

Operator's Manual for the Coating Thickness Measuring Instrument

DUALSCOPE® MP0R USB
DUALSCOPE® MP0RH USB
DUALSCOPE® MP0R-FP USB
DUALSCOPE® MP0RH-FP USB
ISOSCOPE® MP0R USB
 and variants

DKD-K-33101



Operator's Manual for
ISOSCOPE® MP0R USB; DUALSCOPE® MP0R(-FP) USB
DUALSCOPE® MP0RH(-FP) USB

Documentation order #: 952-584
Version 4.2 11/2006

Applies to software versions P0R04 and higher

Manufacturer:

HELMUT FISCHER GMBH+CO.KG
Institute for Electronics and Measuring Technology
Industriestrasse 21 71069 Sindelfingen, Germany
Phone ++49 (0) 70 31 30 30
Fax ++49 (0) 70 31 30 379
Internet www.Helmut-Fischer.com
eMail mail@Helmut-Fischer.com

© 2006 by Helmut Fischer GmbH+Co.KG,
Sindelfingen/Germany.

This operator's manual remains the copyrighted property of Helmut Fischer GmbH+Co.KG. All rights reserved.
This manual may not be reproduced by any means (print, photocopy, microfilm or any other method) in full or in part, or processed, multiplied or distributed to third parties by electronic means without the written consent of Helmut Fischer GmbH+Co.KG. Subject to technical changes and corrections.

ISOSCOPE® and DUALSCOPE® are registered trademarks of Helmut Fischer GmbH+Co.KG, Sindelfingen, Germany.

Table of Contents	Page
1 Switching the instrument ON / OFF (valid for all instrument models except the "...-FP" models).....	5
2 Switching the "...-FP" instrument models ON / OFF.....	6
3 Main Menu – Functional Overview	7
4 Measurements on coating material.....	8
5 Evaluation of a test series (Statistics function)	10
6 Transmitting data to a computer.....	12
6.1 Transmitting only the current reading	12
6.2 Transmitting all measurement data in the instrument memory	13
6.3 Sending the current mean value	13
6.3.1 Triggering the mean value transmission manually	14
6.3.2 Sending the mean value automatically.....	14
7 Deleting measurements.....	15
7.1 Deleting only the last reading.....	15

7.2 Deleting all measurement data from the measurement data memory	15
8 Normalizing.....	16
9 Calibration	18
10 Deleting a calibration / Restoring the baseline of the characteristic.....	20
11 Setting the specification limits.....	22
12 Deleting the specification limits.....	24
13 Triggering the group separator	25
14 Service Menus.....	27
15 Trouble Shooting	34
16 Technical data	39
17 Order information for instruments and accessories	46

1 Switching the instrument ON / OFF (valid for all instrument models except the "...-FP" models)

Note: The instrument does not have a specific ON / OFF switch.

Switching the instrument ON

The instrument will switch **ON** automatically when it is placed on a specimen. If the instrument is placed on nonferromagnetic or electrically nonconductive material, the display will show the error note "Er6" and then four horizontal bars instead of a reading.

PLEASE NOTE!

Do **not** power up the instrument by pressing a finger on the sensor! It may result in erroneous measurements.

Switching the instrument OFF / Auto-Switch-Off

After a certain time, the instrument will switch off automatically (OFF = when instrument's display is empty)

You can set the period from the last measurement to the automatic OFF from the service mode.

See chapter 14 "Service Menus", page 27.

2 Switching the "...-FP" instrument models ON / OFF

Note: The on/off operation is different to the other MPOR models!

Switching the "...-FP" instrument ON

The **ON** key is the key [OK].

