

Deutscher Kalibrierdienst (DKD)
Accreditation Body
represented in

Deutscher AkkreditierungsRat



Accreditation

The Accreditation Body of **Deutscher Kalibrierdienst** hereby accredits
SPEKTRA Schwingungstechnik und Akustik GmbH Dresden
Gostritzer Straße 61-63
01217 Dresden

according to DIN EN ISO/IEC 17025:2005 for calibrations in the field / fields:

acceleration, acoustical quantities

Part of the certificate is: Annex 06 (3 pages), 2008-09-26

DAR registration number: DKD-K-27801
DKD accredited since: 2000-05-10

Braunschweig, 2008-09-26

M. Schaller

Dipl.-Ing. Michael Schaller
Head of Accreditation Body



The accreditation is granted on the basis of an assessment and the contract concluded with the Accreditation Body of Deutscher Kalibrierdienst concerning the accreditation of a calibration laboratory according to rules and procedures of Deutscher Kalibrierdienst pursuant to the Standards DIN EN ISO/IEC 17025:2005 and DIN EN ISO/IEC 17011.

The calibration laboratory is authorized to issue DKD calibration certificates and to use the DKD logo.

Details of the scope of accreditation (measuring instruments, measurands, ranges of measurement, uncertainties of measurement) are specified in the annex. The documents submitted form an integral part of the accreditation. Modifications must be made in writing.

The accreditation is granted with the reservation that it can be withdrawn at any time if the defined conditions are no longer met. The validity and the current scope of accreditation are documented on the web pages of Deutscher Kalibrierdienst (<http://www.dkd.eu>).

Accreditation certificates and annexes to them may be distributed only without modifications. Extracts may be published only with the permission of the Accreditation Body of Deutscher Kalibrierdienst.

The impression that products and services of the holder, that are not covered by the accreditation, are also subject to the calibration laboratory's control has to be avoided. Should this impression nevertheless be given, the Accreditation Body of Deutscher Kalibrierdienst shall be authorized to demand modifications.

If reference is made to the accreditation as a calibration laboratory, the fields covered by the accreditation must be explicitly specified. In case of doubt, the Accreditation Body of Deutscher Kalibrierdienst should be contacted before such reference is made.

Annex 06

as of 2008-09-26 to Accreditation certificate of Calibration laboratory

Registration number:

DKD-K-27801

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at

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Measured quantities:

acceleration,
acoustics
charge
voltage

Head of laboratory: Dr.-Ing. Holger Nicklich
Deputy head: Dipl.-Inf. (FH) Heiko Deierlein
Dipl.-Ing. (FH) Philipp Begoff

First accreditation: 2000-05-10

Permanent laboratory

| Measurand / Calibration object | Measuring range / Span | Measuring conditions / Methods | Smallest uncertainty to be stated ¹⁾ | | Comment |
|---|---|---|---|-----------------------|---|
| Acoustics Sound pressure level (free field) / Measuring microphone Free-field open-circuit or effective sensitivity level of measuring microphones with / without wind shield | Sensitivity level: -60 dB to +20 dB (re 1 V / Pa) 125 Hz to <250 Hz 250 Hz to 8 kHz >8 kHz to 10 kHz >10 kHz to 20 kHz | Substitution method in an anechoic chamber with ½" or 1" standard microphone at sound pressure level 74 dB to 94 dB | 0.30 dB 0.25 dB 0.35 dB 0.40 dB | | Measurement of cartridge capacitance |
| Sound pressure level (pressure) / Measuring microphone Open-circuit or effective pressure sensitivity level of measuring microphones | Sensitivity level: -60 dB to +20 dB (re 1 V / Pa) 250 Hz / 124 dB 1 000 Hz / 94 dB 1 000 Hz / 114 dB | Calibration with reference standard: Pistonphone Calibrator Calibrator | 0.15 dB | | Measurement of cartridge capacitance |
| | Sensitivity level: -60 dB to +20 dB (re 1 V / Pa) 31.5 Hz to 2 kHz | Comparative measurement in an electro-acoustical coupler ¼" or ½" at sound pressure level 84 dB to 114 dB | 0.25 dB | | |
| Sound pressure level (pressure), frequency, total harmonic distortion / Calibrators Pistonphones and Sound calibrators | Sound pressure level: 74 dB to 130 dB (re 20 µV / Pa) 250 Hz / 124 dB 1 000 Hz / 94 dB 1 000 Hz / 114 dB | Substitution measurement with traced-back calibrators | approved calibrators | any other calibrators | Data apply to reference conditions for approved sound calibrators: (23 °C; 101.3 kPa; 50% r.h.) |
| | | | 0.1 dB | 0.2 dB | |
| | Frequency: 250 Hz or 1 000 Hz | Measurement with traced-back frequency counter | 0.05 Hz | | |
| Total harmonic distortion: 0.1 % to 10 % | Measurement with traced-back analyzer | 0.2 % | | | |
| Sound pressure level (pressure), frequency, total harmonic distortion / Calibrators Multi-tone calibrators | Sound pressure level: 60 dB to 130 dB (re 20 µV / Pa) 31.5 Hz to 10 kHz >10 kHz to 16 kHz | Calibration with reference standard (LS1 or LS2) ½" or 1" | 0.2 dB 0.3 dB | | |
| | Frequency: 31.5 Hz or 16 kHz | Measurement with traced-back frequency counter | 0.05 Hz | | |
| | Total harmonic distortion: 0.3 % to 10 % | Measurement with traced-back analyzer | 0.2 % | | |

