not** shown in the bottom line of the display

A description of the remaining key symbols can be found starting at page 41

2.4 Menus - function overview

Main menu

Statistics >	Display of the statistics for the opened batch

Batch Modify > Settings and entries for the opened batch	MEASURE >	Switch to Measurement view
	Tolerance Limits >	Activation of limit monitoring and setting of the limits
	Batch Infos	
	View Settings >	Measurement View Batch Statistic View Block View
	Block Size >	Activation of automatic block formation and setting of the block size
	Measurement Settings >	Max. value, mean value, mean (Min, Max), measured reading per location
	Value Resolution >	low, medium, high
	Save measurements	Powering on/off

Batches >	New > List of saved batches (After a batch has been selected, it can be opened, copied or deleted.)

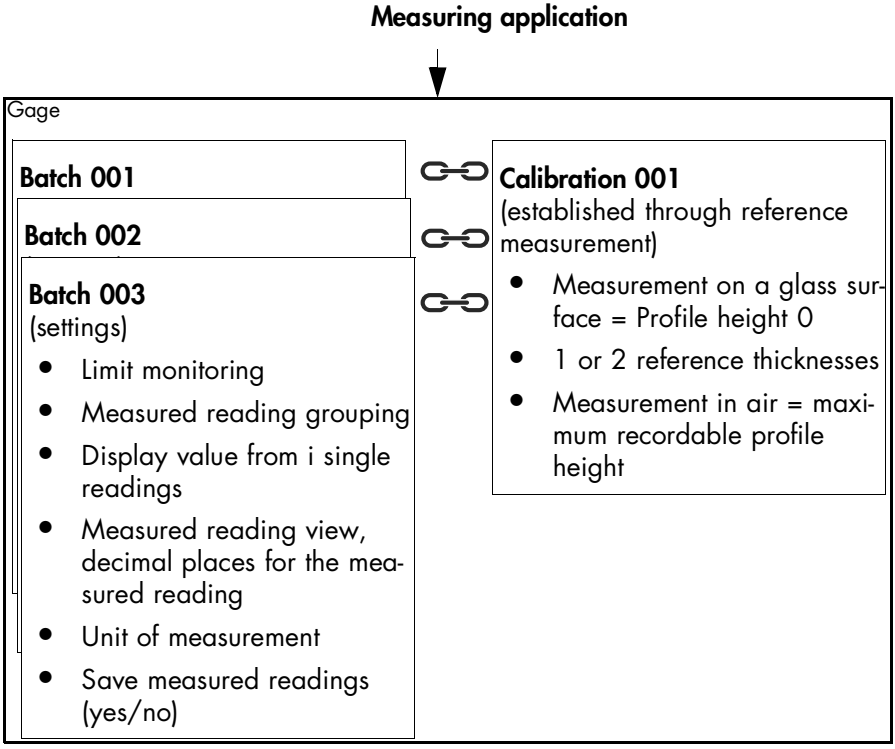
Gage Settings >	Language	Select the display language
	Display Settings >	Brightness Rotate display
	Indication Settings >	Key actuation signal Audible signal Visual signal Vibration
	Connections >	USB mode WiFi
	Date & Time >	Settings for date, time, time and date format
	More Settings >	Measurement units (for new batch) Resolution of the measured reading display (default) Battery type

	Probe Settings >	Raw data from probe Line frequency settings
	About >	Information about software version and probe as well as legal information such as copyright, data protection conditions, enhanced labeling

2.4.1 Gage concept

In order to measure, a batch (file) must be created in the gage for each application. The calibration 001, which serves as a reference for each batch, is saved in the gage. A description of the expression measuring application, and the terms batch and calibration can be found in Chapter "Glossary".

The key contents of the batch files and calibration file and their relationship with one another are shown schematically in the figure below:



A measuring application is defined in the gage by a batch file, which is always linked with the calibration file calibration 001.

Data Sheet

MMS® Inspection SPG

Surface profile measurement
according to ASTM D4417, Method B

- Easy and convenient operation
- Compact and robust case

Scale 1:1

MMS® Inspection SPG

Description

The gage models MMS Inspection SPG measure the depths of surface profiles easily, quick, non-destructively and with the precision that is typical for all Fischer instruments. The SPG gages measure the peak-to-valley distances according ASTM D4417, Method B. Therefore, measurements of the depths of surface profiles by using the SPG gages are conform to many standards and guidances, e.g., SSPC-PA17.

Gage properties

- Ideal for onsite applications (outside and inside) due to the compact size and the robust and durable instrument design
- Probe integrated in the gage for single-handed operation
- IP65, dust-tight and water repellant and resistant
- A large touchdown table ensures a sure positioning on the surface
- Intuitive operation of the menu navigation and graphic display
- The measurement presentation flips automatically and thus allows optimum reading in different measuring positions
- Different languages selectable
- Measurements according to ASTM D4417, Method B

Applications

Examples

- Measuring the depths of surface profiles
- Inspection, whether the surface profile depth is within the specifications
- Assessment of blasted surfaces whether they are appropriate for varnishing

Variants

Start	High
Entry level gage with small data memory for max. 10,000 measured values in one batch, display of measurement acquisition (audible and optical) and USB interface for data transfer	High-end gage with large data memory for 250,000 measured values in 2500 batches, display of measurement acquisition (audible and optical) additional by gage vibration, USB interface and WiFi for data transfer

Metrological Standard Functions / Measurement Tasks

Batch	File containing all metrological function settings and the linking to calibration necessary for the measurement task as well as the measured readings and evaluations
Block creation	Measured readings grouped in measurement blocks
Tolerance limits	Adjustable, upper and lower limit values
Representativ measurement reading (Measurement Settings)	Display and storage of the representative measurement reading of a specified number (n) of measurements, the n measured readings are not stored. Methods for determination of the representative measurement reading: • Mean value from n measurements • Maximum value from n measurements • Middle value, determined by the maximum and minimum values of n measurements
Measurement reading acquistion	Automatic upon placement of the gage probe
Measurement reading storage	On/Off switchable
Measurement units	µm/mm or mils/inches
Resolution of measurement reading	Low (up to 1 decimal place), Medium (up to 2 decimal places), High (up to 3 decimal places)
Air reference value acquisition	During measurement, the air reference value is used to detemine the maximum depth value. Regular measurement of the air reference value is necessary to achieve high measurement accuracy.