Switch the instrument ON by pressing the key [OK]

Switching the instrument OFF / Auto-Switch-Off

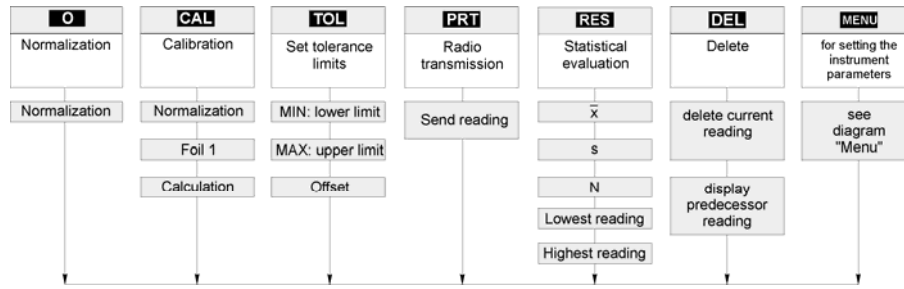
After a certain time, the instrument will switch off automatically (OFF = when instrument's display is empty)

You can set the period from the last measurement to the automatic OFF from the service mode.

See chapter 14 "Service Menus", page 27.

3 Main Menu – Functional Overview

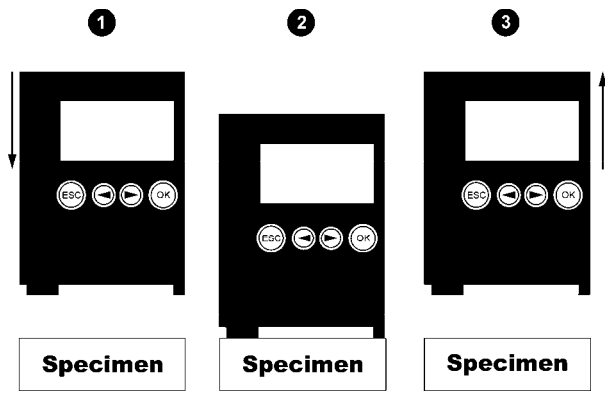
Select the specific sub-menus with [◀] or [▶] and press key [OK].



4 Measurements on coating material

Making measurements with the MP0R:

1. With the instrument switched ON, place the instrument on the specimen and wait, until the acoustic signal sounds. The instrument will switch ON automatically this way.
2. Lift the instrument off the specimen.
The acoustic signal sounds and the reading will be displayed. **Note:** when lifting the instrument *too early* (before the beep sound), the error note "Er6" will appear. In this case, repeat step #1.
The measurement is transmitted automatically to the radio receiver (cf. chapter 14 "Service Menu", page 27, menu 3, "radio transmission ON/OFF". The transmission is indicated by the flashing radio tower symbol.
3. When measuring with an instrument which is already switched ON, a reading will be displayed at once.
As well as with an instrument placed on the specimen and with the instrument lifted off.



Measurement with the MPOR instrument

5 Evaluation of a test series (Statistics function)

Prerequisite: At least two readings must be saved in the measurement data memory.

Note: The measurement data memory must always be empty before starting a test series that is to be evaluated (cf. chapter 7 "Deleting measurements", page 15). If at least two readings are not stored in memory when you first press **RES** and then [OK], the statistical evaluation will NOT start.

Statistical evaluation of a test series:

1. The display menu shows "**RES**". This is the default setting of the instrument. If **RES** is not currently shown on the display, use the arrow key [◀] or [▶] to switch to this setting.
2. Press button [OK] repeatedly.
After each [OK], the display will change to the next statistic number (see table below).
3. Press [ESC] or do further measurements to continue a block. This allows to do statistical evaluations within a test series.

Display	Explanation
\bar{X}	Mean value (= arithmetic mean value)
s	Standard deviation (= mean square deviation of the single readings from the mean value)
N	Number of measurements in the test series
MIN	Lowest value in the test series
MAX	Highest value in the test series

Meaning of statistical evaluation data shown in the display.

6 Transmitting data to a computer

The RS232 radio interface integrated in the instrument facilitates the transmission of the data stored in the measurement data memory to an optional radio receiver (order no. of US-receiver version: 603-544).