¹⁾ The smallest uncertainties to be stated are specified according to DKD-3 (EA-4/02). They are expanded uncertainties with a coverage probability of 95 % based on coverage factor $k = 2$, if not specified otherwise. Uncertainties for which no unit of measurement is given are relative values in relation to the measuring value, if not specified otherwise.

| Measurand / Calibration object | Measuring range / Span | Measuring conditions / Methods | Smallest uncertainty to be stated ¹⁾ | | Comment |
|---|---|---|---|--|--|
| Sound pressure level (free field) / Sound level meters Sound level meters with separate microphone with / without wind shield | Deviation of indication in frequency range 125 Hz to <250 Hz 250 Hz to 8 kHz >8 kHz to 10 kHz >10 kHz to 20 kHz | Substitution method in an anechoic chamber with ½" or 1" standard microphone at sound pressure level 74 dB to 94 dB | approved sound level meters | any other sound level meters | |
| | | | 0.35 dB 0.30 dB 0.40 dB 0.45 dB | 0.65 dB 0.40 dB 0.50 dB 0.60 dB | |
| Sound level meters with microphone attached to body with / without wind shield | Deviation of indication in frequency range 125 Hz to <250 Hz 250 Hz to 8 kHz >8 kHz to 10 kHz >10 kHz to 20 kHz | | 0.5 dB 0.4 dB 0.5 dB 0.6 dB | 0.8 dB 0.5 dB 0.6 dB 0.8 dB | |
| Sound pressure level (pressure) / Sound level meters | Deviation of indication at reference point 250 Hz / 124 dB 1 000 Hz / 94 dB 1 000 Hz / 114 dB | Calibration with reference standard: Pistonphone Calibrator Calibrator | approved sound level meters | any other sound level meters | Pressure sensitivity is stated without considering the effect of the device body |
| | Sensitivity level: -60 dB to +20 dB (re 1 V / Pa) 31.5 Hz to 2 kHz | Comparative measurement in an electro-acoustical coupler ¼" or ½" at sound pressure level 84 dB to 114 dB | 0.15 dB | 0.20 dB | |
| Test electrical / acoustical sound level meters Inherent noise | Lowest measuring range A weighting | Measurement at lowest possible ambient sound (down to 20 dB (A)) | 0.5 dB | | |
| | | Measurement with shorted dummy capacitor | 0.1 dB | | |
| Electrical test / sound level meter Frequency weighting | A, B, C, LIN, Z, FLAT weightings 22.4 Hz to 22.4 kHz | Supply of electrical signal through dummy capacitor in voltage range 20 µVRMS to 20 VRMS 26 dB to 146 dB (re 1 µV) | 0.1 dB | | |
| Frequency weighting at 1 kHz | A, B, C, LIN, Z, FLAT weightings 1 kHz | | 0.05 dB | | |
| Level linearity | A, B, C, LIN, Z, FLAT weightings 22.4 Hz to 22.4 kHz | | 0.1 dB | | |
| Tone burst response | Tone pulse duration: 0.25 ms to 1 000 ms 4 kHz | | 0.1 dB | | |
| C-weighted peak level | Test signal: 0.5 and 1 cycle 31.5 Hz; 500 Hz; 8 kHz | | 0.1 dB | | |
| Overload indication | Positive and negative half-sinusoidal signals 4 kHz | | 0.1 dB | | |
| Electrical test / signal conditioner for microphones Polarization voltage | Polarization voltage 200 V | | Measurement of difference from reference source | 0.2 V | |

