

## Electrical conductivity measurement of non-ferrous metals enters a new dimension

The electrical conductivity is an important material property that not only informs about how well a metal conducts electrical current but also provides information about its composition, microstructure or mechanical properties.

The SIGMASCOPE® SMP10 provides excellent features for measuring these characteristics. Signal evaluation based on established physical knowledge, the latest instrument technology and software for simple handling provide the ideal basis for such measurements.



# Measurement principle, application and hardware

## Measurement principle

The SIGMASCOPE® SMP10 measures the electrical conductivity using the eddy current method according to DIN EN 2004-1 and ASTM E 1004. The phase-sensitive measurement signal evaluation enables a contact-free determination of the electrical conductivity, for example, under paint or synthetic coatings of up to 500 µm in thickness. This also minimizes the influence of surface roughness.

## Applications

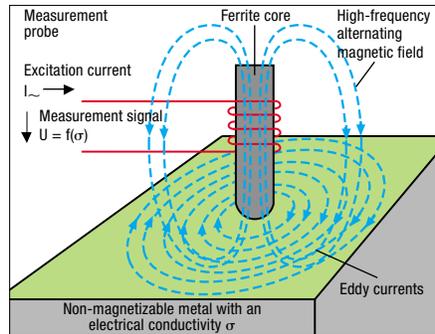
- Measurement of the electrical conductivity of all non-magnetic metals, even stainless steel, EURO coins, etc.
- Measurement of the hardness and strength of heat-treated materials, e.g., aluminum alloys; inspection for heat damage.
- Measurement of the phosphor content in copper.
- Monitoring of deposition processes, e.g., for Cu-Cr-alloys.
- Determination of the degree of purity.
- Verifying the homogeneity of alloys.
- Scrap metal sorting.

## Hardware

The SIGMASCOPE® SMP10 is a compact, ergonomic portable instrument with a shock-resistant synthetic housing, a large, backlit LCD screen and a user-friendly keyboard with direct access to the most important measurement functions. The corresponding measurement probe ES40 is suitable for all four measurement frequencies of 60 kHz to 480 kHz. For automatic temperature compensation of the conductivity measurement (referenced to 20°C), the surrounding temperature or the current temperature of the specimen can be measured using either the temperature sensor integrated in the probe or an optional external sensor.

## Calibration standards

A high-precision measurement is required to determine the electrical conductivity. Accurate standards are required to calibrate the instrument because the measurement is a comparison using the eddy current method. These standards are available in certified versions for the entire conductivity range. Special standards are also available for testing EURO coins, for example.



The eddy currents generated by the magnetic field of the probe and utilized as the measurement effect are influenced by the electrical conductivity.



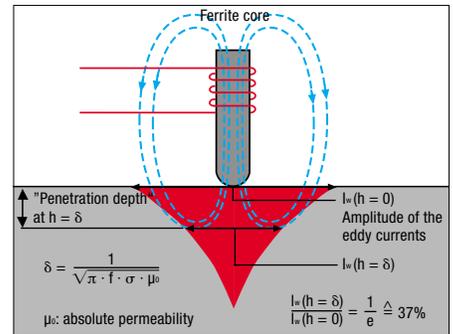
The electrical conductivity measurement is employed for the production, processing or inspection of finished goods (e.g., EURO coins) made of NF metals.



Hard shell case for transporting and storing the SIGMASCOPE® SMP10 including the required accessories (plug-in type AC adaptor, calibration standards, external temperature sensor and MPG stand).



Certified standards for calibrating the SIGMASCOPE® SMP10 are traceable to internationally recognized calibration standards.



The penetration depth  $\delta$  of the eddy currents is established by the measurement frequency  $f$ , which determines the minimum permissible thickness of the specimen.



The electrical conductivity measurement is an important quality assurance component in the manufacture, maintenance or repair of airplanes.



The MPG stand is available for convenient use of the SIGMASCOPE® SMP10 in the lab. The optional MPG charging station is used to charge a spare rechargeable battery pack.



Internationally recognized Boeing Standards are used to establish the working standards of the SIGMASCOPE® SMP10.

# Features, Technical Data, Ordering Data

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## Features

- Standard measurement according to ASTM E 1004 and DIN EN 2004-1.
- Menu-driven operator guidance.
- 100 application memories for calibrations and 20,000 measurement data in up to 4,000 measurement data blocks.
- Individual consideration of the temperature coefficient as applicable to each material for the electrical conductivity.
- Measurement capture: automatic, continuous or with external start.
- Fast analog display.
- 3-stage measurement resolution.
- Graphical presentation of the specification limits on the display.
- Extensive statistical evaluation of test series with date and time as well as computation of Cp, Cpk and histogram display.
- 2 display modes: scientific or statistic.
- Current saver function with adjustable measurement time.
- Automatic shut-off function.
- Manual temperature input.
- Monitoring of the temperature change over time ( $\Delta T/\Delta t$ ).
- Alarm function for the absolute temperature deviation.
- Single display mode.
- Master calibration using 8 standards.
- Corrective calibration using a maximum of 4 standards.
- Acoustic signal for measurement capture and violation of specification limits.
- 5 display languages (D, GB, F, I, E).