Metrological Standard Functions

Measurement Tasks

Calibration	For a correct measurement of the depth of surface profiles, the gage must record the two extreme values "Zero" and "maximum depth" (= air value). This adjustment is carried out by a calibration. If necessary, an adjustment to 1 to 2 further depth values is also possible.

General Features

Test method	ASTM D4417, Method B, and magnetic induction method ISO 2178, ASTM D7091
Factory Calibration	Each individual gage is factory calibrated at several reference points with the greatest care to ensure the highest possible degree of trueness.
Data memory	The memory content is preserved even when there is no voltage supply; subsequent viewing of the measured single readings and evaluations • Gage variant Start with memory capacity of max. 10,000 measured readings in 1 batch • Gage variant High with memory capacity of 250,000 measured readings in 2500 batches
Evaluation	*Statistics* Display of mean value of all location values, standard deviation, min/ max values, range and number of measured locations, number of measured readings lower/upper the set limit values *Graphic Presentation* Run-Chart, showing the progress of stored readings
Probe	Single tip axial probe with spring-loaded measuring tip built-in into gage Measuring tip: 60° tip angle; Probe tip radius: 50 µm, hard metal Probe tip replaceable by customer using the probe tip replacement kit 605-434
Quantity of measurements	Before each measurement the probe tip has to be checked! After approximately 20,000 measurements the intact probe tip may show signs of wear and should be replaced.
Display of measurement acquisition	Audible by a short beep and visual by colored illuminated LED; gage variant High: Additional by gage vibration
Display for limit monitoring	• Limit violation: Audible by 2 short beeps and visual by red illuminated LED; gage variant High: Additional by gage vibration • Measured readings between the limits: Audible by 1 short beep and visual by green illuminated LED; gage variant High: Additional by gage vibration
Languages	German and English
Presettings for batches Only available in gage variant High	Each new batch is created with a preset measurement unit and resolution for the displayed measured value. You can adapt these presettings to your requirements. However, you can also change the unit of measurement and the resolution for the measured value display at any time in the batch that has already been created.
Display	• Graphic display with automatic flipping measuring presentation view (deactivatable) to read measurement results in many different gage positions • Setting of brightness and contrast (definable for Office, Sunlight and Night)
Data transfer Bluetooth/WiFi only available in gage variant High	• USB: Data transfer of single readings to a PC, Data import to MSExcel via PC-Datex software; You can gratis download the PC-Datex program from Fischer-Homepage • Bluetooth/WiFi: Data transfer of measurements and data transfer of batches to App PHASCOPE® PAINT; Creation and export of reports via App; You can gratis download the App from Google Play Store and Apple App Store
USB port	2.0 Type C • For service purpose • For connection to PC for data transfer, max. cable length: 3 m (118 inches)

General Features

Wireless interface
Only available in gage variant High

WiFi: WiFi module integrated in gage, Standards IEEE 802.11b/g/n

Bluetooth: Bluetooth module integrated in gage, Bluetooth v4.2 BR/EDR and BLE

Admissible climatic conditions during operation

Ambient temperature	Relative Humidity	Altitude of location	Pollution Degree
0 … +50 °C	5 … 85 %RH, at 25 °C (77 °F), non-condensing	up to 2000 m (6561.7 ft (US)) (above sea level)	3

Surface temperature: max. + 60 °C

Protection class (housing): IP65, measurements under water are not permissible

Weight (incl. batteries): about 392 g

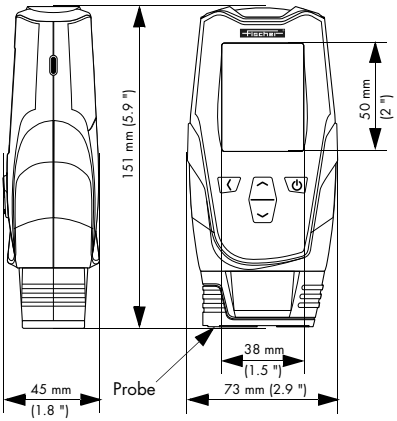
Power supply:
- 2 batteries: Mignon, Alkaline or Lithium, LR6 - AA, 1.5 V
- 2 rechargeable batteries: Mignon, NiMH, HR6 - AA

Battery life
Specifications valid for +20 °C (+68 °F) ambient temperature and Alkaline batteries used

> 8 h for continuous measuring, brightness set to sunlight and deactivated wireless interface

Dimensions

Gage



Measurement range

0 … 500 µm	0 … 19.69 mils

Trueness*

Based on Fischer factory calibration standards, 20 °C (68 °F) for specimen temperature and 20 … 25 °C (68 … 77 °F) ambient temperature

0 … 100 µm: ≤ 3 µm 100 … 500 µm: ≤3 % of nominal value	0 … 3.94 mils: ≤ 0.12 mils 3.94 … 19.69 mils: ≤3 % of nominal value

