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German Accreditation Body

Annex to the Accreditation Certificate D-K-15183-01-00
according to DIN EN ISO/IEC 17025:2005

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Holder of certificate:

SPEKTRA Schwingungstechnik und Akustik GmbH Dresden
Heidelberger Straße 12, 01189 Dresden

Head: Dipl.-Ing. (FH) Philipp Begoff
Deputy: Dipl.-Inf. (FH) Heiko Deierlein
Dipl.-Ing. Mario Chares
Dipl.-Ing. Mario Gutbier

Accredited since: 10.05.2000

Calibrations in the fields:

Mechanical quantities

– **Acceleration**

Acoustics

Abbreviations used: see last page

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Permanent Laboratory

Measured quantity / Calibration item	Range	Measurement conditions / procedure	Calibration and measurement capability ¹⁾		Remarks
Acoustics					
Sound pressure level (free field) / Measuring microphone	Sensitivity level: -60 dB to +20 dB (re 1V / Pa)	IEC 61094-8:2012 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
Free-field open-circuit or effective sensitivity level of measuring microphones with / without wind shield	125 Hz to < 250 Hz 250 Hz to 8 kHz > 8 kHz to 10 kHz > 10 kHz to 20 kHz				
Sound pressure level (pressure) / Measuring microphone	Sensitivity level: -60 dB to +20 dB (re 1 V / Pa)	IEC 60942:2004 Calibration with reference standard: Pistonphone Calibrator	0.15 dB		
Open-circuit or effective pressure sensitivity level of measuring microphones	250 Hz / 124 dB 1 000 Hz / 94 dB 1 000 Hz / 114 dB				
	Sensitivity level: -60 dB to +20 dB (re 1V / Pa)	IEC 61094-5:2016 Comparative measurement in an electro-acoustical coupler	SPEKTRA SQ-4.2 0.15 dB 0.20 dB 0.40 dB	SPEKTRA SQ-4.1 0.15 dB 0.50 dB -	Calibration at f > 10 kHz (½") or f > 5 kHz (1") only possible with removeable Microphonegrid
	31.5 Hz to 5 kHz > 5 kHz to 10 kHz > 10 kHz to 16 kHz	½"-Micr. 31.5 Hz to 16 kHz 1"-Micr. 31.5 Hz to 8 kHz at 64 dB to 124 dB			
	31.5 Hz bis 2 kHz	IEC 61094-5:2016 ¼"- or ½"-Microphone at sound pressure level 84 dB to 114 dB	0.25 dB		
Sound pressure level (pressure), frequency, total harmonic distortion / Calibrators	Sound pressure level: 74 dB to 130 dB (re 20 µV / Pa)	IEC 60942:2004 Substitution measurement with traced-back calibrators	Approved calibrators 0.1 dB	Any other calibrators 0.2 dB	Data apply to reference conditions for approved sound calibrators: (23 °C; 101.3 kPa; 50 % r.h.)
Pistonphones and Sound calibrators	250 Hz / 124 dB 1 000 Hz / 94 dB 1 000 Hz / 114 dB				
	Frequency: 250 Hz or 1 000 Hz	Measurement with traced-back frequency counter	0.05 Hz		
	Total harmonic distortion: 0.1 % to 10 %	Ratio of the fundamental frequency to ten harmonic components	0.2 %		
Sound pressure level (pressure), frequency, total harmonic distortion / Calibrators	Sound pressure level: 60 dB to 130 dB (re 20 µV / Pa)	IEC 60942:2004 Calibration with reference standard (LS1P or LS2P) ½" or 1"	0.2 dB 0.3 dB		
Multi-tone calibrators	31.5 Hz to 10 kHz > 10 kHz to 16 kHz				
	Frequency 31.5 Hz to 16 kHz	Measurement with traced-back frequency counter	0.05 Hz		
	Total harmonic distortion: 0.1 % to 10 % in the Range 31.5 Hz to 4 kHz	Ratio of the fundamental frequency to ten harmonic components	0.2 %		