## Technical Data

- Ergonomically shaped robust housing; user-friendly keyboard.
- Large backlit LCD display for measurement data, measurement parameters and graphics.
- Measurement frequencies of 60 kHz, 120 kHz, 240 kHz and 480 kHz without changing probe.
- Measurement range: 0.5 - 65 MS/m, or 1 - 112 %IACS.
- Measurement accuracy at room temperature:  $\pm 0.5\%$  from MV.
- Up to 16 measurements per sec.
- Lift-off-compensation up to 0.5 mm.
- Smallest diameter of the measurement area without noticeable influence on the measurement: 13 mm
- Probe-integrated or optional external temperature sensor for the temperature compensation of the electrical conductivity measurement.
- RS232 interface for data output to printer or PC.
- Easily replaceable NiCd battery for a min. of 20 h of operating time.
- Operating temperature: 0°C to 50°C.
- Mass incl. battery: 600 g / 21 oz.
- Dimensions: L x W x H 230 x 95 x (40-55) mm / 9.1" x 3.7" x (1.6"-2.2").

Based on the user-friendly software menus, the user can quickly and easily select the instrument settings required for the measurement application, perform evaluations and present the measurement results in the desired manner. Not only in a numeric format but also in a graphical format with inserted specification limits or as a histogram.



In the standard measurement mode, the display shows the number of measurements  $n$  and the electrical conductivity valid at the current temperature in addition to the electrical conductivity compensated to 20°C incl. the unit of measurement and the measurement frequency. In the statistics display mode, the display also provides information about the running mean value and the standard deviation.



In the scientific display mode, the temperature taken by the sensor as well as the temperature coefficient used for the temperature compensation of the electrical conductivity are displayed in place of the mean value and the standard deviation. Additional instrument functions can be selected by using the softkeys in the lower LCD region.



The simple display mode is available for applications where only the current display of the electrical conductivity and the number of performed measurements is of interest. The temperature compensation of the conductivity can be activated in this mode of operation as well.



## Ordering Data

Product	Order no.	Product	Order no.
SIGMASCOPE® SMP10*	603-231	<b>Calibration standards</b>	
Measurement probe ES40	603-235	CAL-S SMP Titanium LT31	600-378
<b>Optional accessories</b>		CAL-S SMP Nickel silver	600-379
Temperature sensor SMP10	603-237	CAL-S SMP Bronze	600-380
Battery pack MPG	603-232	CAL-S SMP Nordic Gold	602-603
Charging station MPG 230 V	603-245	CAL-S SMP Brass	600-381
Charging station MPG 110 V	603-269	CAL-S SMP Al 2024/T3511	600-373
Printer FMP3040/41	603-890	CAL-S SMP Al 7175/T7351	600-374
PC-DATEX for EXCEL	602-465	CAL-S SMP AlMgSi F32	600-375
PC-DATACC for ACCESS	603-028	CAL-S SMP Al 99.5	600-376
Interface connection set MP	602-341	CAL-S SMP Cu 58 MS/m	600-377

\* Included in the shipment:

Carrying case, Stand MPG, Plug-in AC converter 110/230V, Cu reference standard with certificate.

FISCHER is a leading multi-national company in the field of electronic coating thickness measurement and materials testing instruments. The company is able to recommend the best coating thickness measuring instrument for any application, due to the company's extensive experience in this field. The wide range of instruments includes models for coating thickness measurements according



to the X-ray fluorescent, Beta Backscatter, magnetic induction, eddy current and coulometric methods. Additionally, the program includes instruments for measuring microhardness, ferrite content, and porosity testing. FISCHER is active around the world. Instruments manufactured by our company are used in many countries. FISCHER has subsidiaries in eight different countries.



*FISCHERSCOPE® X-RAY XAN energy dispersive spectrometer for quantitative material analysis from Al(Z=13) to U(Z=92).*



*FISCHERSCOPE® H100C with WIN-HCU® for the measurement of the microhardness HM according to DIN EN ISO 14577 and DIN 55676.*



*FERITSCOPE® MP30 for standardized non-destructive measurement of the ferrite content in austenitic welded products or in duplex steel.*

The high quality standard of FISCHER instruments is the result of our efforts to provide the very best instrumentation to our customers.

FISCHER is a reliable and competent partner, offering expert advice, extensive service, and training seminars.

Today, FISCHER instruments are used successfully in all technological fields of industry and research.