Repeatability Precision*

Based on Fischer factory calibration standards, 5 single readings per standard, 20 °C (68 °F) specimen temperature and 20 … 25 °C (68 … 77 °F) ambient temperature

0 … 100 µm: ≤ 1.5 µm
100 … 500 µm: ≤ 1.5 % of reading

0 … 3.94 mils: ≤ 0.06 mils
3.94 … 19.69 mils: ≤ 1.5 % of reading

*

The data for accuracy and repeatability may differ in harsh industrial environments

Influence

Curvarure	Probe unsuited for measurements on curved surfaces
Edge distance	No influence; for the measurement, the touchdown table of the measuring instrument must rest completely on the surface

Scope of Supply

Gage; 2 batteries; USB cable type C to type A (1 m (39.4 inches)); calibration standard set 605-308; guideline

Order Information

MMS Inspection SPG

Gage

Variant	Order no.	Interface	Memory capacity	Vibration
Start	606-034	USB	max. 10,000 measured values in 1 batch	
High	606-035	USB + WiFi	250,000 measured values in 2500 batches	●

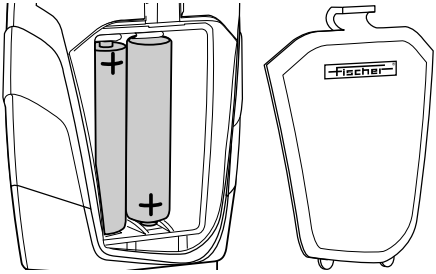
We recommend ordering the probe tip replacement kit at the same time

Spare parts/accessory for MMS Inspection SPG

Product	Order no.	Description
Calibration standard set	605-308	Glass base (606-306), 2 depth standards 300 µm/11.8 mils (605-305) and 100 µm/3.94 mils (605-307)
Probe tip replacement kit	605-434	3 measuring tips, exchange tool 605-248

3 Set up

3.1 Installing batteries



Battery polarity

Observe the correct polarity when inserting the batteries!

Damage to the gage

The use of defective batteries or the wrong type of battery causes damage to the gage. Leaking batteries destroy the gage's electronics.

- ▶ Use only undamaged batteries.
- ▶ Use only the following battery types:
  Alkaline, 1.5 V, AA - LR6
  Lithium 1.5 V, AA - LR6
  NiMH rechargeable, 1.2 V, AA - HR6

Rechargeable batteries cannot be charged in the gage

Individual rechargeable batteries in the gage cannot be charged via the USB port

- ▶ Use a commercially available charger to charge individual rechargeable batteries.

3.2 Switching on the gage

- ▶ Press the ⏻ key for approx. 1 s.
- ▶ Measurement in air: Hold the gage in your hand and press **OK.**

  The display shows the main menu or measurement view for the batch that was open at shutdown.

3.3 Switching off the gage

- ▶ Press the ⏻ key for approx. 1 s.

What you can do next

- Setting the language: **Main Menu** (∨) **> Gage Settings > OK > Language >** *Select the desired language* **> OK > 2 x** ↶
- Create a new batch, page 20
- Settings for measurement, page 18

4 Getting started

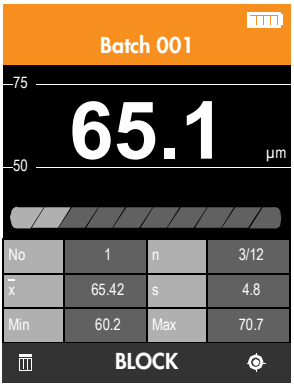
All the settings relevant to measuring the height of surface profile of a sample[1] and the measured readings themselves are saved in a file. Such a file is called a batch.

In the batch, you define the measurement procedure, e.g. whether the specification limit is to be monitored during the measurement or whether the measured readings are to be logged in measurement block groups. The batch is always assigned the calibration 001 as a reference.

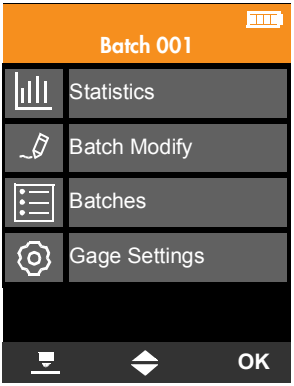
3 steps to the measurement

1. Switch on the gage, ⏻
2. Open a batch or create a new one
   - Opening a batch, see page 21
   - Creating a new batch, see page 20
3. Take a measurement on the sample, see Page 22

ℹ If the specified precision is not achieved during the measurement, you must recalibrate the gage, see page 24.



After the gage is switched on, the Measurement view (example) for the batch that was open at shutdown appears.



After the gage is switched on, the main menu appears (example: Batch 001 is open)

1. In this manual, both a coated part of any shape and size and a surface containing multiple measurement locations are referred to as the sample.

5 Settings for measurement

In order to measure, you need to create and open a batch (measuring application file). In a batch, you define the measuring application and settings for the measurement procedure, e.g. specification limit monitoring or grouping of measured readings in measurement blocks during the measurement. The link to the Calibration 001, to which the measurements are referenced, is also saved in the batch file.

If a parameter changes, there is a new measuring application and you have to create a new batch.

Overview of the possible settings you have to make before a measurement

5.1 Visual inspection of probe tips

Although the probe tip is produced from wear-resistant material, it can become damaged during the measurement. The probe tip wears over time and should be replaced after approx. 20,000 measurements. To prevent faulty measurements, the probe tips should therefore be visually inspected at regular intervals.

When to perform

- Our recommendation: At the start of each series of measurements
- Before each calibration

Required materials

- Gage
- Magnifying glass

Visual inspection of probe tips - procedure

▶ Examine the probe tip under a magnifying glass.