¹⁾ The best measurement capabilities are stated according to EA-4/02. These are expanded uncertainties of measurement with a coverage probability of 95% and have a coverage factor of $k = 2$ unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

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Measured quantity / Calibration item	Range	Measurement conditions / procedure	Calibration and measurement capability ¹⁾		Remarks
			Approved sound level meters	Any other sound level meters	
Acoustics					
Sound pressure level (free field) / Sound level meters	Deviation of indication in frequency range	IEC 61672-3:2013 Substitution method in an anechoic chamber with ½" or 1" standard microphone at sound pressure level 74 dB to 94 dB	0.35 dB	0.65 dB	
Sound level meters with separate microphone with / without wind shield	125 Hz to < 250 Hz 250 Hz to 8 kHz > 8 kHz to 10 kHz > 10 kHz to 20 kHz		0.30 dB 0.40 dB 0.45 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	IEC 61672-3:2013 Calibration with reference standard: Pistonphone Calibrator Calibrator	Approved sound level meters 0.15 dB	Any other sound level meters 0.20 dB	Deviation of indication is stated without considering the effect of the device body
	250 Hz / 124 dB 1 000 Hz / 94 dB 1 000 Hz / 114 dB				
	Deviation of indication in the frequency range	IEC 61672-3:2013 Comparison in an electro-acoustic coupler	Approved sound level meters	Any other sound level meters	
	31.5 Hz to 5 kHz > 5 kHz to 10 kHz > 10 kHz to 16 kHz	½"-Micr. 31.5 Hz to 16 kHz 1"-Micr. 31.5 Hz to 8 kHz at 64 dB to 124 dB	0.25 dB 0.30 dB 0.50 dB	0.30 dB 0.40 dB 0.60 dB	
	31.5 Hz to 2 kHz	IEC 61672-1:2013 ¼" Microphone or ½" Microphone by a sound pressure level 84 dB to 114 dB	0.25 dB	0.30 dB	
Test electrical, acoustical / sound level meters Inherent noise	Lowest measuring range A weighting	IEC 61672-3:2013 Measurement at lowest possible ambient sound (down to 20 dB (A))	0.5 dB		
		IEC 61672-3:2013 Measurement with shorted dummy capacitor	0.1 dB		
Electrical test / sound level meters Frequency weighting	A A, B, C, LIN, Z, FLAT weightings 22.4 Hz to 22.4 kHz	IEC 61672-3:2013 Supply of electrical signal through dummy capacitor in voltage range 20 µV _{RMS} to 20 V _{RMS} 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		

