



Coating thickness measurement

MikroTest®

A coating thickness gauge for quick, precise and non-destructive measurement of:

- electroplating
- nickel coatings
- phosphating
- paint
- plastic
- enamel etc. on steel

No power supply

No calibration

Measurement at any angle

Fully automatic



MikroTest® Magnetic coating thickness measurement

The MikroTest® has been the most widely used coating thickness gauge in the world over the last 40 years. International patents and our production "know-how" ensure that the gauge has the highest technical standards of all analogue magnetic coating thickness gauges.

All instruments conform to national and international standards: DIN EN ISO 2178, DIN 50982, ASTM B 499, E 376, D 1186, G 12, B 530, BS 5411, ISO 2361

Application

11 Models – a MikroTest® for every application (see table)

The balanced measuring system ensures accurate readings at any angle

- Horizontal, vertical, overhead
- The gauge allows measurements on curved surfaces
- Precise measurements in tubes and on round parts due to the automatic operation

Measuring principle

The measurement of the coating thickness is based on magnetic attraction. The attractive force is related to the distance between a permanent magnet and a steel substrate. This

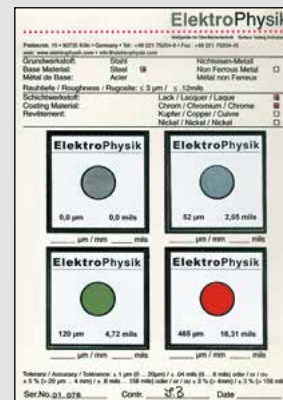
distance represents the thickness of the coating to be measured. The magnet is lifted from the surface by means of a spring connected to the magnet arm. The force needed to lift the magnet is directly related to the angle of rotation of the torsion spring. This measuring principle is also especially suited for electroplated nickel on copper, aluminium and other non-ferrous metals.

Technical data

Features to make your quality control more precise and accurate

- Highest accuracy with simplest operation
- No calibration necessary
Simple set-up and measurement
- All gauges are without power or battery

Coating thickness standards for checking the accuracy of MikroTest



- One point measurement
- Robust metal case to protect from mechanical shocks
- Precision measuring system resistant to solvents

Useful accessories

- Belt pouch for safe transport of the MikroTest®
- Wet film gauge for measuring the thickness of wet coatings
- Coating thickness standards for checking accuracy

Supply schedule

- MikroTest® gauge with hand strap
- Soft pouch
- Operating instructions

Technical data

Type	Range	Application	Tolerance*	Minimum surface	Minimum curvature radius of the sample	Minimum base thickness
5/6 G	0 ... 100 µm	Electroplating and paint coatings on steel**	± 1 µm or 5% of reading	Ø 20 mm	5 mm convex/ 25 mm concave	0.5 mm
5/6 F	0 ... 1000 µm	Paint on steel**	± 5 µm or 5% of reading	Ø 30 mm	8 mm convex/ 25 mm concave	0.5 mm
6 S3	0.2...3 mm	Enamel, plastic, rubber on steel**	± 5% of reading	Ø 30 mm	15 mm convex/ 25 mm concave	1.0 mm
6 S5	0.5...5 mm		± 5% of reading	Ø 50 mm	15 mm convex/ 25 mm concave	1.0 mm
6 S10	2.5...10 mm		± 5% of reading	Ø 50 mm	15 mm convex/ 25 mm concave	2.0 mm
6 S20	7.5...20 mm	electroplated nickel on non-ferrous substrates	± 5% of reading	Ø 100 mm	100 mm convex/150 mm concave	7.0 mm
6 Ni50	0...50 µm		± (1 µm + 5% of reading)	Ø 15 mm	5 mm convex/ 25 mm concave	–
6 Ni100	0...100 µm		± (1 µm + 5% of reading)	Ø 15 mm	5 mm convex/ 25 mm concave	–
6 NiFe50	0 ... 50 µm	Electroplated nickel on steel**	± (2 µm + 8% of reading)	Ø 20 mm	10 mm convex/ 25 mm concave	0.5 mm

Ambient temperature: -20°C...100°C · Dimensions: Gauge 215 mm x 55 mm x 29 mm · Plastic carrying case 235 mm x 185 mm x 46 mm · Weight: Case incl. gauge approx. 560 g

* Referring to ElektroPhysik standards

** Steel: ST 33 to ST 60

(Type 5 = Standard version, Type 6 = Automatic version)



ElektroPhysik

ElektroPhysik
 Pasteurstr. 15
 D-50735 Köln
 Tel.: +49(0)221 75204-0
 Fax: +49(0)221 75204-67
 www.elektrophysik.com
 info@elektrophysik.com

Ultrasonic Thickness Measurement

MiniTest 400 Series



Wall Thickness Gauges

- Portable hand-held precision gauges
- Suitable for steel, stainless steel, aluminium, glass, plastics, etc.
- Interchangeable transducers
- Automatic transducer recognition
- Models with automatic zero adjustment and high-speed scan
- Pulse-echo mode from 0.65...500 mm

Echo-echo mode (3...25 mm) to measure through coatings

MiniTest 420 · 430 · 440

Field of application

Rugged ultrasonic thickness gauges are designed for use in harsh industrial environments. Easy to use and light-weight, these handy gauges provide accurate thickness readings on site for quality assurance and corrosion testing.

MiniTest 420

The basic models are designed for simple and quick thickness measurement. This model incorporates a calibration block for zero adjustment and a quick calibration.

MiniTest 430

Equipped with data memory and USB interface, the MiniTest 430 also includes an automatic zero calibration facility. Various modes such as minimum, difference and alarm mode make this model the ideal tool for quality control. In high-speed scan mode an increased measuring rate of 10 readings per second is achieved along with indication of the smallest thickness values. MiniTest 430 provides reliable corrosion testing.

The high-speed scan mode is also particularly suited for measurements on hot-temperature samples.

MiniTest 440

Featuring all functions of the MiniTest 430, the top model of the series connects to the U5.0E transducer to measure through a coating in the echo-echo mode.

Transducers for versatile applications

In the standard supply schedule, all models come with a 5 MHz transducer. To meet specific customer requirements, ElektroPhysik offers a range of transducers that connect to all

models of the MiniTest 400 series. The automatic transducer recognition allows to switch quickly between different measuring tasks.