Measuring probe with undamaged probe tip

Example of a damaged probe tip (broken tip)

What you can do next

- Take measurements, see page 22
- Run a calibration, see page 24
- Replace the faulty probe tip, see page 36

5.2 Creating a new batch

Each batch contains some presets for the measurement procedure.

The preset selection is based on the requirements in a directive/standard or according to customer specifications.

Before you start

- The gage is switched on (⏻ key)

Creating a new batch

1. **Main Menu (V) > Batches > OK > New > OK**
2. Measurements in air: Hold the device in your hand and press **OK**

This completes the creation process for a new batch.

What you can do next

- Measure, see Page 22
- Repeat calibration, recalibration, see page 24
- Make batch settings under **Main Menu (V) > Batch Modify > OK**
- Rename the batch, see page 35

5.3 Opening a batch

Before you start

- The gage is switched on (⏻ key)

Opening an existing batch

1. **Main Menu** (∨) **> Batches > OK**
2. Select the desired batch from the list: ⬍
3. **OK**
4. **MEASURE > OK**
5. Measurements in air: Hold the device in your hand and press **OK**

Measurement view for the selected batch opens.

What you can do next

- Measure, see Page 22
- Repeat calibration, recalibration, see page 24

6 Measurement

Use the device model MMS Inspection SPG to measure the height of surface profiles. The probe measures the peak-to-trough height differences according to ASTM 4417, Method B. The gage is therefore suitable for height measurements of surface profiles according to various directives and guidelines, such as SSPC-PA17.

During the measurement you can also:

- Delete measured readings: Press the 🗑 key
- View the statistics of the open measurement block: Press the **BLOCK** key

6.1 Notes on measuring

Essentially: If the specified precision is not achieved during the measurement, you must recalibrate the gage, see page 24.

Measured readings outside the specified tolerance limits are displayed in red and indicated by an illuminated red LED.

The gage vibrates during measurement acquisition if this is activated in the gage settings.

6.2 Before you start

- The gage is switched on (⏻ key)
- The required batch is opened (key in the main menu, see also page 21)
- **The probe tip has been inspected and shows no sign of damage.** Examine the probe tip for damage, see page 19.

6.3 Measurement - procedure

1 Place the gage

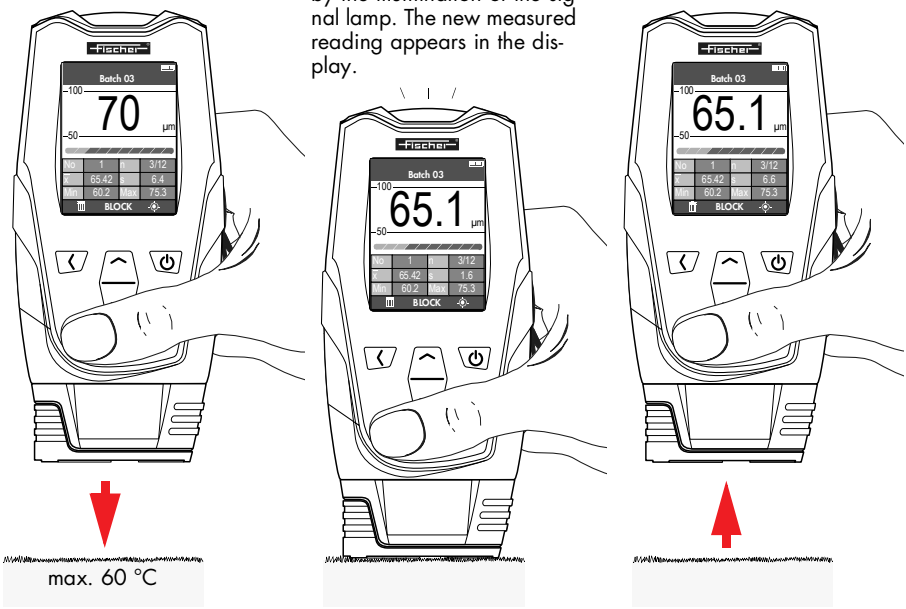
Place the gage on the surface.

2 Measurement acquisition

The measurement acquisition is reported audibly and also by the illumination of the signal lamp. The new measured reading appears in the display.

3 Lifting the gage

Lift the gage from the surface.



The display screens are to be understood only as examples

7 Calibration

For a correct measurement, the gage must be adjusted to the extreme values of zero and "maximum height" (= air value). This is done by means of a calibration. The extreme and height values are recorded using a glass plate and one or two calibration shims in order to compensate the influences for future measurements.

Please observe the following information

Perform the calibration carefully! This is the benchmark for the accuracy to which the following measurements can be performed. - Measurements can never be more accurate than the calibration!

7.1 Calibration - When necessary?

- After switching on the gage
- To start a series of measurements

7.2 Performing a calibration

Handle the calibration shims (foils) with care. Replace soiled, bent, scratched or cracked calibration shims.

Required materials

- Glass plate 605-306 from scope of supply
- 1 or 2 calibration shims from scope of supply, depending on the measurement accuracy required

Before you start

- The gage is switched on
- Glass plate and calibration shim ready for use. The parts you need depends on the measurement accuracy required.

7.2.1 Calibration - procedure

1. Open the calibration: ⌖ (in the measurement display)
2. Follow the routine and perform the calibration steps displayed (air value and zero). In this regard, refer to the descriptions in the sections "Air value calibration step", page 25 and "Zero calibration step", page 26.
3. Require a greater measurement accuracy?

   Yes:
   Continue the calibration routines with 1 or 2 calibration shims.
   - Observe "Foil calibration step (calibration shim)", page 28.
   - Calibration with only 1 calibration shim: Skip the calibration step Foil 2 with ↷.