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Measured quantity / Calibration item	Range	Measurement conditions / procedure	Calibration and measurement capability ¹⁾	Remarks
Electrical test / sound level meters Overload indication	Positive and negative half-sinusoidal signals 4 kHz	IEC 61672-3:2013 Supply of electrical signal through dummy capacitor in voltage range 20 μV_{RMS} to 20 V_{RMS} 26 dB to 146 dB (re 1 μV)	0.1 dB	
Electrical test / signal conditioner for microphones Polarization voltage	Polarization voltage 200 V	Measurement of voltage difference to reference source	0.2 V	
Acoustics Force sensitivity (Mechanical impedance) / Artificial mastoid	125 Hz to 800 Hz > 800 Hz to 4 kHz > 4 kHz to 8 kHz 250 Hz	Calibration with impedance head at (23.0 \pm 0.5) $^{\circ}\text{C}$ according to IEC 60318-6:2007	0.4 dB (0.5 dB) 0.5 dB (0.7 dB) 1.0 dB (1.0 dB) 1.0 degree	Calibration at 5.4 N and 2.5 N contact force
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 using the 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) sinusoidal Vibration sensor Vibration meter Vibration calibrator Laser vibrometer Calibration System for vibration Sensors	0.01 m/s^2 to 20 m/s^2 0.1 m/s^2 to 500 m/s^2 1 m/s^2 to 250 m/s^2	ISO 16063-21:2003 DAkkS-DKD-R 3-1, Part 3:2010 0.1 Hz to < 0.2 Hz 0.2 Hz to < 0.4 Hz 0.4 Hz to < 1 Hz 1 Hz to 63 Hz > 63 Hz to 160 Hz 2 Hz to < 5 Hz 5 Hz to < 20 Hz 20 Hz to 1 kHz > 1 kHz to 5 kHz > 5 kHz to 10 kHz 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 % / 2.0° 1.0 % / 1.0° 0.7 % / 0.7° 0.5 % / 0.7° 1.0 % / 1.0° 1.5 % / 1.0° 1.0 % / 1.0° 0.5 % / 0.5° 1.0 % / 1.0° 2.0 % / 1.0° 1.0 % / 1.0° 0.7 % / 0.7° 0.5 % / 0.5° 0.7 % / 0.7° 1.5 % / 1.0° 2.0 % / 2.0° 2.5 % / 3.0°	Sensor weight up to 0.9 kg Displacement amplitude up to 400 mm Sensor weight up to 0.5 kg Displacement amplitude up to 10 mm Sensor weight up to 0.2 kg Displacement amplitude up to 8 mm Calibration result: - complex sensitivity (amount/phase) - displayed deviation - vibration amplitude
Acceleration (secondary) sinusoidal Geophone / Seismometer Measurement chain	0.001 m/s^2 to 20 m/s^2	ISO 16063-21:2003 DAkkS-DKD-R 3-1, Part 3:2010 0.2 Hz to < 1 Hz 1 Hz to 10 Hz > 10 Hz to 160 Hz > 160 Hz to 400 Hz	1.5 % / 1.5° 1.0 % / 1.0° 2.0 % / 2.0° 3.0 % / 3.0°	Maximum payload refer under chapter: "Acceleration sinusoidal Geophones / Seismometer" Calibration result: - complex sensitivity (amount /phase)