Supply schedule in the plastics carrying case

- MiniTest 420 / U5.0 or
- MiniTest 430 / U5.0 or
- MiniTest 440 / U5.0E
- Protective rubber cover
- Coupling gel, 200 ml
- Operating instructions
- 2 x batteries, 1,5V (AA)
- Data transfer software with USB connecting cable (430; 440)
- Control test block (optional accessories)

Transducer Specifications					
Type	Ø	Frequency	Measuring range	Temperature	Applications
U5.0E	8 mm	5.0 MHz	3...25 mm (E-E) 0.8...300 mm (I-E)	-20...+50°C	Measures through coatings in the E-E mode
U5.0	8 mm	5.0 MHz	0.8...350 mm	-20...+50°C	Flat surfaces, large curvatures
U2.0	12 mm	2.0 MHz	2.0...500 mm	-20...+50°C	Rough surfaces (e.g. cast steel)
U7.5	6 mm	7.5 MHz	0.65...50 mm	-20...+50°C	Thin walls, small radii
U10.0	4 mm	10.0 MHz	0.65...20 mm	-20...+50°C	Small shaped objects
U5.0HT	13 mm	5.0 MHz	3.0...200 mm	-20...+350°C	High-temperature transducer

Technical Data		420	430	440
Display	Current data, velocity, transducer type, battery state, batch	●	●	●
Range	Echo-echo: 3...25 mm Pulse-echo: 0.65...500 mm (depending on transducer)	●	●	●
Display / resolution	128 x 64 pixels, backlit / 0.01 mm (0...99.9 mm); 0.1 mm (>100 mm)	●	●	●
Measuring systems	Metric/mils (switchable)	●	●	●
Sound velocity	1000 m/s to 9999 m/s; 9 pre-set sound velocities	●	●	●
Gain setting	Automatic and manual	●	●	●
Transducer recognition	Automatic	●	●	●
Transducer calibration	Automatic		●	●
Measuring accuracy	0.65 mm ...9.99 mm: +/- 0.04 mm; 10.00 mm...99.99 mm: +/- (0.1 % of reading + 0.04 mm); 100.00 mm...500.00 mm: +/- (0.3 % of reading)			
Pulse-echo mode	Standard, Minimum (seek the smallest point) Difference, Alarm, High-speed scan	●	●	●
Echo-echo mode	Measures through coatings			●
Data storage / output	10 batches with max 500 values / USB interface		●	●
Automatic shut off	2 min., 5 min. or disable			
Dimensions and weight	130 x 73 x 24 mm / approx. 190 g			
Operating temperature	-20 to 50°C			
Power	2 x AA batteries, approx. 64 hours in continuous operation			

ElektroPhysik

Pasteurstr. 15 · D-50735 Cologne · Germany
Phone: +49 221 75204-0 · Fax +49 75204-67
www.elektrophysik.com · info@elektrophysik.com



Coating thickness measurement

MiniTest 650

Rugged coating thickness gauge

- for any non-magnetic coatings on steel such as paint, enamel, chrome, zinc, etc.
- for any insulating coatings on non-ferrous metals such as paint, anodising, ceramics on aluminium, copper, zinc die-cast, brass, etc.

Ram- and impact-protected through rubber rimmed casing
Wear-resistant carbide metal sensor tip



MiniTest 650

Durability and High-Precision

Application

Designed for durability and high-precision, MiniTest 650 is the ideal tool for any measuring task in the finishing industry.

The rugged and easy-to-handle thickness gauge combines extended mechanical life on the one hand and high accuracy on the other hand to meet the requirements of any professional user in the shipbuilding, automotive, bridge building, construction or other industry.

According to model, MiniTest 650 is suitable to measure

- any non-magnetic coatings such as paint, enamel, chrome and zinc on steel
- any insulating coatings on non-ferrous metals such as paint, anodising, ceramics on aluminium, copper, zinc die-cast, brass, etc.

Description

The battery-operated gauge features a backlit display and a one meter sensor cable. The newly developed one pole sensor is made of a wear-and-tear resistant carbide material to ensure a virtually unlimited life cycle under normal condition use.

An optimal ram- and impact-protection is provided through the rubber rimmed casing. Via an USB interface, the MiniTest 650 can be connected to a PC for online measurements or display of the statistics.

MiniTest 650 is available in three different models:

- with a magnetic-induction sensor for measurements on steel substrates
- with an eddy currents sensor for measurements on non-ferrous metals
- with a dual sensor for measuring on both, steel or non-ferrous metals

Special feature of the FN model:

Its dual sensor identifies the substrate material. Upon contact with the surface, the gauge automatically switches to the suitable measuring principle based on your application. The measuring principle conforms to the DIN, ISO, BS, and ASTM norms and standards.

Scope of delivery

- Gauge with sensor and three batteries
- Control standard(s) and calibration standard(s)
- Operating instructions
- Soft pouch
- Data transfer program MSoft 7000 basic edition

Recommended accessories

- High-precision measuring stand for measuring small parts
- Rechargeable batteries with battery charger
- USB connecting cable

Technical specifications

Measuring range	model F (steel) 0 ... 3000 µm / 120 mils model N (non-ferrous metal) 0 ... 2000 µm / 80 mils model FN (dual sensor) 0 ... 2000 µm / 80 mils
Measuring uncertainty	± (2 % of reading + 2 µm) / ± (2 % of reading + 0.08 mils)
Minimum curvature radius	5 mm / 0.2" convex, 25 mm / 1" concave
Minimum measuring area	Ø 20 mm / 0.8"
Minimum base thickness	0.5 mm / 20 mils (F), 50 µm / 2 mils (N)
Display	4-digit screen data (11 mm / 0.44")
Measuring units	µm – mils user selectable
Calibration	standard, 1-point and 2-point calibration
Statistics	calculated from maximum 9.999 readings, mean value, standard deviation, number of readings, minimum and maximum
Interface	USB
Power supply	3 Micro AAA batteries (for more than 10,000 readings)
Dimensions and weight	housing: 70 mm x 122 mm x 32 mm / 2.7" x 4.8" x 1.26" sensor: Ø 15 mm x 62 mm / Ø 0.60" x 2.44"; 225 grams / 7.93 ozs
Ambient temperature	gauge: 0 to 50 °C / 32° to 122 °F sensor: -10° to 70 °C / 14° to 158 °F

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ElektroPhysik Dr. Steingroever GmbH & Co. KG
Pasteurstr. 15 · 50735 Cologne · Germany
Phone: +49 221 75204-0 · Fax: +49 221 75204-67
info@elektrophysik.com · www.elektrophysik.com



MiniTest 725 · 735 · 745

Precise – flexible – smart

Standard Supply Schedule

- MiniTest, model 725, 735 or 745
- SIDSP®-sensor according to choice
- Set with calibration foils and zero reference plate(s)
- Operating instructions in German, English, French and Spanish on a CD-ROM
- Shoulder bag with belt clip
- Batteries (2 pcs, type AA Mignon)
- Manufacturer's Certificate
- MSoft 7 basic data transfer software

Recommended Accessories

- Measuring stand for F 1.5, N 0.7, FN 1.5 and miniature sensors
- Protective rubber cover
- MSoft 7 professional data evaluation software
- MiniPrint, portable data printer
- Bluetooth Smart-adapter