The radio receiver, in turn, transmits the data to the evaluation computer via a cable. There is a separate operator's manual for the optional radio receiver.

Prerequisite for all following sub-chapters: Settings of service menu must be "rF = 1" e.g. the radio transmitter is active. See chapter 14 "Service menu", menu #3, radio transmission, page 26.

6.1 Transmitting only the current reading

Independent of the current menu selection, each reading is radioed to the computer automatically.

At the same time, the reading is accepted into the measurement data memory of the instrument and can be evaluated statistically.

6.2 Transmitting all measurement data in the instrument memory

1. Set the display menu with [◀] or [▶] to show **PRT** .
2. Press button [OK].

All readings in the memory are then radioed to the PC. This is indicated by the flashing radio tower symbol.

6.3 Sending the current mean value

Prerequisite for following sub-chapters of 5.3:

Settings of service menu must be "SI = 0" e.g. mean value transmission is active. See chapter 14 "Service menu, menu #4", menu mean value transmission".

6.3.1 Triggering the mean value transmission manually

Prerequisite: Settings of service menu must be "bL = 1" e.g. mean value transmission is active. See chapter 14 "Service menu, menu #1", menu point "Block length".

1. Make desired number of measurements.
2. Set the display menu with [◀] or [▶] to show "RES". Press button [OK]. The mean value of the readings in the memory are then radioed to the PC. This is indicated by the flashing radio tower symbol.

6.3.2 Sending the mean value automatically

Prerequisite: Service menu settings of "bL" must be between 2 and 20.

The set value indicates the number of readings, which are collected in one block. See chapter 14 "Service menu".

1. Make desired number of measurements.
2. Independently of the pre-set number of readings/block, a block mean value is radioed and a new block will be begun.

7 Deleting measurements

7.1 Deleting only the last reading


1. Select the menu **DEL** with [◀] or [▶].
2. Press button [OK]. The last reading will be deleted.

7.2 Deleting all measurement data from the measurement data memory

1. Select the menu **RES** with [◀] or [▶].
2. Press button [OK].
3. Select the menu **DEL** with [◀] or [▶].
4. Press button [OK]. All measurement data will be deleted from the measurement data memory.

8 Normalizing

A normalization is used to adjust the measuring instrument to a measuring task.

The  symbol on the display of the instrument indicates the "Normalization" operating mode.


The following items are required for performing a normalization:

- Uncoated specimen.
In geometry and substrate material, this specimen should correspond exactly to the parts to be measured.


Note: All readings in the memory will be deleted when performing a normalization.

Normalizing the instrument:

Prerequisite: Instrument must be turned ON.

1. Select the menu  (normalization) with button [◀] or [▶].
2. Press button [OK]. The message "**Base**" (for "substrate (base) material") appears.

3. Perform about 5 measurements on the uncoated specimen.
After each measurement, the current reading will appear on the display.
Note: If you want to delete wrong readings, press button [ESC]. Then, the complete data memory will be deleted, but the normalization routine will not be interrupted. After that, perform five more measurements.
4. Press button [OK].
By pressing button [OK], the mean value of all readings will be calculated and used for normalization.
Thus, a good normalization is possible on rough surfaces as well. The mean value is set to zero.
The reading 0.00 will appear on the display.
Finished.

Note: the function „Normalization“ can be locked to protect the instrument from unintended interventions.
Cf. Chapter 14 „Service menu“. If the normalization is called while the function lock (display: ) is active, the error note „Er29“ will appear on the display.

9 Calibration

The following items are required for performing a calibration: An uncoated specimen: In geometry & substrate material, this specimen should correspond exactly to the parts to be measured and a calibration standard (instrument-specific correction foil 75 µm (3 mils)).

Note: All readings in the memory will be deleted when performing a calibration.