   No:
   Skip the next two calibration steps (Foil 1 and 2) with ↷.

Acknowledging (**OK**/ ↷) the last calibration step exits the calibration routine automatically and the calibration is completed.

7.2.2 Air value calibration step

Measurement in air

Procedure – air value calibration step

1. Hold the gage in the air and press **OK**.
   The display automatically switches to the next calibration step or to Measurement view (after switching on the gage or opening another batch).

7.2.3 Zero calibration step

Measurements on the glass plate from scope of supply.

Required material

- Glass plate 605-306 from scope of supply

Procedure – Zero calibration step

1 Perform 5 to 10 measurements on the glass plate.

A Placing the gage

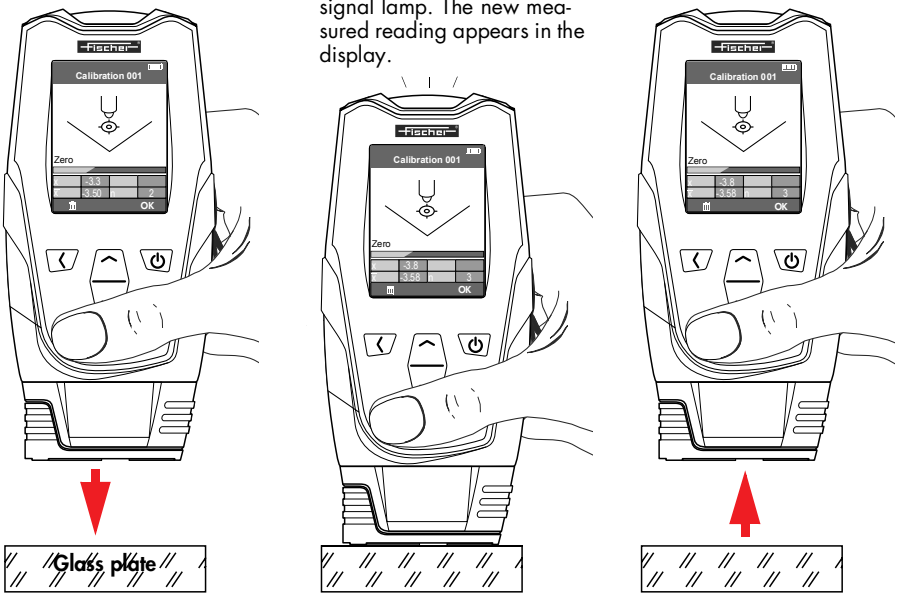
Place the gage on the surface.

B Measurement acquisition

The measurement acquisition is reported by a beep and also by the illumination of the signal lamp. The new measured reading appears in the display.

C Lifting the gage

Lift the gage from the surface.

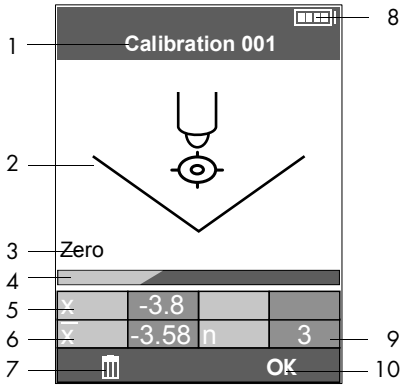


Repeat steps A to C for
the next measurement on the uncoated specimen

The display screens are to be understood only as examples

Display description - Zero calibration step

1 Name of calibration
2 Schematic illustration of the current calibration step
3 Current calibration step
4 Progress display of the calibration steps (example of 3 calibration steps, calibration step 1 current)
5 Currently measured reading (example)
6 Mean value of the previously measured measured readings (example)
7 Deletes the last measured reading
8 Battery indicator
9 Number of measurements (example)
10 To next calibration step/exit calibration



7.2.4 Foil calibration step (calibration shim)

Measurements on the calibration shim (foil) located on the glass plate directly.

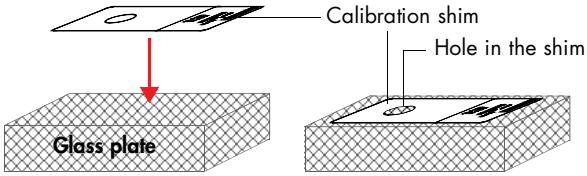
Required material

- Calibration shim(s) from scope of supply. The hole in the shim marks the specified measuring area.
- Glass plate from scope of supply

Procedure – Foil calibration step (calibration shim)

1 Position the calibration shim

Place the calibration shim (Foil 1/2) on the glass plate.



There must only be **one** calibration shim on the glass plate at any one time!