ElektroPhysik's Range of Products

- Coating thickness gauges
- Wall thickness gauges
- Pinhole detectors
- Cross hatch cutters
- Asphalt layer thickness measurement

Technical Data

Dual sensors	Automatic recognition of the substrate material with FN sensors
Data memory	10 batches for a maximum of 10,000 readings (MiniTest 725 and 735) 100 batches for a maximum of 100,000 readings (MiniTest 745) Memories can be partitioned as needed.
Statistical evaluation	Number of readings, min, max, mean value, standard deviation, coefficient of variation, single value statistics, blocks statistics (norm-conforming / freely configurable)
Calibration modes	Factory calibration, zero-point-, 2-point-, 3-point-calibration, calibration method "rough"
Calibration procedures according to international standards	ISO, SSPC, "Swedish", "Australian"
Monitoring of limits	Visual and audible signal output
Measuring units	Switchable from metric (µm, mm, cm) to imperial (mils, inch, thou)
Measuring rate	70 readings per minute in the single mode 20 readings per second in the continuous mode
Continuous mode	For quick identification of thickness variations
Operating temperature	–10 °C ... 60 °C
Storage temperature	–20 °C ... 70 °C
Data interfaces	USB and Bluetooth
Power supply	2 pcs batteries, type AA (Mignon); rechargeable NiMH batteries, type AA/HR6 as an option. Battery or rechargeable battery setting option to adapt to the matching nominal voltage
Norms and standards	DIN EN ISO 1461, 2064, 2178, 2360, 2808, 3882, 19840, ASTM B 244, B 499, D7091, E 376, AS 3894.3, SS 1841 60, SSPC-PA 2

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Phone: +49 221 75204-0 · Fax: +49 221 75204-67
info@elektrophysik.com · www.elektrophysik.com



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Advancing with Technology

ElektroPhysik

Messgeräte für Oberflächentechnik · Surface Testing Instruments

Coating Thickness Measurement MiniTest 725 · 735 · 745

The intelligent solution for coating thickness measurement

- Modular design made-to-measure
- With built-in, external or convertible sensors
- Bluetooth for data transfer to a PC, Tablet-PC or smartphone
- Wireless sensors
- Special miniature and tube sensors



Precision gauges »Made in Germany« since 1947

MiniTest 725 · 735 · 745

Precise – flexible – smart

Made in Germany – Tradition in quality

ElektroPhysik has a long-standing tradition of more than 70 years in the manufacture of non-destructive coating thickness gauges for the finishing industry. Typical applications: non-magnetic coatings such as paint, varnish, enamel, chrome and galvanizing on steel substrates or insulating coatings such as paint, anodized layers or ceramic on non-ferrous substrates such as copper, aluminium, die cast zinc, brass etc.

Innovation through Bluetooth, mobile app and CAQ-Software

The new MiniTest 725 · 735 · 745 series sets new standards in precision and flexibility. All models of the new series are equipped with a Bluetooth interface for wireless data transfer to a PC, Tablet-PC or smartphone. As an alternative, data transfer can also be made via a conventional USB connection. Further data processing on the end device can be done via a comprehensive evaluation software, MSoft 7 professional, or the mobile app.

Practice-oriented and versatile

MiniTest 725 with a built-in sensor is especially suited for quick measurement on car bodies, hulls or steel constructions. Thanks to its ergonomic design for one-handed operation all functions can be easily accessed with one hand only. **MiniTest 735** with an external sensor combines high precision and ease of measurement. The cable-connected sensor ensures convenient measurement on objects difficult to access.

MiniTest 745 – the top model of the series – convinces through its flexible sensor design. Its built-in sensor can be easily converted into an external sensor. Thus you can take advantage of the features of both sensor designs. Additional comfort and flexibility is provided by the wireless sensor.

Flexibility and mobility through wireless sensors

Take full advantage of today's innovative and flexible connectivity options by using the wireless MiniTest 745 sensors. Just connect your digital sensor to the Bluetooth Smart-adaptor and your readings will be transferred immediately to the MiniTest 745 gauge – in a distance of up to a 10 m. All MiniTest 745 sensors are Bluetooth Smart-adaptor capable.

Advanced precision through digital signal processing SIDSP®

All models of the MiniTest 725 · 735 · 745 series connect to SIDSP®-sensors. Thanks to the use of the most-advanced SIDSP®-technology, these sensors are unsusceptible to interference and provide an excellent measuring accuracy. Even variations in temperature will not affect measurement and readings remain stable to ensure a very good reproducibility over the complete measuring range.

Special sensors adapted to difficult conditions

In addition to the comprehensive range of standard sensors, ElektroPhysik offers a number of special sensors for particularly difficult applications:

- FN 2.6 sensor, particularly adapted for measurement on car bodies, highly unsusceptible to varying geometries or base materials
- Miniature sensors in 0°, 45° or 90° design for measurement on thin layers and very small surfaces, in grooves, bore holes or recesses
- HD-sensors for heavy-duty use in rough environments, with the sensor electronics especially protected against dust, paint or other aggressive substances
- Tube sensors with grip extension for easy access in pipes and tubes

Advantages at a glance

- Large memory capacity for up to 100,000 readings
- Easy, menu-guided operation in up to 20 languages
- Bluetooth interface for wireless data transfer to a PC, Tablet-PC or smartphone
- Increased precision through various calibration modes
- Perfect compensation of temperature variations over the complete measuring range
- Utmost accuracy and reproducibility thanks to the SIDSP®-technology
- Monitoring of limits, user-adjustable Offset and correction value for rough substrate materials
- Continuous measuring mode
- Free software update downloads for sensor and gauge via the internet