Calibrating the instrument (Prerequisite: Instrument must be turned ON)

1. Select the menu **CAL** with button [◀] or [▶].
2. Press button [OK]. The message "**Base**" (for "substrate (base) material") appears.
3. Perform about 5 measurements on the uncoated specimen. After each measurement, the current reading will appear on the display. *(continued on next page!)*
4. Press button [OK].
By pressing button [OK], the mean value of all readings will be calculated and used for normalization.

The mean value is set to zero. The reading 0.00 will appear on the display.

The message **STD1** (that is, calibration standard # 1) appears.

5. Place the calibration foil on the uncoated specimen and perform about 5 measurements.


After each measurement, the current single reading will appear on the display.

Note: If you want to delete wrong readings, press button [ESC]. Then, the complete data memory will be deleted, but the calibration routine will not be interrupted. In this case, repeat the test series with the calibration foil.

6. On the display, set the NOMINAL value for the calibration standard, e.g., "75 µm". Use the arrow key [◀] or [▶]. The NOMINAL value of the calibration standard is printed on the standard.

7. Press button [OK]. By pressing [OK], the mean value of all readings from step 5 will be used for calibration.

Note: the function „Calibration“ can be locked to protect the instrument from unintended interventions.

Cf. Chapter 14 „Service menu“. If the calibration is called while the function lock (display: ) is active, the error note „Er29“ will appear on the display.

10 Deleting a calibration / Restoring the baseline of the characteristic

Sometimes, if an instrument does not measure correctly even after a calibration, the calibration can be deleted.

This can occur if the previous calibration has not been carried out correctly.

In such a case, the baseline of the characteristic can be restored to its original factory condition.

Note to users of the DUALSCOPE® MP0R (instrument version with two measurement channels): the base line of each of the two measurement channels must be restored separately (Fe Base and Al Base required).

Deleting the calibration of the instrument: *(Instructions continued on next page)*

Prerequisite: Instrument is switched ON.

1. Select the menu option **CAL** (i.e., calibration) using button [◀] or [▶].
2. Press button [OK]. "**Base**" (i.e., "substrate material") will appear on the display.
The instrument is now in calibration mode.

3. Perform three to five measurements on the uncoated specimen.
The current reading appears on the display after each measurement.
4. Press button [OK].
Note: When pressing [OK], the mean value of all measurements is used as the normalization value.
This mean value is set to 0. The display shows 0.00.
STD1 (that is, calibration standard # 1) appears on the display.
5. Measure at least two times on the uncoated specimen. A reading will appear.
6. Use button [◀] or [▶] to set the displayed value to 0.00.
7. Press button [OK]. The baseline of the characteristic is restored.
Ready. The instrument is again ready to measure, but you must do a corrective calibration prior to measuring.
Cf. Chapter 9 Calibration.

11 Setting the specification limits

Example: Lower specification limit (MIN): 20 μm ; upper specification limit (MAX): 40 μm

Setting the specification limits:

1. On the display, set the specification limit mode **TOL** using the arrow key [◀] or [▶].
2. Press button [OK]. " - - - " and **MIN** appear on the display. This means that no values are stored in memory and that the instrument is ready for entering the **MIN** value; i.e., it is ready to enter the lower specification limit.
3. Make one measurement on the specimen that is to be tested.
4. Set the desired **MIN** value using the key [◀] or [▶]. *Example: the lower specification limit 20 μm .*
5. Press button [OK] to accept this value into the memory. **MAX** appears on the display.

6. Measure again once on the specimen (*continued on next page!*)
7. Set the desired **MAX** value using the key [◀] or [▶]. *Example: the upper specification limit 40 μm.*
8. Press button [OK] to accept this value into memory.
9. **OFFS** appears on the display. At this stage, you can enter an offset value using the key [◀] or [▶]. In the measuring mode, this offset-value will be subtracted automatically from the readings.
Application example: having a given, constant thickness of an intermediate layer, you can set this thickness as "offset". In this case, only the thickness of the top coating will be displayed.
10. Press button [OK]. If you have entered an **OFFS** value, this will be accepted. The **TOL** mode will be left.

