

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 user-friendly 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

- User-friendly 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.

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 SMPTitanLT31 | 0,6 MS/m - 1,0% IACS 605-529 |
| KAL-N SMPManganin | 2,3 MS/m - 4,0% IACS 605-525 |
| KAL-N SMP Neusilber | 5,0 MS/m - 8,6% IACS 605-527 |
| KAL-N SMP Bronze RG7 | 9,0 MS/m - 15,5% IACS 605-523 |
| KAL-N SMP NORDIC GOLD | 9,6 MS/m - 16,5% IACS 605-528 |
| KAL-N SMP Messing | 15,0 MS/m - 25,9% IACS 605-526 |
| KAL-N SMP Al 2024/T3511 | 17,0 MS/m - 29,3% IACS 605-519 |
| KAL-N SMP Al 7175/T7351 | 22,0 MS/m - 39,0% IACS 605-520 |
| KAL-N SMP AlMgSi F32 | 28,0 MS/m - 48,3% IACS 605-522 |
| KAL-N SMP Al 99.5 | 34,2 MS/m - 58,6% IACS 605-521 |
| KAL-N SMP Cu 58 Ms/m | 58,0 MS/m - 100% IACS 605-524 |

**Certificates for calibration standards must be ordered separately

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