Measuring procedure	Sensor model	Measuring range	Uncertainty (of reading)*	Minimum measuring spot	Available in combination with		
					MiniTest 725	MiniTest 735	MiniTest 745
Magnetic-induction sensors	F 0.5M-0° F 0.5M-45° F 0.5M-90°	0 ... 0,5 mm	± (0,5 µm + 0,75 %)	ø 3 mm		X	X
	F 1.5	0 ... 1,5 mm	± (1,0 µm + 0,75 %)	ø 5 mm	X	X	X
	F 1.5-90°	0 ... 1,5 mm	± (1,0 µm + 0,75 %)	ø 5 mm		X	X
	F2	0 ... 2,0 mm	± (1,5 µm + 0,75 %)	ø 10 mm	X	X	X
	F2.6	0 ... 2,6 mm	± (1,0 µm + 0,75 %)	ø 5 mm	X	X	X
	F 5	0 ... 5,0 mm	± (1,5 µm + 0,75 %)	ø 10 mm	X	X	X
	F 15	0 ... 15 mm	± (5,0 µm + 0,75 %)	ø 25 mm	X	X	X
Eddy current sensors	N 0.3M-0° N 0.3M-45° N 0.3M-90°	0 ... 0,3 mm	± (0,5 µm + 0,75 %)	ø 3 mm		X	X
	N 0.7	0 ... 0,7 mm	± (1,0 µm + 0,75 %)	ø 5 mm	X	X	X
	N 0.7-90°	0 ... 0,7 mm	± (1,0 µm + 0,75 %)	ø 5 mm		X	X
	N 2.5	0 ... 2,5 mm	± (1,5 µm + 0,75 %)	ø 10 mm	X	X	X
	N 7	0 ... 7,0 mm	± (5,0 µm + 0,75 %)	ø 20 mm	X	X	X
Dual sensors	FN 1.5	F: 0 ... 1,5 mm N: 0 ... 0,7 mm	± (1,0 µm + 0,75 %)	ø 5 mm	X	X	X
	FN 1.5-90°	F: 0 ... 1,5 mm N: 0 ... 0,7 mm	± (1,0 µm + 0,75 %)	ø 5 mm		X	X
	FN 2.6	F: 0 ... 2,6 mm N: 0 ... 1,3 mm	± (1,0 µm + 0,75 %)	ø 5 mm	X	X	X
	FN 5	F: 0 ... 5,0 mm N: 0 ... 2,5 mm	± (1,0 µm + 0,75 %)	ø 10 mm	X	X	X

* referring to multipoint calibration

Wall Thickness Gauges

MiniTest 7200/7400 FH

Reliable Wall Thickness Measurement

- Of non-ferrous materials
- Up to 24 mm thickness
- For packaging materials such as bottles, glass or plastics containers
- For composite materials, aluminium or titanium parts of complex shapes in the aviation or automotive industry
- Menu-guided user interface
- Extremely accurate through digital signalprocessing

Extended measuring range up to 24 mm



MiniTest 7200/7400 FH

Maximum Accuracy

The MiniTest 7200 FH/MiniTest 7400 FH is a portable thickness measuring device that offers the capability to precisely measure materials up to 24 mm thickness. The small size and portability of the device enables it to be operated in production areas and quality laboratories. The two models ensure easy, non-destructive and highly accurate wall thickness measurement on all types of non-ferrous products, regardless of their size, shape, and material.

They are ideal for applications where accurate measurement of sharp corners, small radii and/or complex shapes are required.

Two Models

MiniTest 7200 FH offers measurement capabilities including real-time thickness measurement, display of minimum and maximum readings, an offset mode, and automatic storage of up to 100,000 values. MiniTest 7400 FH offers the same capabilities as the MiniTest 7200 FH plus statistical graphing, real time trend, data base with up to 200 batches and a larger

memory for automatic storage of up to 240,000 readings, e. g. 1,200 readings per batch.

SIDSP® Provides Higher Accuracy

The MiniTest 7200 FH/MiniTest 7400 FH Gauging Systems incorporate sensor-integrated digital signal processing (SIDSP®). All measuring signals are digitally created and completely digitally processed inside the sensor itself. Only completely processed digital readings are transferred to the base unit for display, statistical analysis, and storage.

Five Sensors to Choose From

In order to maximize the accuracy of readings, easily interchangeable sensors with a hardened tip and a variety of ball sizes are available to cover the various thickness ranges. The FH 4 type sensors use steel balls to measure from 0 to 6 mm and magnetic balls to measure up to 9 mm. A special FH 4 sensor allows to work with a 1mm steel ball which can be introduced in small cavities. The FH 10 type sensors use steel balls to measure from 0 to 13 mm and magnetic balls to

measure up to 24 mm. All sensor models are interchangeable and can be connected to any of the two gauge models.

Advanced Reference Ball Design

The MiniTest 7400 FH/MiniTest 7200 FH utilize specially treated reference balls. Balls of this design result in improved measurement reproducibility of up to 0.5%. Reference balls are available in 1 mm, 1.5 mm, 2.5 mm, 4.0 mm (FH 4), and 2.5 mm, 4 mm, 6 mm and 9 mm sizes (FH 10). The measuring range can be extended by magnetic reference balls so that also very thick walls can be measured such as engine parts made of aluminium or titanium or very thickwalled plastic containers.

Innovative Menu Control and Data Filing System

The MiniTest 7200 FH/MiniTest 7400 FH feature an easy to understand, menu-driven operator interface and data filing system, similar to common PC applications. Operational assistance is always available via context-sensitive help topics.

Standard Delivery Schedule

- MiniTest 7200 FH or
- MiniTest 7400 FH
- Operating instructions in German / English / French / Spanish / Portuguese / Italian on CD Rom
- Short instructions
- 4 AA cells, type LR06
- Plastic carrying case
- Rubber protection case with positioning device and belt
- MSoft 7 data transfer software for creation and management of batches



Sensor Models

Sensor type FH 4 (0 to 6 mm)

- 3 precision standards approx. 0.25 mm, 1 mm, 3 mm
- Set of target balls 1.5 mm and 2.5 mm dia. (comprising 100 balls of each size)
- Set of target balls 4 mm diameter (50 balls)
- Set of Zero calibration standards for 1.5 mm, 2.5 mm and 4 mm dia. balls (1 pc per ball size)

Sensor type FH 4 +1 (0 to 6 mm)

- additional set of target balls 1.0 mm (100 pieces)
- additional precision standard approx. 0.150 mm
- additional zero calibration standard for 1.0 mm

Sensor type FH 4 M (0 to 9 mm)

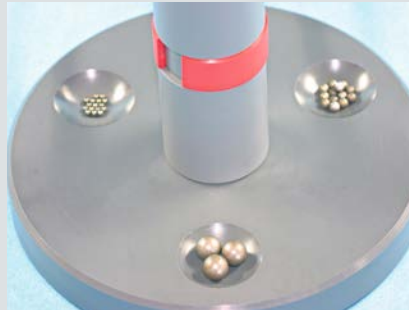
- additional set of magnetic target balls 1.5 and 3.0 mm (20 pieces each)
- additional precision standard approx. 8.0 mm
- additional zero calibration standards for magnetic steel balls

Sensor type FH 10 (0 to 13 mm)

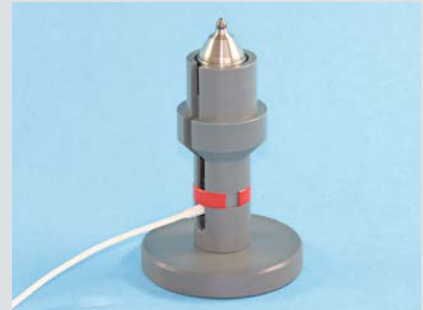
- 3 precision standards approx. 1 mm, 3 mm, 8 mm
- Set of target balls 2.5 mm (100 pcs)
- Set of target balls 4 mm (50 pcs)
- Set of target balls 6 mm (25 pcs)
- Set of Zero calibration standards for 2.5 mm, 4 mm and 6 mm dia. balls (1 pc per ball size)