Finished.

12 Deleting the specification limits

1. Switch to the specification limit mode **TOL** using the button [◀] or [▶].
2. Press button [OK]. The set **TOL** value appears on the display.
3. Set the value to "0.00" using the key [◀] or [▶].
4. Press button [OK] to accept this value into memory. The **MAX** value will be set to zero with this action. 0.00 will appear on the display.
5. The **TOL** value can be set to "0.00" using the button [◀] or [▶].
6. Press button [OK]. The **TOL** mode will be left.

Now the specification limits no longer apply. The MIN and MAX values are deleted from the memory. The instrument is ready to make measurements.

13 Triggering the group separator

The purpose for group separators is to obtain and present data sets in different blocks.

In an Excel spreadsheet, the group separator has the effect of writing the succeeding data set into a new column adjacent to the one that has just been processed. Below is a description of the various options for triggering the radio transmission of a group separator of the MP0R instrument.

General prerequisites:

The setting of the GS menu option in Service Menu #4 must be I, i.e., "GS I" must appear on the display when setting the menu. Cf. Chapter 14 in this operator's manual (pages 27 pp.).

Note: This applies also when single reading transmission is disabled, i.e., "SI0" or "SI1" can be set.

Cf. Chapter 14 "Service Menu", Service Menu #4, Page 27)

1) Automatic triggering of the group separator (with fixed block sizes)

Prerequisite: the block size is set > 0 .

A group separator is sent automatically after the computation of the block statistics (cf. Chapter 4 "Evaluation of a test series", Page 9) and the subsequent automatic deletion of the data of the block in the measurement memory.

2) Manual triggering of the group separator (without creating a block)

Prerequisite: Block size = 0


- Obtain any number of measurements.
- Select **RES** using [◀] or [▶].
- Press button [OK] to the statistics computation.
- Select **DEL** using [◀] or [▶].
- Press button [OK] to delete the measurement memory.
After this delete command, the instrument will send a group separator automatically.

14 Service Menus

Access to the service menus and setting of the service points

1. Select the menu icon **MENU** using the key [◀] or [▶].
2. Press button [OK]. "157" will appear on the display.
3. Set "159" using the key [▶].
4. Press button [OK]. **FREE** will be displayed.
5. Select the desired service menu number using [◀] [▶] (only service menus # 1, 2, 3, 4 and 10 are active)
6. Press button [OK] repeatedly to select the menu points. Set their current setting using the key [◀] or [▶].
7. Press button [OK] to leave the service routine at the end. **Note:** By pressing [ESC], the service routine can be left at any time. If you have modified an instrument setting, this will be saved automatically.

Service menu 1

Menu point	Default setting	Further settings	
Lock function  for CAL or LO	CE 1 = CAL locked LO free	CE 0 = CAL locked LO locked	CE 2 = CAL free LO free
Block length	bL1	2 ... 20 Note: "0" has the same function like "1".	
Display resolution	dl 0 = low resolution	1 = medium resolution 2 = high resolution	

Block length: Block length determines, how many single readings are collected to a block. If block formation and the **RES** mode are active, the mean value of the block is displayed automatically after the determined number of single readings ("block formation": this is the case, when the block length number is higher than 1).

Display resolution: this is to determine the number of numerals after the decimal point in the display.

Service menu 2 "Radio transmission"

Menu point	Default setting	Further settings
SubNet number	nN 0	0 ... 15
Instrument number within the SubNet	nr 0	0 ... 15
Repeat specification	nP 1	0 ... 7

SubNet Number: this no. specifies a certain group of MPOR instruments, which are assigned to common radio receiver. This allows to distinguish this certain group from other instrument groups with radio transmission.

Instrument number within the SubNet: this number identifies a single MPOR instrument within a subnet group.

Repeat specification: a signal can be sent repeatedly to allow a transfer check. The set rate is the same as the number of repetitions.