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Measured quantity / Calibration item	Range	Measurement conditions / procedure	Calibration and measurement capability ¹⁾	Remarks
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) shock (sin²-pulse) Vibration sensor Vibration meter Calibration system for vibration Sensors	0.2 km/s ² to 2 km/s ² 0.2 km/s ² to 2 km/s ² > 2 km/s ² to 20 km/s ² > 20 km/s ² to 100 km/s ²	ISO 16063-22:2005 DAKKS-DKD-R 3-1, Part 2:2010 Shock excitation Pulse width (PWHS): 10 ms to 1 ms 4.0 ms to 1.6 ms 0.4 ms to 0.1 ms 0.2 ms to 0.08 ms	1.0 % 0.8 % 1.5 % 3.0 %	Excitation with pendulum Sensor weight up to 0.3 kg Excitation with PN-LMS Sensor weight up to 0.05 kg
Acceleration (secondary) shock (sin-pulse) Vibration sensor Vibration meter Calibration system for vibration Sensors	0.2 km/s ² to 2.5 km/s ² 0.2 km/s ² to 5.5 km/s ² 0.2 km/s ² to 10 km/s ² 10 km/s ² to 40 km/s ²	ISO 16063-22:2005 Shock excitation Pulse width (PWHS): 200 µs to 150 µs < 150 µs to 100 µs < 100 µs to 30 µs 70 µs to 30 µs	1.0 % 1.5 % 2.0 % 4.0 %	Excitation with HOP-MS Sensor weight up to 0.05 kg
Acceleration (primary) sinusoidal Vibration sensor Vibration meter Vibration calibrator Laser-vibrometer Calibration system for vibration Sensors Vibration sensor is integrated in vibration exciter (internal reference accelerometer)	0.01 m/s ² to 30 m/s ² 0.01 m/s ² to 30 m/s ²	ISO 16063-11:1999 DAKKS-DKD-R 3-1, Part 4:2010 0.1 Hz to < 0.2 Hz 0.2 Hz to < 0.4 Hz 0.4 Hz to < 1 Hz 1 Hz to 63 Hz > 63 Hz to 160 Hz 0.1 Hz to < 0.2 Hz 0.2 Hz to < 0.4 Hz 0.4 Hz to < 1 Hz 1 Hz to 63 Hz > 63 Hz to 160 Hz	1.0 % / 1.5° 0.5 % / 0.7° 0.5 % / 0.5° 0.3 % / 0.5° 0.7 % / 0.7° 1.0 % / 1.5° 0.5 % / 0.7° 0.4 % / 0.5° 0.3 % / 0.4° 0.5 % / 0.7°	Sensor weight up to 0.9 kg Displacement amplitude up to 400 mm Calibration result: - complex sensitivity (amount /phase) - displayed deviation - vibration amplitude For vibration exciters whose technical data correspond to the vibration exciters used in the laboratory Displacement up to 400 mm Calibration result: - complex sensitivity (amount /phase)
Acceleration (primary) sinusoidal Vibration sensor Vibration meter Vibration calibrator Laser vibrometer Calibration System for vibration Sensors Vibration sensor is integrated in vibration exciter (internal reference accelerometer)	1 m/s ² to 250 m/s ² 1 m/s ² to 100 m/s ²	ISO 16063-11:1999 DAKKS-DKD-R 3-1, Part 4:2010 5 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 5 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	0.5 % / 0.5° 0.3 % / 0.5° 0.5 % / 0.5° 1.0 % / 1° 2.0 % / 2° 2.5 % / 3° 0.5 % / 0.4° 0.3 % / 0.4° 0.3 % / 0.4° 0.5 % / 0.7° 1.0 % / 1.5° 1.5 % / 2.0°	Sensor weight up to 0.9 kg Displacement amplitude up to 400mm Calibration result: - complex sensitivity (amount /phase) - displayed deviation - vibration amplitude For vibration exciters whose technical data correspond to the vibration exciters used in the laboratory Calibration result: - complex sensitivity (amount /phase)

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Measured quantity / Calibration item	Range	Measurement conditions / procedure	Calibration and measurement capability ¹⁾	Remarks
Acceleration (primary) sinusoidal Geophone / Seismometer Measurement chain	0.001 m/s ² to 20 m/s ²	ISO 16063-11:1999 DAKKS-DKD-R 3-1, Part 4:2010 0.1 Hz to < 0.2 Hz <i>m_{mMax}</i> vertical: 50 kg <i>m_{max}</i> horizontal: 30 kg	1.5 % / 2.0°	<i>m_{max}</i> : maximum Payload Device under Test Calibration result: - complex sensitivity (amount/phase) - displayed deviation
		0.2 Hz to < 1 Hz <i>m_{max}</i> vertical: 50 kg <i>m_{max}</i> horizontal: 30 kg	1.0 % / 1.0°	
		1 Hz to 10 Hz <i>m_{max}</i> vertical: 50 kg <i>m_{max}</i> horizontal: 30 kg	0.7 % / 1.0°	
		> 10 Hz to 160 Hz <i>m_{max}</i> vertical: 20 kg <i>m_{max}</i> horizontal: 20 kg	1.5 % / 1.5°	
		> 160 Hz to 400 Hz <i>m_{max}</i> vertical: 10 kg	2.0 % / 2.0°	
Acceleration (primary) sinusoidal Reference Laser vibrometer	0.01 m/s ² to 30 m/s ² 1.0 m/s ² to 250 m/s ²	ISO 16063-41:2011 0.1 Hz to < 0.4 Hz 0.4 Hz to < 1.0 Hz 1.0 Hz to 160 Hz	0.25 % / 0.20° 0.15 % / 0.20° 0.15 % / 0.20°	Displacement amplitude up to 400 mm Displacement amplitude up to 8 mm Calibration result: Deviation of indication
		5 Hz to 1 kHz > 1 kHz to 10 kHz > 10 kHz to 15 kHz > 15 kHz to 20 kHz	0.15 % / 0.2° 0.15 % / 0.5° 0.25 % / 1.0° 0.30 % / 1.5°	
Acceleration (primary) Vibration meter Vibration sensor	0 m/s ² to 1 g _L 0.17 m/s ² to < 0.342 m/s ² 0.342 m/s ² to < 0.513 m/s ² 0.513 m/s ² to < 1.703 m/s ² 1.703 m/s ² to < 3.355 m/s ² 3.355 m/s ² to < 6.306 m/s ² 6.306 m/s ² to < 9.219 m/s ² 9.219 m/s ² to 1 g _L	ISO 16063-16:2014 Calibration from 0 m/s ² until maximum local gravity acceleration (<i>g_L</i>) by inclination in the earth's gravity field	0.01 m/s ² 2.40 % 1.30 % 0.90 % 0.30 % 0.20 % 0.10 % 0.04 %	Calibration result: deviation for measuring instruments and transmission coefficient for sensors (transducer)
Inclination angle (secondary) Inclination angle sensor	1° to < 2° 2° to < 3° 3° to < 10° 10° to < 25° 25° to < 50° 50° to < 75° 75° to 90°	Calibration in the angular range 1 ° to 90 ° in relation to the direction of the gravitational vector <i>g_L</i>	2.2 % 1.2 % 0.50 % 0.30 % 0.20 % 0.10 % 0.04 %	Calibration result: - transfer coefficient
Angular rate dynamic (secondary)	8 °/s to 3000 °/s	0.5 Hz to < 1 Hz 1 Hz to 200 Hz	0.7 % / 0.8° 0.6 % / 0.8°	Calibration result: - complex sensitivity (value/phase) - displayed deviation