Sensor type FH 10 M (0 to 24 mm)

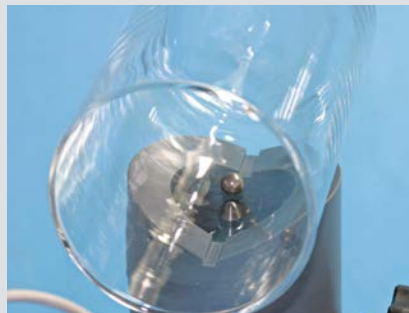
- additional set of magnetic target balls 4.0 and 6.0 mm (20 pieces each)
- additional precision standard approx. 18.0 mm
- additional zero calibration standards for magnetic steel balls



Sensor stand with grooves to hold steel balls in place

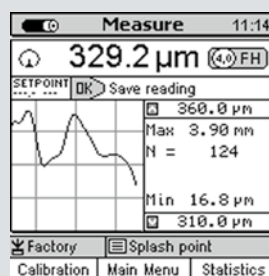


Measuring stand for FH 10 sensor

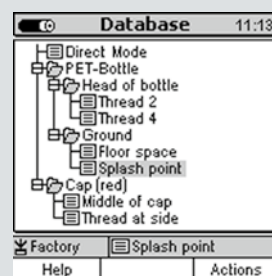


Reference balls with a specially coated finish and dimensional precision to obtain maximum reproducibility of readings.

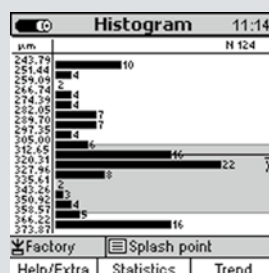
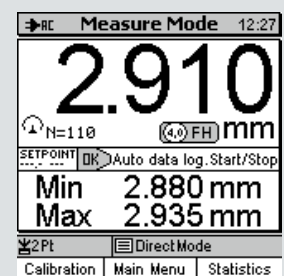
Measuring Value combined with Real-Time Trend Diagram



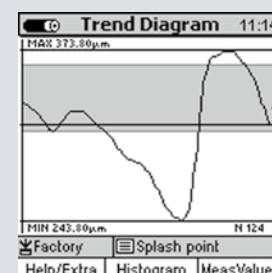
Convenient Data Filing System



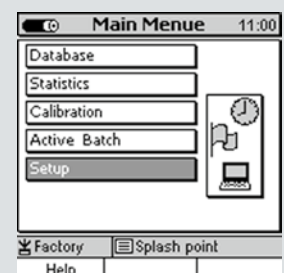
Measure Screen of MiniTest 7200 FH



Histogram with MiniTest 7400 FH



Trend Diagram with MiniTest 7400 FH



Menu System

MiniTest 7200/7400 FH

Recommended Accessories

- MiniPrint 7000 data printer incl. charger unit
- Quick charger unit for NiMH storage batteries
- NiMH-Akku AA HR6 1.2 V baby cells (4 pcs for MiniTest FH required)
- Footswitch for data storage trigger incl. adapter unit for mains operation
- Shoulder bag with belt for MiniTest 7200 FH/MiniTest 7400 FH
- Anti-dust cover
- Multi-purpose connection box incl. USB cable for simultaneous connection of
 - power supply unit
 - footswitch
 - alarm device
 - headphones
 - PC via USB or RS232 adapter cable
- IrDA/USB adapter for wireless data transfer

Product Features at a Glance

- Wear-resistant carbide sensor tip
- High precision target balls for reproducible measurements
- Data capture up to 20 data points per second
- Sensor-integrated digital signal processing
- Multi-point calibration up to 5 points
- Large, easy-to-read display
- Display of minimum and maximum
- Menu-controlled user interface
- Context-sensitive online help
- SPC capabilities



Zero calibration standard



MiniPrint 7000 data printer

Technical Data

	Measuring Ranges	Measuring Tolerance*
FH 4+1 sensor	0...1.3 mm with 1.0 mm steel ball	0...1.3 mm: $\pm (3 \mu\text{m} + 1\% \text{ of reading})$
FH 4 sensor	0...2.0 mm with 1.5 mm steel ball	0...2.0 mm: $\pm (3 \mu\text{m} + 1\% \text{ of reading})$
	0...3.5 mm with 2.5 mm steel ball	0...3.5 mm: $\pm (5 \mu\text{m} + 1\% \text{ of reading})$
	0...6.0 mm with 4 mm steel ball	0...6.0 mm: $\pm (10 \mu\text{m} + 1\% \text{ of reading})$
FH 4 M sensor	0...5.0 mm with 1.5 mm magnetic ball	0...5.0 mm: $\pm (20 \mu\text{m} + 2\% \text{ of reading})$
	0...9.0 mm with 3.0 mm magnetic ball	0...9.0 mm: $\pm (40 \mu\text{m} + 2\% \text{ of reading})$
FH10 sensor	0...4.0 mm with 2.5 mm steel ball	0...4.0 mm: $\pm (5 \mu\text{m} + 1\% \text{ of reading})$
	0...7.0 mm with 4.0 mm steel ball	0...7.0 mm: $\pm (10 \mu\text{m} + 1\% \text{ of reading})$
	0...10.0 mm with 6.0 mm steel ball	0...10.0 mm: $\pm (20 \mu\text{m} + 1\% \text{ of reading})$
	0...13.0 mm with 9.0 mm steel ball	0...13.0 mm: $\pm (20 \mu\text{m} + 1\% \text{ of reading})$
FH10 M sensor	0...16.0 mm with 4.0 mm magnetic ball	0...16.0 mm: $\pm (40 \mu\text{m} + 2\% \text{ of reading})$
	0...24.0 mm with 6.0 mm magnetic ball	0...24.0 mm: $\pm (60 \mu\text{m} + 2\% \text{ of reading})$

* depending on the calibration method

Low range resolution	0.1 μm (FH 4) / 0.2 μm (FH 10)
Repeatability	Better than $\pm (1 \mu\text{m} + 0.5\% \text{ of reading})$
Measuring principle	Magnetostatic
Logging rate	1, 2, 5, 10, 20 readings per second (selectable)
Data memory	240.000 values (limited to 100,000 values on MiniTest 7200 FH)
Calibration modes	Factory, Zero, Zero + up to 4 points
Measuring units	metric (μm , mm), imperial (mils, inch)
Statistical charting	Numeric, trend, and histogram (with MiniTest 7400 FH only)
Interfaces	RS232 TTL + IrDA 1.0 + USB (via connection box)
Operating temperature	-10 °C to +60 °C (Storage temperature: -20°C to +80°C)
Dimension/Weight	153 mm x 89 mm x 32 mm/310 g 6 in. x 3.5 in. x 1.3 in./11 oz. (Gauge with Batteries only)
Power supply	4 x AA (LR06) batteries, or optional power unit (90 – 240 V~/48 – 62 Hz)