Service menu 3

Menu point	Default setting	Further settings
Dimension unit	UN = μm	NILS = mils
Measuring program	r 00 = display of coating thickness reading	r 01 = display of the normalized probe output signal Xn (normalized countrate) (for service purposes only!) r 02 = display of the measured probe output signal X (countrate) (for service purposes only!)

Menu point	Default setting	Further settings
Acoustical signal	bep1 = beep sound ON	bep0 = beep sound OFF
Measuring mode (only displayed with Dualscope instr.)	dual = automatic selection between magnetic induction method and Eddy current method	Fe = measurements with magnetic induction method only NF = measurements with Eddy current method only
Radio transmission	rF 1 = radio transmission ON	rF 0 = radio transmission OFF
Radio transmission in the continuous mode <i>(for service purposes only)</i>	FrL 1 = radio transmission in the continuous mode ON	FrL0 = radio transmission in the continuous mode OFF Assumption for the operation in the continuous mode: radio transmission is OFF. See "Measuring in the continuous mode" in menu 5.

Service menu 4

Menu point	Default setting	Further settings
Single reading transmission / Mean value transmission	SI 1 Each single reading will be transmitted to the PC	SI 0 Mean values only will be transmitted to the PC
Group separation	GS 1 Group separation ON	GS 0 Group separation OFF
Auto switching-off	OFF1 short switch-off time approx. 1 minute	OFF2 long switch-off time approx. 5 minutes
Display lighting	EL1 Display lighting ON	EL0 Display lighting OFF

Group separation: The end of a block can be marked with a group separator. The group separator can be transferred to the computer together with the readings.

Service menu 5

Menu point	Meaning
Measuring in the continuous mode	Assumption for the operation in the continuous mode: "Radio transmission in the „continuous mode" is OFF (see service menu 3 "FrL0") Continuous mode ON: call service menu 5 Continuous mode OFF: call service menu 5 again Note: At the end of the operation with the MP0R instrument, always switch OFF the continuous mode! Otherwise the batteries will go empty (Auto-switch-off doesn't work in the continuous mode!)

Service menu 10

Menu point	Meaning
Master calibration	UCAL (<i>for service purposes only!</i>)

15 Trouble Shooting

Message	Explanation / Possible Cause	Solution
Er1	Internal error	Perform a normalization. If the error occurs repeatedly, call the Fischer service dpt.
Er4	Overflow of the data memory	Delete the data memory.
Er5	Cannot determine value for substrate material.	Perform calibration on coating using a suitable calibration standard. The selected calibration standard should have at least 50% of the coating thickness of the coated specimen (this refers to the specimen that is used for the calibration on the coating).

Message	Explanation / Possible Cause	Solution
Er6	<p>Reading cannot be displayed since it is out of the measuring range.</p> <p><u>Cause:</u> coating is too thick.</p> <p><u>Cause:</u> measurement was not performed correctly</p> <p><u>Cause:</u> erroneous normalization or calibration</p>	<p>Perform measurements on a specimen having a coating thickness measurable by the instrument.</p> <p>Perform measurements correctly (e.g. do not hover with the instrument over the specimen before or after the measurement or do not lift off the instrument from the specimen too swiftly after the measurement).</p>
Er7 (continued on next page)	<p>Outlier measurement was recognized during normalization or calibration</p> <p>- measurement on the calibration standard was not performed correctly.</p>	<p>Delete memory and perform new test series.</p> <p>Repeat normalization or calibration correctly (e.g. do not hover with the instrument or do not lift off the instrument too swiftly after the meas.</p>

