

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

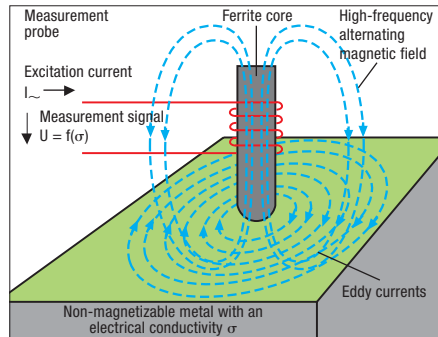
- Measurement of the electrical conductivity of all non-magnetic metals, even stainless steel, EURO coins, etc.
- Measurement of the hardness and strength of heat-treated materials, e.g., aluminum alloys; inspection for heat damage.
- Measurement of the phosphor content in copper.
- Monitoring of deposition 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.



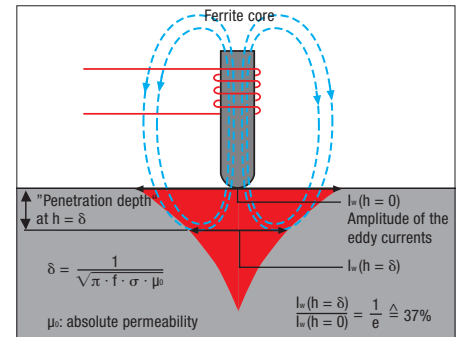
The electrical conductivity measurement is employed for the production, processing or inspection of finished goods (e.g., EURO coins) made of NF metals.



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 δ 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

- 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.
- Automatic determination of temperature coefficient for el. conductivity of each material, by material selection or the user may input the coefficient.
- 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.
- Display modes: scientific, statistic or simple.
- Current saver function.
- Automatic shut-off function.
- Temp. input: manual or automatic.
- Monitoring of the temperature change over time ($\Delta T/\Delta t$).
- Alarm function for the absolute temperature deviation.
- 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

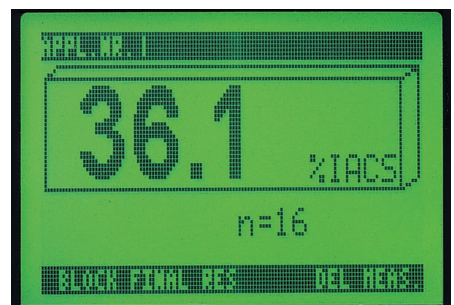
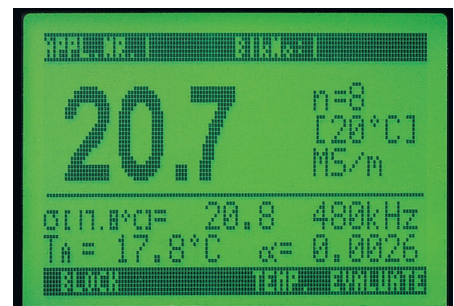
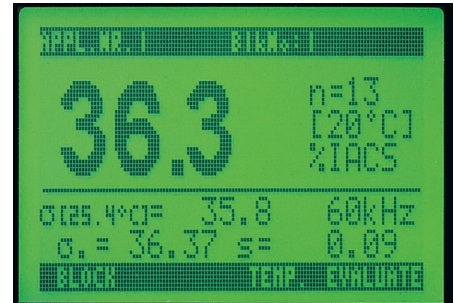
- Ergonomically shaped robust housing; user-friendly keyboard.
- Large backlit LCD display.
- Measurement frequencies: SMP10: 60, 120, 240 and 480 kHz with probe ES40. SMP10-HF: 60, 240, 480 kHz with probe ES40 and 1250 kHz with probe ES40-HF.
- Measurement range: 0.3 - 63 MS/m, or 0.5 - 108 %IACS.
- Measurement accuracy at +20°C: $\geq 0.5\%$ (1 - 100 % IACS) depending on the measurement frequency.
- Up to 16 measurements per sec.
- Lift-off-compensation up to 0.5 mm.
- Smallest diameter of the measurement area: 13 mm
- Probe-integrated or optional external temperature sensor for the temperature compensation of the electrical conductivity measurement.
- RS232 interface.
- NiCd battery for operating time of approx. 20 h.
- Operating temperature: 5°C to 50°C.
- Mass incl. battery: 600 g / 21 oz.
- Dimensions: L x W x H 230 x 95 x 55 mm / 9.1" x 3.7" x 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 temperature used for temperature compensation and 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), the temperature coefficient or the selected material 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	Calibration standards	
Probe ES40 (60, 120, 240, 480 kHz)	603-235	CAL-S SMP Titanium LT31	600-378
SIGMASCOPE® SMP10-HF*	603-403	CAL-S SMP Nickel silver	600-379
Probe ES40 (60, 240, 480 kHz)	603-235	CAL-S SMP Bronze	600-380
Probe ES40HF (1250 kHz)	603-401	CAL-S SMP Nordic Gold	602-603
Optional accessories		CAL-S SMP Brass	600-381
Temperature sensor SMP10	603-237	CAL-S SMP Al 2024/T3511	600-373
Battery pack MPG	603-232	CAL-S SMP Al 7175/T7351	600-374
Charging station MPG 230 V	603-245	CAL-S SMP AlMgSi F32	600-375
Charging station MPG 110 V	603-269	CAL-S SMP Al 99.5	600-376
Printer FMP3040/41	603-890	CAL-S SMP Cu 58 MS/m	600-377
PC-DATEX for EXCEL	602-465		
PC-DATACC for ACCESS	603-028		
Interface connection set MP	602-341		

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