ElektroPhysik

ElektroPhysik Dr. Steingroever GmbH & Co. KG
 Pasteurstr. 15 · 50735 Cologne · Germany
 Phone: +49 221 75204-0 · Fax: +49 221 75204-67
 info@elektrophysik.com · www.elektrophysik.com



Coating Thickness Measurement

MiniTest 70E / 70B MiniTest 650E / 650B



Focusing on the substance

- Gauges for use on the shop floor, in the automotive or other industries and quality inspection
- High degree of ergonomics, technology and product quality
- For all non-magnetic layers such as paint, enamel, chrome, galvanic zinc plating on steel
- For all insulating coatings such as paint, anodizing, ceramics on non-ferrous metals such as aluminium, copper, zinc die cast, brass, etc.

Single-button operation – switch on and take readings

MiniTest 70E and MiniTest 70B

Especially designed for quick and easy non-destructive coating thickness measurement, the economical and basic models **MiniTest 70E** and **70B** are suitable for all non-magnetic coatings applied on steel and insulating coatings applied on non-ferrous-metals.

Focusing on easy operation, the small and handy gauges are the ideal tool for the mobile on-site use. No prior knowledge or instructions are required: Just switch on and proceed on measurement. The acquisition of a reading is confirmed by an audible signal.

A built-in dual sensor FN is available to identify the substrate material. According to the material, the gauge will automatically set to the matching measuring principle: magnetic induction or eddy-currents.

Supply schedule

- Gauge with built-in sensor
- 1 AA (Mignon) battery
- 2 zero reference plates
- operating instructions
- 1 control standard
- belt pouch

Technical Data

	70E FN	70B FN
Measuring range	F: 0...3 mm / 120 mils N: 0...2.5 mm / 100 mils	F: 0...3 mm / 120 mils N: 0...2.5 mm / 100 mils
Measuring uncertainty	± (3 µm + 5 % of reading) ± (0.12 mils + 5 % of reading)	± (2 µm + 3 % of reading) ± (0.08 mils + 3 % of reading)
Resolution	2 µm / 0.08 mils	1 µm / 0.04 mils
Geometry of measuring sample		
Curvature radius, convex	> 50 mm / 2"	> 10 mm / 0.4"
Curvature radius, concave	> 100 mm / 4"	> 50 mm / 2"
Diameter of measuring spot	> 50 mm / 2"	> 50 mm / 2"
Minimum substrate thickness	F: 0.7 mm / 28 mils N: 0.1 mm / 4 mils	F: 0.7 mm / 28 mils N: 0.1 mm / 4 mils
Units of measurement	metric / imperial (user selectable)	metric / imperial (user selectable)
Calibration procedure	factory calibration	factory calibration, zero calibration

MiniTest 650E and MiniTest 650B

The robust models **MiniTest 650E** and **650B** are particularly suited for the rough environment in the industrial corrosion protection. Thanks to their rugged design, these wear-resistant coating thickness gauges provide reliable high-accuracy readings throughout an extended service life. Particularly adapted to harsh working environments, the two models are most convenient for use in the automotive industry, in ship-yards, steel and bridge construction. Their rubber protection and durable housing provide excellent protection against shocks and impacts.

The models **MiniTest 650E F** and **MiniTest 650B F** measure all non-magnetic coatings such as paint, enamel, chrome or galvanic zinc plating on steel whereas the dual models **MiniTest 650E FN** and **650B FN** are also suited for all insulating coatings on non-ferrous metals such as paint, anodizing, or ceramics applied to aluminium, copper, zinc die-cast, brass, etc.

The external, extremely wear-resistant one-pole measuring sensor connects to the gauge via a one-meter cable. The dual sensor FN identifies the ferrous or non-ferrous substrate and automatically adjusts to the correct measuring mode. The measuring principle conforms to DIN, ISO, BS and ASTM.

Supply schedule

- Gauge incl. sensor
- 3 AAA batteries
- 1 and/or 2 zero reference plate(s)
- control standard
- operating instructions
- soft pouch

Technical Data

	650E		650B	
Gauge type	F	FN	F	FN
Measuring range	0...3 mm / 120 mils	0...2 mm / 80 mils	0...3 mm / 120 mils	0...2 mm / 80 mils
Measuring uncertainty	± (3 μm + 5 % of reading) ± (0.12 mils + 5 % of reading)		± (2 μm + 3 % of reading) ± (0.12 mils + 5 % of reading)	
Resolution	2 μm / 0.08 mils		1 μm / 0.04 mils	
Geometry of measuring sample				
Curvature radius, convex	> 50 mm / 2"		> 10 mm / 0.4"	
Curvature radius, concave	> 100 mm / 4"		> 50 mm / 2"	
Diameter of measuring spot	> 50 mm / 2"		> 50 mm / 2"	
Minimum substrate thickness	F: 0.70 mm / 28 mils N: 0.1 mm / 4 mils		F: 0.7 mm / 28 mils N: 0.1 mm / 4 mils	
Units of measurement	according to model μm/ mm or mils/inch		according to model μm/ mm or mils/inch	
Calibration	factory calibration		factory calibration, zero calibration	

ElektroPhysik

Pasteurstr. 15 · D-50735 Cologne · Germany
Tel.: +49 (0) 221 752 04-0 · Fax: +49 (0) 221 752 04-67
www.elektrophysik.com · info@elektrophysik.com



Coating thickness measurement **MiniTest 2500/4500**

Classic Design

- All functions directly accessible
- Large selection of interchangeable sensors
- High-contrast display and illuminated keypad
- Memory and Statistics
- Bluetooth and USB Output
- IP 65 Rated Rugged housing



MiniTest 2500/4500

All-rounders for quality assurance



Height: 91, Ø 19 mm



Height: 194, Ø 10,9 mm



Height: 79, Ø 16 mm



Height: 91, Ø 19 mm

Type of sensor	FN 1.6	FN 1.6/90	F 05	F 3
Application:	Non-magnetic coatings on steel and insulating coatings on non-ferrous metal. The multi-talent for standard applications. Also available as version F 1.6 only for measuring on magnetic substrate or version N 1.6 only for measuring on non-ferrous metals.	Non-magnetic coatings on steel and insulating coatings on non-ferrous metal. Especially appropriate for measurements in tubes and pipes or objects which are difficult to access. Also available as version F 1.6/90 only for measuring on magnetic substrate or version N 1.6/90 only for measuring on non-ferrous metals.	Extremely thin non-ferrous metal, oxide or paint coatings on small steel objects. Highest precision for thin coatings.	Non-magnetic coatings on steel, thick paint and enamel coatings. A true classic of coating thickness measurement.