	<ul style="list-style-type: none"> - measurement was performed on a the cal. standard instead of the uncoated specimen. - measurement on a creased cal. standard. - measurement was not performed with the instrument placed squarely on the specimen or the calibration standard. 	<p>Perform all measurements for the normalization using a mean value on the same specimen.</p> <p>Replace calibration standard.</p> <p>Perform all measurements correctly with the instrument placed squarely on the specimen or the calibration standard.</p>
Er12	Calibration standards measured in wrong sequence during the calibration.	Repeat the calibration in the correct sequence.
Er13 (continued on next page)	<p>Readings of the calibration standard are not in the admissible interval range of the master calibration.</p> <p>Used wrong calibration standards.</p>	<p>Inform customer service.</p> <p>Use correct calibration standards.</p>

	Normalization performed by mistake on calibration standard instead of on uncoated specimen.	Perform normalization on uncoated specimen.
Er14	Internal instrument error: Not able to compute master characteristic. The original master characteristic is retained.	Repeat master calibration. If this error occurs repeatedly: Contact customer service.
Er15	Not able to save the master characteristic. Probe may be defective.	Contact customer service.
Er17	Not enough readings. Thus, not able to finish a block (applies to measurements w. fixed block limits). While calibration: STD1 has been measured only once.	Make additional measurements until the first block can be finished. Then generate a new final result. While calibration: STD1 has to be measured for approx. 5 times.

Er22	Internal instrument error. Error accessing the measurement memory or. EEPROM.	Contact customer service.
Er28	Internal instrument error: Not able to compute measurement.	Contact customer service.
Er29	A locked function has been called (CAL or O).	Set the function free again in service menu 1.

16 Technical data

Instrument model	DUALSCOPE® MP0R USB DUALSCOPE® MP0R-FP USB	ISOSCOPE® MP0R USB
Part no. standard version	MP0R USB: 604-048 (MP0R-FP: 604-049)	604-063
Part no. US version	MP0R USB: 604-051 (MP0R-FP: not available)	604-066
Coatings that can be measured (test methods)	NF, Iso/Fe Non-magnetic coatings or isolating coatings on steel or iron (Magnetic induction method) Iso/NF Isolating coatings on nonferrous metals (Eddy current method)	Iso/NF Isolating coatings on nonferrous metals (Eddy current method)

Instrument model	DUALSCOPE® MP0R(-FP) USB	ISOSCOPE® MP0R USB
Measurement ranges	NF,Iso/Fe 0 - 2000 µm (0 - 78 mils) Iso/NF 0 - 2000 µm (0 - 78 mils)	Iso/NF 0 - 1200 µm (0 - 48 mils)
Trueness <i>based on Fischer standards</i>	0 ... 75 µm (0 - 3 mils) 1.5 µm 75 ... 1000 µm (2 - 39 mils) 2 % 1000 ... 2000 µm (40 - 78 mils) up to 3 %	0 ... 100 µm (0 - 4 mils) 1 µm 100 ... 500 µm (4 - 20 mils) 1 % 500 ... 1200 µm (20 - 48 mils) up to 2 %
Repeatability precision <i>based on Fischer standards</i>	0 ... 50 µm (0 - 2 mils) 0.5 µm 50 ... 1000 µm (2 - 39 mils) 1 % 1000 ... 2000 µm (40 - 78 mils) up to 1.5 %	0 ... 100 µm (0 - 4 mils) 0.5 µm 100 ... 500 µm (4 - 20 mils) 0.5 % 500 ... 1200 µm (19.7-48 mils) up to 1 %
Weight	60 g (2.12 oz) (without batteries)	
Dimensions	W x D x H: 64 x 30 x 85 mm (2.5" x 1.2" x 3.4")	

Power supply	2 x LR6.AA
Power consumption	Max. 0.2 Watt
Permissible ambient temp.	5 ... 40°C (41 – 104°F) during operation; storage temp.: 5... 60°C (41 – 140°F)
Permissible rel. humidity	30 ... 90 % (non-condensing)
Radio communication	Radio transmitter 868 MHz or 915 MHz (US-version) for the unidirectional transmission of measurement data to an external computer (cf. order information next chapter).
Transmitting power	25 mW standard
USB data communication	Bi-directional communication from MP0R instrument to a PC via optional interface cable
Measurement data memory	A maximum of 999 measurement readings can be combined in one block. The memory contents are retained even without power supply.
Minimum meas. interval	2 seconds minimum duration between two measurements