2 Perform 5 to 10 measurements with the calibration shim.

A Placing the gage

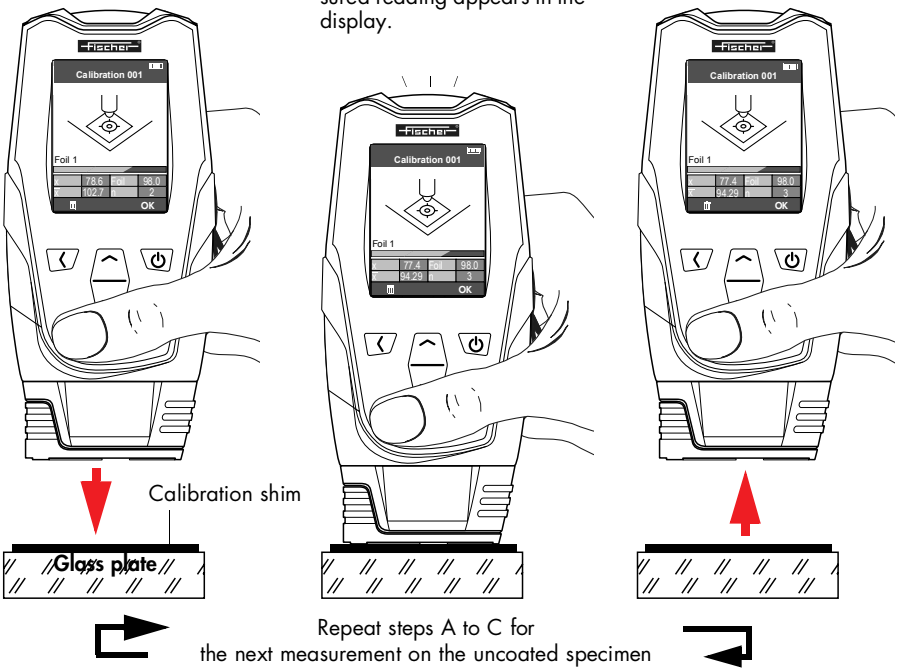
Place the gage on the surface. The probe tip must be touching the glass plate within the hole.

B Measurement acquisition

The measurement acquisition is reported by a beep and also by the illumination of the signal lamp. The new measured reading appears in the display.

C Lifting the gage

Lift the gage from the surface.



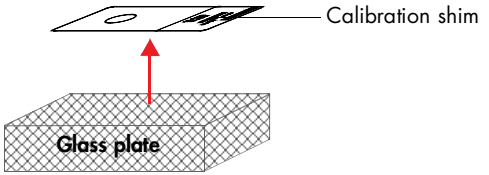
The display screens are to be understood only as examples

3 Check whether the nominal value of the calibration shim used is shown in the *Foil* table cell.

► How to set the nominal value of the calibration shim: **SET >** *set nominal value via* ▲▼ **> OK**

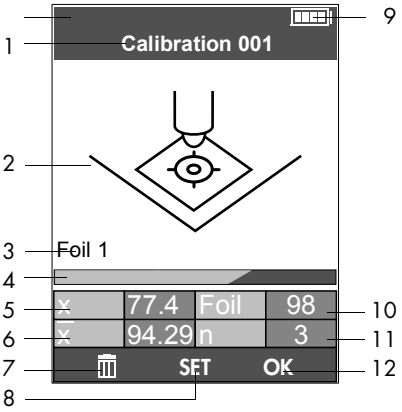
4 Take the calibration shim from the glass plate

Return the calibration shim (1/2) to the protective sleeve.



To calibrate with 2 calibration shims, repeat the entire foil calibration step (steps 1 to 4) with the second foil.

Display description - Foil calibration step (calibration shim)



1 Name of calibration
2 Schematic illustration of the current calibration step
3 Current calibration step
4 Progress display of the calibration steps (example of 3 calibration steps, calibration step 2 current)
5 Currently measured reading (example)
6 Mean value of the previously measured measured readings (example)
7 Deletes the last measured reading
8 Opens the window to set the calibration shim nominal value
9 Battery indicator
10 Set nominal value of the calibration shim used (example)
11 Number of measurements (example)
12 To next calibration step/exit calibration

8 Data transfer

The following data can be transferred from the gage:

- Batch files into the App PHASCOPE PAINT, see page 31
  You can download the app for free from the Google Play Store or Apple App Store.
- Single readings in an Excel file via PC-Datex, see page 33
  You can download the program PC-Datex for free from the Fischer-Homepage.

8.1 Transfer batch files in the PHASCOPE PAINT app

Before you start

- The PHASCOPE PAINT app is installed in the used mobile device. You can use the app on any mobile device (smart phone, tablet) with a Android (as of 5.0) or IOS (as of 9.0) operating system. You can download the app for free from the Google Play Store or Apple App Store.

Procedure

1. Establish a WiFi connection between the Smartphone and the gage:
   a Gage: **Main menu (v) > Gage Settings > Connections > WiFi > Enable AP > OK**
   The WiFi interface of the gage is now activated. (•) shows the activated WiFi connection (WLAN connection) in the header line.
   b Smartphone:
   - Activate the WLAN/WiFi connection
   - Select the gage ID: MMsc_....

2. Import the batch files in the app:
   a Open the PHASCOPE PAINT app in the smart phone.
   b App: Open the data manager: ≡ **> Data Manager**
   c App: Tap on ⬇.

All batch files are be transferred from the gage to the PHASCOPE PAINT app. The data transfer is now finished.

What you can do next

- Use the PHASCOPE PAINT app to export the data as follows:
  - CSV file, for measurement blocks, e.g., for import to MS Excel. Date and time of measurement block creation and measurement capture, single readings, tolerance specification limits, if in the selected application set, are always exported.
  - pdf file, for reports

    Date and time of measurement block creation and measurement capture, tester name, single readings, tolerance specification limits, if in the selected application set, are always reported in the file. The photo will be displayed in the report, if a photo is assigned for the single reading or measurement block. Description, comment and histogram are only reported if set so under Menu overview ( ) > Settings > Export.
- Make further measurements with the gage, see page 22
- Delete readings of the open batch in the gage: **Main menu (v) > > > All Readings > OK**

8.2 Transfer single readings online to an Excel file via PC-Datex

The data is transferred directly from the gage to the computer via an USB cable connection.

i For further processing of the data transferred from the gage commercially as well as internally developed data processing programs can be used. Information on the data import and further processing can be found in the corresponding program manuals.

i You can download the program PC-Datex for free from the Fischer-Homepage.

Before you start

- Excel is installed on the computer with the program PC-Datex as an Add-In
- The gage is switched on and the desired batch is open in the gage, which measured values should be transferred to the computer while measuring.