Technical Data

Measuring range:	0...1600 µm/65 mils	0...1600 µm/65 mils	0...500 µm/20 mils	0...3000 µm/120 mils
Low range resolution:	0.1 µm/0.004 mils	0.1 µm/0.004 mils	0.1 µm/0.004 mils	0.2 µm/0.008 mils
Guaranteed tolerance (of reading):	± (1%+1 µm/0.04 mils) *	± (1%+1 µm/0.04 mils) *	± (1%+0.7 µm) *	± (1%+1 µm/0.04 mils) *
Minimum radius of curvature (convex/concave):	1.5 mm/0.06 in convex/ 10 mm/0.4 in concave	flat convex/ 6 mm/0.2 in concave	0.75 mm/0.03 in convex/ 5 mm/0.2 in concave	1.5 mm/0.06 in convex/ 10 mm/0.4 in concave
Minimum area for measurement:	Ø 5 mm/0.2 in	Ø 5 mm/0.2 in	Ø 3 mm/0.1 in	Ø 5 mm/0.2 in
Minimum substrate thickness:	F 0.5 mm/N 50 µm F 20 mils/N 2 mils	F 0.5 mm/N 50 µm F 20 mils/N 2 mils	0.1 mm/4 mils	0.5 mm/20 mils

*(of measurement value referring to ElektroPhysik calibration foils)

All illustrations are not true to scale

All Sensors of MiniTest series 1100-4100 are compatible with MiniTest 2500/4500

MiniTest 2500/4500

Specialists for more complexe me



Height: 99, Ø 19 mm

N 02

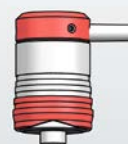
The precise solution for very thin insulating layers like lacquer, enamel or anodized layers on non-ferrous metals with high measurement resolution, (0.1 µm) and defined tracking force of just 25 g.



Height: 99, Ø 19 mm

N 08.Cr

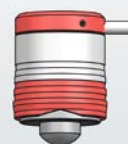
Special version to measure chrome layers up to 80 µm on copper substrate with minimum thickness of 100 µm.



Height: 47, Ø 28 mm

F 10

Thick coatings like plastic in tank, pipeline and container construction.



Height: 64, Ø 46 mm

F 20

Thick plastic, rubber or concrete layers in pipeline construction as well as corrosion-resistant layers.

Technische Daten

0...200 µm/8 mils
0.1 µm/0.004 mils
± (1%+0.5 µm/0.02 mils) *
1 mm/0.04 in convex/ 5 mm/0.2 in concave
Ø 2 mm/0.08 in
50 µm/2 mils

Measuring range:	0...80 µm/3 mils	0...10000 µm/394 mils	0...20000 µm/790 mils
Low range resolution:	0.1 µm/0.004 mils	5 µm/0.2 mils	10 µm/0.4 mils
Guaranteed tolerance (of reading):	± (1%+ 1µm/0.04 mils) *	± (1%+10 µm/0.4 mils) *	± (1%+20 µm/0.8 mils) *
Minimum radius of curvature (convex/concave):	2,5 mm/0.1 in convex/ 10 mm/0.4 in concave	5 mm/0.2 in convex/ 16 mm/0.6 in concave	10 mm/0.4 in convex/ 30 mm/1.2 in concave
Minimum area for measurement:	Ø 5 mm (0.2 in)	Ø 20 mm/0.8 in	Ø 40 mm/1.6 in
Minimum substrate thickness:	100 µm/4 mils	1 mm/40 mils	2 mm/80 mils

*(of measurement value referring to ElektroPhysik calibration foils)

All illustrations are not true to scale

All Sensors of MiniTest series 1100-4100 are compatible with MiniTest 2500/4500



Height: 69, Ø 46 mm



Height: 72, Ø 50 mm



Height: 74, Ø 66 mm



Height: 154,5, Ø 126 mm



Height: 154,5, Ø 126 mm

F 50	N 10	N 20	N 100	F 2 HT
Very thick corrosion-resistant layers and anti-drumming layers.	For measurement of insulating layers made of rubber, plastics, glass etc. on non-ferrous metals.	Insulating coatings, e. g. rubber, plastics, glass on non-ferrous metal.	Thick insulating layers and composite materials on non-ferrous metals.	Special high temperature sensors allow coating thickness measurement on hot surfaces either up to a surface temperature of 250°C / 482° F or 350° C / 662° F.

0...50000 µm/1970 mils	0...10000 µm/394 mils	0...20000 µm/790 mils	0...100000 µm/3940 mils	0...2000 µm
10 µm/0.4 mils	10 µm/0.4 mils	10 µm/0.4 mils	100 µm/4 mils	0.2 µm
± (3%+50 µm/2 mils) *	± (1%+25 µm/1 mils) *	± (1%+50 µm/2 mils) *	± (1%+0.3 µm/12 mils) *	± (1%+1 µm) *
50 mm/2 in convex/ 200 mm/7.9 in concave	25 mm/1 in convex/ 100 mm/3.9 in concave	25 mm/1 in convex/ 100 mm/3.9 in concave	100 mm/3.9 in convex/ plan	1.5 mm in convex/ 10 mm in concave
Ø 300 mm/12 in	Ø 50 mm/2 in	Ø 70 mm/2.8 in	Ø 200 mm/78.8 in	Ø 5 mm
2 mm/80 mils	50 µm/2 mils	50 µm/2 mils	50 µm/2 mils	0.5 mm

MiniTest 2500/4500

Application

The portable coating thickness gauges MiniTest 2500 and MiniTest 4500 measure non-destructively using either magnetic induction or the eddy current principle. The gauges are useful for a wide range of applications where high precision coating thickness measurement is required including; industrial corrosion protection, decorative coatings in design sector or daily use by:

- Manufacturers and end-users of all types of coated products
- Auditors and inspectors
- Electroplating and paint shops
- Chemical industry
- Automotive production, ship building, aviation, plant and mechanical engineering

MiniTest coating thickness gauges are not only useful in the laboratory but are equally qualified for use in industrial applications thanks to their rugged housing with a IP 65 rating. Both models feature USB output for connection to notebooks and PCs. The MiniTest 4500 additionally

offers a Bluetooth output for wireless data transfer to mobile devices like Smartphones and printers directly on site. All gauge functions can be triggered directly pressing a single key of the illuminated keypad. The large display with background illumination adds to a high level of user comfort and ergonomics. A broad selection of measuring sensors is available for the MiniTest 2500/4500 line of coating thickness gauges allowing it to handle standard applications as well more complex measuring tasks. The scope of application is determined by the sensor connected to the gauge:

F-type sensors work according to the magnetic induction principle and can measure non-magnetic coatings such as paint, enamel, rubber, aluminum, chrome, copper, zinc etc applied on iron and steel (including steel alloys and hardened magnetic steels).