Instrument model	DUALSCOPE® MP0RH(-FP) USB
Part no. standard version	MP0RH USB: 604-052 (MP0RH-FP: 604-053)
Part no. US version	MP0RH USB: 604-055 (MP0RH-FP: not available)
Coatings that can be measured (test methods)	<p>NF,Iso/Fe Nonferromagnetic or isolating coatings on steel or iron (Magnetic induction method)</p> <p><i>and</i></p> <p>Iso/NF Isolating coatings on nonferrous metals (Eddy current method)</p>

Instrument model	DUALSCOPE® MP0RH-FP USB	
Measurement ranges	NF,Iso/Fe	0 - 7000 µm (0 - 275 mils)
	Iso/NF	0 - 2000 µm (0 - 80 mils)
Trueness <i>based on Fischer standards</i>	NF,Iso/Fe	
	0 ... 50 µm (0 - 2 mils)	2 µm
	50 ... 2000 µm (2 - 80 mils)	4 %
	2000 ... 7000 µm (80 - 275 mils)	up to 6 %
	Iso/NF	
	0 ... 50 µm (0 - 2 mils)	1 µm
	50 ... 1000 µm (2 - 40 mils)	2 %
	1000 ... 2000 µm (40 - 80 mils)	up to 3 %

Repeatability precision <i>based on Fischer standards</i>	NF,iso/Fe	
	0 ... 50 µm (0 - 2 mils)	1 µm
	50 ... 2000 µm (2 - 80 mils)	2 %
	2000 ... 7000 µm (80 - 275 mils)	up to 3 %
	Iso/NF	
	0 ... 50 µm (0 - 2 mils)	0.5 µm
50 ... 1000 µm (2 - 40 mils)	1 %	
1000 ... 2000 µm (40 - 80 mils)	up to 1.5 %	
Weight	60 g (2.12 oz) (without batteries)	
Dimensions	W x D x H: 64 x 30 x 85 mm (2.5" x 1.2" x 3.4")	
Power supply	2 x LR6.AA	

Power consumption	Max. 0.2 Watt
Permissible ambient temp.	5 ... 40°C (41 – 104°F) during operation; storage temp. 5 ... 60°C (41 - 140°F)
Permissible rel. humidity	30 ... 90 % (non-condensing)
Communication	Radio transmitter 868 MHz or 915 MHz (US-version) for the unidirectional transmission of measurement data to an external computer (cf. order information next chapter).
Transmitting power	25 mW standard
USB data communication	Bi-directional communication from MP0R instrument to a PC via optional interface cable
Measurement data memory	A maximum of 999 measurement readings can be combined in one block. The memory contents are retained even without power supply.
Minimum meas. interval	2 seconds minimum duration between two measurements.

17 Order information for instruments and accessories

<i>Item</i>	<i>Part no.</i>	<i>Item</i>	<i>Part no.</i>
DUALSCOPE® MP0R USB (incl. standard accessories)	604-048	DUALSCOPE® MP0RH-US USB	604-055
DUALSCOPE® MP0R-US USB (incl. standard accessories)	604-051	Radio receiver-US USB RS232 915 MHz	604-045
ISOSCOPE® MP0R USB (incl. standard accessories)	604-063	Carrying loop MP0R	603-481
ISOSCOPE® MP0R-US USB (incl. standard accessories)	604-066	Calibration standard 75 µm	603-479
Radio receiver USB RS232 868 MHz	604-044	Software PC-DATEX	602-465
DUALSCOPE® MP0RH USB	604-052	Protective cover MP0R	603-582
		Calibration standard 75 µm plastic MP0R	603-479
		Calibration standard Al-Base MP0R	603-478
		Calibration standard Fe-Base MP0R	603-477