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| Measurand / Calibration object | Measuring range / Span | Measuring conditions / Methods | Smallest uncertainty to be stated ¹⁾ | Comment |
|--|--|--|--|---|
| Acceleration | For sinusoidal excitation and narrow-band evaluation methods (sine approximation), the amplitudes of vibration acceleration, vibration velocity and vibration displacement are unambiguously linked to one another by the vibration frequency. This is why vibration velocity sensors and vibration displacement sensors can be calibrated, too using measurand acceleration as stated in the table in ranges of velocity and displacement converted accordingly for the stated frequency ranges. All measuring ranges refer to peak values (sinus amplitude). | | | |
| Acceleration (secondary) Vibration sensor Vibration meter Vibration calibrator Optical vibration Sensor Laser vibrometer Calibration System for vibration Sensors | 0.1 m/s ² to 30 m/s ² | Sinusoidal excitation Frequencies: 0.2 Hz bis <0.4 Hz 0.4 Hz bis <1 Hz 1 Hz bis 63 Hz >63 Hz bis 160 Hz | 2 % / 1,5° 1 % / 1° 0.5 % / 1° 1 % / 1° | Calibration result: Complex transfer coefficient (module / phase) Sensor weight up to 0,9 kg Geophone to 80 Hz - horizontal to 5 kg - vertical to 3 kg Displ. amplitude to 100 mm |
| | 0.1 m/s ² to 500 m/s ² | 2 Hz bis <5 Hz 5 Hz bis <20 Hz 20 Hz bis 1 kHz >1 kHz bis 5 kHz | 1.5 % / 1° 1 % / 1° 0.75 % / 1° 1 % / 1,5° | Sensor weight up to 0,5 kg (with adapter, if need be), Displ. amplitude up to 10 mm |
| | 1 m/s ² to 250 m/s ² | 5 Hz to <10 Hz 10 Hz to <20 Hz 20 Hz to 1 kHz >1 kHz to 5 kHz >5 kHz to 10 kHz >10 kHz to 15 kHz >15 kHz to 20 kHz | 1.5 % / 1° 1 % / 1° 0.5 % / 1° 1 % / 1,5° 2 % / 1,5° 3 % 4 % | Sensor weight up to 0,2 kg. Displ. amplitude up to 8 mm |
| Acceleration (secondary) Vibration sensor Vibration meter Calibration system for vibration Sensors | 200 m/s ² to 2 000 m/s ² | Shock excitation Resulting pulse width: 1 ms to 10 ms | 1 % | Calibration result: Transfer coefficient (module) Sensor weight up to 0,3 kg (with adapter, if applicable) |
| Acceleration (primary) Vibration sensor Vibration meter Vibration calibrator Optical vibration Sensor Laser vibrometer Calibration system for vibration Sensors | 0.1 m/s ² to 30 m/s ² | Sinusoidal excitation Frequencies: 0.2 Hz bis <0.4 Hz 0.4 Hz bis <1 Hz 1 Hz bis 100 Hz >100 Hz bis 160 Hz | 1 % / 1,5° 0.75 % / 1° 0.5 % / 1° 0.75 % / 0,75° | Calibration result: Complex transfer coefficient (module / phase) Sensor weight up to 0,9 kg Geophone to 80 Hz - horizontal to 5 kg - vertical to 3 kg Displ. amplitude to 100 mm |
| | 1 m/s ² to 250 m/s ² | 5 Hz bis 5 kHz >5 kHz bis 10 kHz >10 kHz bis 15 kHz >15 kHz bis 20 kHz | 0.5 % / 0,5° 1 % / 1° 2 % 2.5 % | Sensor weight up to 0,2 kg. Displ. amplitude up to 8 mm |
| Acceleration (primary) Laser vibrometer standard | 0.1 m/s ² to 30 m/s ² | Sinusoidal excitation frequencies: 0.4 Hz to 160 Hz | 0.25 % | Calibration result: Transfer coefficient (module) Displacement amplitude up to 50 mm |
| | 1 m/s ² to 250 m/s ² | 5 Hz to 5 kHz >5 kHz to 10 kHz >10 kHz to 15 kHz >15 kHz to 20 kHz | 0.25 % 0.3 % 0.4 % 0.5 % | Displacement amplitude up to 8 mm |
| Charge Charge amplifier | 0.1 pC to 10 000 pC | 0.2 Hz bis 20 kHz >20 kHz bis 50 kHz | 0,25 % / 0,5° 1 % | Calibration result: Complex transfer coefficient (module / phase) |
| Voltage Measuring amplifier | 1 mV to 30 V | 0.2 Hz bis 20 kHz >20 kHz bis 50 kHz | 0,2 % / 0,5° 1 % | |

¹⁾ The smallest uncertainties to be stated are specified according to DKD-3 (EA-4/02). They are expanded uncertainties with a coverage probability of 95 % based on coverage factor $k = 2$, if not specified otherwise. Uncertainties for which no unit of measurement is given are relative values in relation to the measuring value, if not specified otherwise.