N-type sensors work according to the eddy current principle and measure insulating coatings such as paint, anodizing,

ceramics etc. applied on all non-ferrous metals (for example aluminum, copper, zinc die cast, brass etc.) including austenitic steels.

FN-type sensors combine both principles and identify the substrate underneath the coating thus automatically switching to the correct measuring principle to measure on base material steel or non-ferrous metal.



Standard supply

Gauge:

- MiniTest 2500 or 4500
- Plastic transport case
- Rubber protection case
- Manual german, english, french
- 3 x AA battery
- USB connection cable

Sensor:

- Coating thickness sensor at choice
- Set of calibration standards including calibration foils and zero standard



Accessories

- Manufacturers certificate (DIN 55350 M) for coating thickness gauge, sensor and calibration standards
- External trigger option for transfer of readings to the memory
- Precision support for serial measurement and measurement of small objects
- Quick charger for NiMH rechargeable batteries

Technical data

	MiniTest 2500	MiniTest 4500
Data memory		
- Total number of storable readings	2.000.000	2.000.000
- Max. number of batches	1	more than 9500
- number of application memories for batches with individual calibration	-	99
- number of batches per application memory for batches with identical calibration	-	99
Statistical functions (per batch)	kvar, n, max., min. kvar, n, max., min.	kvar, n, max., min., CP, CPK kvar, n, max., min., CP, CPK
Calibration	Factory settings, zero and up to four calibration points	
	-	Calibration through coating if the base material is not accessible (CTC)
Offset function	-	for addition or subtraction of a constant value to/from the reading
Limit settings (user definable) with monitoring function	-	Optical and acoustical alert when a limit is exceeded
Measuring units	µm, mm, cm, mils, inch	
Interface	USB	USB and Bluetooth 4.0
Upgradeable interfaces	-	alarm output, trigger for footswitch, RS 232 interface
Power supply	3 x AA (LR06) batteries, USB	
Operating time per battery set approx.	150 hours (illumination deactivated)	
Norms and standards	DIN EN ISO 1461, 2064, 2178, 2360, 2808, 3882; ISO 19840; ASTM B 244, B 499, D 7091, E376	
Display	53 x 46 mm, backlit	
Operating temperature/Storage temperature	-10 °C ... 60 °C / -20 °C ... 70 °C, 14°F ... 140° C / -4° F ... 158° F	
Dimensions / Weight	153 mm x 89 mm x 36 mm (6" x 3.5" x 1.4") / 320 g (0.7 lbs) (gauge incl. batteries), 90 g (0.2 lbs) rubber protection case	
Protection class	IP 65	

ElektroPhysik

ElektroPhysik Dr. Steingroever GmbH & Co. KG
 Pasteurstr. 15 · 50735 Cologne · Germany
 Phone: +49 221 75204-0 · Fax: +49 221 75204-67
 info@elektrophysik.com · www.elektrophysik.com



Coating Thickness Measurement with Wireless Sensor and App **SmarTest**

The latest mode of measuring!

- Wireless sensor for coating thickness measurement
- SmarTest App turns your smartphone or tablet into a measuring device
- Always stay on top of information with an updated app



Smart Sensors – now also available in the wireless version

SmarTest is the new concept of coating thickness measurement. A wireless sensor and an APP for smart phones and tablets are all that is required for reliable determination of the coating thickness. Readings are taken with the small sen-

sor, which can fit in any pocket and then transferred to the APP via Bluetooth.

SmarTest – the evaluation APP

The APP itself offers a clear display of current measuring value, statistical evaluation of readings taken, data memory in files, two-point calibration and

export of complete batches as CSV format. Send your measuring data to any recipient by e-mail using the functionality of your smart phone or tablet.

SmarTest

The modern way of measuring coating thickness

SmarTest Sensor – practical and versatile

SmarTest is a most flexible solution: It can also be supplied in other combinations with any of the SIDSP®-sensors of the MiniTest 700 series to cover a wide field of different applications.

Long battery life: for up to 8 hours in continuous operation. Readings exceeding the set limits are indicated on the sensors's green/red LED. The dual Bluetooth module ensures a long operating time in modern devices thanks to the Bluetooth low energy mode.

Standard Scope of Delivery

- SmarTest
- Calibration set with calibration foils and reference zero test plate(s)
- USB charger with mini-B USB cable
- Operating manual
- Manufacturer's certificate
- Storage case

Technical Data

	SmarTest F 1.5	SmarTest FN 1.5	
Measuring range	0 ... 1.5 mm	F-range: 0 ... 1.5 mm / N-range: 0 ... 0.7 mm	
Measuring procedure	Magnetic induction	Magnetic induction / eddy current	
Signal processing	Sensor-integrated digital 32-bit signal processing (SIDSP®)		
Measuring uncertainty	± (1 µm + 0.75 % of reading)		
Repeatability	± (0.5 µm + 0.5 % of reading)		
Low range resolution	0.05 µm		
Smallest curvature radius, convex	1.0 mm		
Smallest curvature radius, concave	7.5 mm		
Smallest measuring surface	ø 5 mm		
Smallest substrate thickness	0.3 mm	0.3 mm	40 µm
Interfaces	Bluetooth 4.0 / Bluetooth Smart, range up to 10 m / Mini-USB connector for charging and power supply, data interface		
Operating temperature	– 10 °C ... + 60 °C		
Storage temperature	– 20 °C ... + 70 °C		
Power supply	LiFePO battery / operating time approx. 8 hrs continuous operation		
Norms	DIN EN ISO 1461, 2064, 2178, 2360, 2808, 3882, ASTM B 244, B 499, D7091, E 376		
Dimensions / weight	ø 16 x 125 mm / 60 g		

SmarTest App Functions

	SmarTest F 1.5	SmarTest FN 1.5
Operation system	as of Android 4.1 and iOS 9.0	
Measuring units	Metric / mils switchable	
Calibration modi	Factory calibration, zero point and 2-point calibration	
Statistics	Number of measuring values, minimum, maximum, mean value, standard deviation	
Storage of measured values	Storage of measured values in CSV file format	

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ElektroPhysik Dr. Steingroever GmbH & Co. KG
Pasteurstr. 15 · 50735 Cologne · Germany
Phone: +49 221 75204-0 · Fax: +49 221 75204-67
info@elektrophysik.com · www.elektrophysik.com