Procedure

1. Activate the data export via USB interface in the gage:

   Main menu (v) > Gage Settings > Connections > USB Mode > PC-Datex > OK

   - Return to main menu: **2 x** ↶

2. Connect the gage with the computer via USB interfaces. Use the supplied USB cable or another commercially USB cable with Type C/A connectors Maximal usable USB cable length: 3 m (118 ").
3. PC: In the PC-Datex Add-In under „Interface“, select the used COM interface (e.g. COM20) to which the gage is connected
4. PC: Tap in an Excel field
5. PC: Tap on button **Online** in the PC-Datex Add-In to start the online data transfer
6. Gage: Measure, capture the measured values on the surface

   While measurement the single readings are transferred to the open Excel table sheet, one column per block.

Finish data transfer

▶ PC: In the PC-Datex Add-In tap on button **Cancel** of the PC-Datex window

What can you do next

- Open another batch, see page 21
- Make further measurements with the gage, see page 22
- Delete readings of the open batch in the gage: **Main menu (v) >**  **>**  **> All Readings > OK**

9 Assigning/changing batch names

Assign a unique name for the batch.

Keep in mind that many batch files are stored in the gage. A unique name makes the selection process easier.

Procedure

1. **Main Menu (∨) > Batches > OK**
2. Select the desired batch from the list: ▲▼
3. **OK > Rename > OK**
4. Change name:
   - Move cursor by means of the ↶ and **OK** keys
   - Select the desired character by means of the ▲▼ keys
   - Delete character: Select space
5. Exit the *Rename* input window:
   a Move the cursor all the way to the right using the **OK** key The character ↵ appears at the right edge of the display.
   b Press **OK** to exit the input window.
6. • Switch to Measurement view: **MEASURE > OK**
   - Return to the main menu: **2 x** ↶

10 Replacing the probe tip

Although the probe tip is produced from wear-resistant material, it can become damaged during the measurement. Furthermore, the probe tip wears over time due to mechanical loading.

When to perform

- We recommend after approx. 20,000 measurements
- When the probe tip is visibly damaged

Required materials

- Gage
- Probe tip replacement kit 605-434
- Small screwdriver

Replacing the probe tip - procedure

1. Using exchange-tool 605-248, rotate the probe tip out of the housing. Insert the tool pins into the openings on the probe tip.

2. Remove the unscrewed probe tip.
3. Remove the felt ring from the bore. Use a small screwdriver.

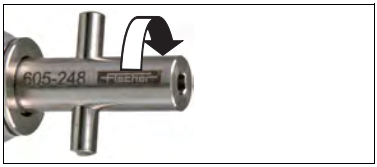

Old probe tip *Old felt ring*

4. Insert the new felt ring from the kit scope of supply kit on the housing of the new probe tip as shown in the figure on the right.

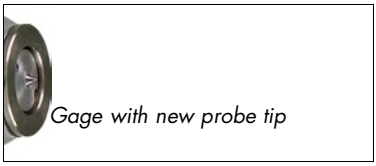

New probe tip with new felt ring

5. Place the new probe tip (with felt ring attached) in the housing.

6. Using exchange-tool 605-248, carefully and without using additional force, screw the new probe tip into the housing as far as it will go.



7. Perform a calibration as described on page 24.



Gage with new probe tip

What you can do next

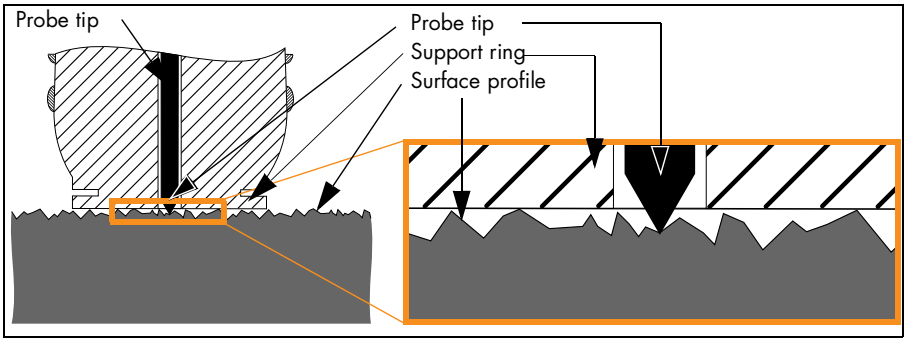
- Take measurements, see page 22
- Run a calibration, see page 24

11 Glossary

ASTM 4417, Method B

Measurement method for measuring the height of surface profile. The peak-to-trough height differences according to standards are measured.

The profile height value is determined in 10 measurements. Depending on the directive or guideline according to which the test is being carried out, you can set in the gage which value of the 10 measurements is to be displayed and saved.



Principle for measuring the height of surface profile with the device model MMS Inspection SPG in sectional view.

Batch

A file for organizing and controlling the measurement data. All the settings relevant to the measurement and the measured readings themselves are saved in a file. In the gage, such a file is marked as a batch. In the batch, you define the measurement procedure, e.g. whether the specification limit is to be monitored during the measurement or whether the measured readings are to be logged in measurement block groups.Each batch file is assigned to *Calibration* 001, which are referenced to the measurements.

Foil

see under Calibration standards

Calibration shim

see under Calibration standards

Calibration standards

- Glass plate from scope of supply. Needed for adjustment to the profile height 0 (zero = zero point).

- Calibration shim, thin shim of a specified thickness. An adjustment to the corresponding profile height value is performed for each calibration foil thickness.