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Measured quantity / Calibration item	Range	Measurement conditions / procedure	Calibration and measurement capability ¹⁾	Remarks
Acceleration (secondary)	0.5 m/s ² to 20 m/s ²	ISO 16063-21:2003 DAkkS-DKD-R 3-1, page 3:2010 0.5 Hz to < 10 Hz 10 Hz to 20 Hz	1.0 % 2.0 %	Calibration of "equipment for system data testing and / or testing via the electronic vehicle interface in accordance with § 29 i. V. m. Annex VIIIa StVZO as universal measuring instruments " (HU adapter) Traffic Journal 23/2014 No. 202: 20.11.2014
Angular rate (secondary)	8 °/s to 100 °/s	0.5 Hz to < 10 Hz 10 Hz to 20 Hz	1.2 % 2.2 %	
Charge Charge amplifier	0.1 pC to 10.000 pC	0.2 Hz to 20 kHz > 20 kHz to 50 kHz	0.25 % / 0.5° 1.0 %	Calibration result: - Complex transfer coefficient (module / phase)
Voltage Measuring amplifier	1 mV to 30 V	0.2 Hz to 20 kHz > 20 kHz to 50 kHz	0.2 % / 0.5° 1.0 %	
Dynamic Force (secondary) shock (sin²-pulse) Impact hammer	10 N to 500 N	Shock excitation Pulse width (PWHS): 10 ms to 0.1 ms	5 %	Calibration result: transfer coefficient

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Onside-Calibration

Measured quantity / Calibration item	Range	Measurement conditions / procedure	Calibration and measurement capability ¹⁾	Remarks
Acceleration (secondary) sinusoidal vibration test system	0.79 m/s ² to 500 m/s ²	2 Hz to 5 Hz	2.0 %	Calibration result: deviation The environmental conditions and characteristics of the vibration test system must be within specified limits
		> 5 Hz to 2 kHz	1.5 %	
Acceleration (secondary) shock vibration test system	20 m/s ² to 500 m/s ²	> 2 kHz to 5 kHz	2.0 %	
		20 ms to 10 ms	2.0 %	
		10 ms to 2 ms	1.5 %	
		2 ms to 0.5 ms	2.0 %	

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