

SIGMASCOPE® SMP350

Measuring the Electrical Conductivity of Nonferrous Metals



Measurement Principle, Applications and Hardware

Electrical conductivity is an important material property that provides information not only about a metal's ability to conduct electrical currents but also about its composition, micro structure and/or mechanical properties. Using the SIGMASCOPE® SMP350, it is easy and quick to determine the electrical conductivity with precision and accuracy.

Measurement principle

The SIGMASCOPE® SMP350 measures the electrical conductivity using the phase-sensitive eddy current method, which is approved by both DIN EN 2004-1 and ASTM E 1004 for determining conductivity. This kind of signal evaluation allows for contact-free determination of a substrate's electrical conductivity, even under paint or plastic coatings up to 500 µm thick. This method also marginalises the influence of surface roughness.



Measuring the electrical conductivity is an important element of quality assurance in the manufacture, maintenance and repair of aircraft



Sorting aluminium raw materials

Applications

The SMP350 can measure the electrical conductivity of any non-magnetisable metal. Furthermore, since the electrical conductivity provides data about other material properties, it is effective in a wide range of measuring applications and fields of use, including:

- Quality assurance and sorting of raw materials
- Authentication of coin alloys (e.g. specific conductivity of Euro coins)
- Assessing hardness and strength of heat-treated materials
- Inspecting for heat damage, material fatigue and cracks
- Estimating the phosphorous content in copper
- Tracking precipitation processes, e.g. for Cu-Cr alloys
- Testing the homogeneity of alloys
- Scrap metal sorting

Hardware

The SIGMASCOPE® SMP350 is equipped with a Windows™ CE operating system and an intuitive graphical user interface that drives a high-resolution touchscreen operable with stylus or finger. The corresponding probes are suited for different measurement frequencies. For automatic compensation of temperature influences on the measurement, the ambient or specimen temperature can be taken directly with the integrated (or optional external) temperature sensor.



Quality assurance to prevent colour variations in anodised aluminium

Features

- Windows™ CE operating system; large touchscreen and displayable keyboard
- Customisable user interface
- Very simple calibration via user prompts
- Simple management of measuring applications with user-definable file and folder structure
- Memory for several thousand measuring applications and several thousand readings
- Consideration of each material's conductivity-related temperature coefficient
- Automatic measurement acquisition in free-running mode or with external start
- Graphical presentation of specification limits
- Extensive statistical evaluation of test series with date/time stamp as well as computation of C_p , C_{pk} and histogram presentation
- Manual temperature input
- Monitoring of temperature changes over time ($\Delta T/\Delta t$)
- Calibration fine-tuning for instrument calibration with up to 4 standards
- Acoustic signal for measurement acquisition and violation of specification limits; can be turned on/off
- Various languages available

Technical data

- Measurements pursuant to ASTM E 1004 and DIN EN 2004-1
- SMP350 with probe FS40 fulfills Boeing specification BAC 5651
- Measurement frequencies ranging from 15 kHz to 2 MHz, depending on the probe
- Measurement range: 0.5 – 65 MS/m or 1 – 112% IACS
- Measurement precision at ambient temperature: $\pm 0.5\%$ of reading
- Operating temperature: 0 – 40 °C
- Lift-off compensation to 500 μm
- Smallest diameter measurement area without noticeable influence on the reading: 13 mm
- Connector for electrical conductivity probe, with or without integrated temperature sensor
- Connector for optional temperature sensor TF100A
- USB communication and printer port
- Power supply via battery or mains electricity

Calibration standards

High-precision measurements are required to determine the electrical conductivity. Because the eddy current method is a comparative measurement method, accurate standards are necessary to calibrate the measuring instrument. Certified standards are available for the entire conductivity range.



Certified standards for calibrating the SIGMASCOPE® SMP350, traceable to internationally-recognised calibration norms

Order information

Product	Order no.
SIGMASCOPE® SMP350*	605-219
Measurement probe FS24	605-441
Measurement probe FS40	605-209
Measurement probe FS40HF	605-210
Measurement probe FS40LF	605-211

Optional accessories

Temperature sensor TF100A	603-237
Rechargeable battery set	604-144

* Included in the shipment: Carrying case, power supply, battery set, carrying strap and protective cover for the instrument, Cu reference standard, USB cable

Product	Order no.
Calibration standards**	
KAL-N SMP Al 2024/T3511	17.0 MS/m 29.3% IACS 600-373
KAL-N SMP Al 7175/T7351	22.0 MS/m 37.9% IACS 600-374
KAL-N SMP Al 99.5	34,2 MS/m 58.6% IACS 600-376
KAL-N SMP AlMgSi F32	28.0 MS/m 48.3% IACS 600-375
KAL-N SMP Bronze RG7	9.0 MS/m 15.5% IACS 600-380
KAL-N SMP Cu 58 Ms/m	58.0 MS/m 100% IACS 600-377
KAL-N SMP Manganin	2.3 MS/m 4.0% IACS 603-558
KAL-N SMP Brass	15.0 MS/m 25.9% IACS 600-381
KAL-N SMP Nickel Silver	5.0 MS/m 8.6% IACS 600-379
KAL-N SMP NORDIC GOLD	9.6 MS/m 16.5% IACS 602-603
KAL-N SMP Titanium LT31	0.6 MS/m 1.0% IACS 600-378

**Certificates for calibration standards must be ordered separately

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