Calibration

A calibration is a reference measurement, which adjusts the gage to the two extreme values of zero and "maximum height" (air value). You can run the calibration with up to 2 calibration shims (from the scope of supply).

Calibration method

The calibration method is a predefined calibration procedure. This procedure determines the measurement accuracy for subsequent measurements. A calibration method consists of one or a combination of both of the following calibration steps:

Calibration zero: Measurements on the glass plate from the scope of supply

Calibration foil: Measurements on the calibration shim, which lies directly on the glass plate.

- Required material: Calibration shims from the scope of supply. The hole in the calibration shim (foil) marks the specified measuring area.

Measuring application

A measuring application can be characterized not only by the measurement location or the *Sample*, but also by the measuring settings, e.g. limit monitoring and measured reading grouping. If any one of these parameters changes, there is a new measuring application and you have to create a new *Batch*.

Sample

- Large surface with several measurement locations
- Part of any size

Specimen

see under Calibration standards

Coefficient of variation V [%]

Percentage scatter of a *series of measurements*, i. e. standard deviation from the mean value. V [%] is a characteristic process constant. A sudden change in V [%] indicates a change in process conditions.

Zero

see under Calibration standards

11.1 Glossary - Display symbols

Batches menu, contains a list of batches already created and the **New** function for creating a new batch.

Batch Modify menu, contains a list of alterable batch settings

Statistics menu, contains statistics displays for the open batch.

- Comprehensive statistics covering all measured readings and measurement blocks
- Statistics for the individual measurement blocks
- Graphical representation of all measured readings in a progress diagram
- Lists of individual values in a block

Gage Settings menu, contains a list of alterable gage settings

Identifies information and requests for action

Identifies warnings

Battery status indicator (example: fully charged)

The power supply for the gage is via the USB connection

On/off switch, parameter is active

On/off switch, parameter is not active

Selector switch, option is activated

Selector switch, option is deactivated

SPG Batch-Type: Surface Profile Gage

11.2 Glossary - Display texts

11.2.1 Keypad Functions

OK Confirms the selection/setting

✓ Confirm the message/information

SET Opens a settings window, e.g. for setting the nominal value of the calibration shim used

× Cancels the setting process and returns to the previous menu page

Forward, skips the next step in the routine

Back

- Returns to the previous menu page, altered settings are applied
- Moves the cursor to the left when the name is entered

Switches to Measurement view

Opens the calibration from measurement view

Moves the cursor

- Moves the selection highlight
- Increases/decreases the numerical value displayed

··· Opens another menu page for a option selection

→ Turn page

Opens the Delete function

11.2.2 Display texts - Evaluation / statistics

Foil Nominal value entered for the calibration shim

Foil 1/2 Calibration step Foil 1 or Foil 2 must be carried out

Max

- Largest single reading measured within a block
- Largest spot value measured within one Area or Location

Min

- Smallest single reading measured within a block
- Smallest spot value measured within an Area or Location

No Block number

n Number of measured location values

USL Upper specification limit

>USL Number of measured readings above the upper specification limit

R Range R equals the difference between the largest measured reading (maximum) and the smallest measured reading (minimum) in a series of measurements

s Standard deviation from the mean value

LSL Lower specification limit

<LSL Number of measured readings below the lower specification limit

V[%] Coefficient of variation, percent variation of a series of measurements, standard deviation from the mean value

x Location value; Maximum value, mean value or mean value (Max-Min/2) from i single readings measured in one location

$\bar{x}$ Block mean value of a measurement block with n location values

3/12 Number of values already measured (determined) / specified block size (example: 3 values from a total of 12 measured; Block size = 12)

Zero Zero calibration step must be carried out

12 About

In this menu you will find all device information, information about the device status, the software and legal information.

Navigation

- ⇕ : Select the desired parameter/batch
- × : Confirms selection
- → : Scrolls forward through the page
- ↶ : Exit page, scrolls back to the previous page

Call up menu

▶ **Main menu (V) > Gage Settings > OK > About > OK**

Call up FCC-ID

▶ **Hauptmenü (V) > Gage Settings > OK > About > OK > 4 x →**

What can you do next

- Switch to measurement view : 2 x ↶ > ⍗
- Perform further gage settings: 1 x ↶
- Return to main menu: 2 x ↶

13 Legal Informations

In this chapter you will find all statements on country-specific regulations and directives

13.1 USA, FCC (Federal Communications Commission)

FCC ID: 2ATFE-MMSINSPEC00

FCC Regulations

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.

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.

This device 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 device 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.
- Consult the dealer or an experienced radio/TV technician for help

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Information about Specific Absorption Rate (SAR)

This device is designed and manufactured not to exceed the emission limits for exposure to radio frequency (RF) energy set by the Federal Communications Commission of the United States.

During SAR testing, this device was set to transmit at its highest certified power level in all tested frequency bands, and placed in positions that simulate RF exposure in usage near the body. Although the SAR is determined at the highest certified power level, the actual SAR level of the device while operating can be well below the maximum value. This is because the Device is designed to operate at multiple power levels so as to use only the power required to reach the network.

The exposure standard for wireless devices employing a unit of measurement is known as the Specific Absorption Rate, or SAR. The SAR limit set by the FCC is 1.6 W/kg.

The FCC has granted an Equipment Authorization for this model Device with all reported SAR levels evaluated as in compliance with the FCC RF exposure guidelines. SAR information on this model Device is on file with the FCC and can be found under the Display Grant section of www.fcc.gov/oet/ea/fccid after searching on FCC ID: 2ATFE- MMSINSPEC00.

For this device, the highest reported SAR value for near the body is 0.001134 W/kg. While there may be differences between the SAR levels of various devices and at various positions, they all meet the government requirements.

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