Calibration Systems CS18

SPEKTRA

Calibration Systems CS18 for Sound and Vibration Measurement Engineering

The CS18 Calibration System is a system family with various versions that are optimized for a wide variety of measurements in sound and vibration engineering. Calibration of the magnitude of transfer coefficient is a common feature of all systems. The SRS-35 Measurement and Control System can integrate acceleration signals over time with high precision and so allows transducers sensitive to vibration velocity and displacement to be calibrated as well. Many optional extras are available by means of which the perfor-mance of every system can be upgraded still further.

Possible modes of calibration by CS18:

Vibration: Absolute and comparison calibration

Sound: Comparison calibration of sound pressure in a free sound field or a pressure chamber.

Electrical quantities: Comparison calibration of charge and voltage

The SRS-35 Measurement, Analysis and Control System by SPEKTRA is the common electronic platform of all CS18 systems. A dedicated software package provides a standardized user interface and is allocated to each system. Depending on the required configuration, their standard signal conditioners directly accept charge sensors, sensors with integrated impedance converters or two measuring microphones.

Explanations to the Calibration Systems

Modern **Calibration Systems** are conforming to ISO 16063 in vibration engineering and to IEC 61094, IEC 61672, IEC 61043, and IEC 60942 in acoustics.

Secondary Calibration is calibration by comparing the test object with a reference standard. The unknown transfer coefficient of the test object is traced back to the known transfer coefficient of the reference standard, in acoustics often by substitution.

Primary Calibration is absolute calibration. In vibration engineering, the excitation acceleration is traced back to the wavelength of Helium-Neon laser light by means of interferometric amplitude measurement.

The **Excitation Signal** in calibration can be vibration acceleration with a sinusoidal or shock-type waveform, depending on the goal of calibration, or sound pressure, configured as a plane wave in a free sound field or alternating pressure in a pressure chamber.

The **Result of Calibration** is the transfer coefficient or its level in dB and a statement of its range of uncertainty.

The **Frequency Range of Calibration** is determined by the customer. Potential frequency ranges are: 0.2 Hz to 20 kHz in vibration engineering or 31.5 Hz to 20 kHz for the calibration in acoustics.

The **Performance** of a calibration system for vibration is mainly dependent on the vibration exciter and reference standard, as they determine the frequency range, maximum test object weight and measurement uncertainty. In acoustics, the inner dimensions of the anechoic chamber determine the lower limiting frequency of free-field calibration.

The **Measurement Uncertainty** of modern systems is specified according to GUM (ISO Guide to the Expression of Uncertainty in Measurement, 1995) with expansion factor k = 2. It is stated in the documentation specifically for each system as a function of frequency, weight of object under test (for vibration) and other relevant calibration parameters.

Systems for Comparison Calibration

CS18 VLF System for the comparison calibration of vibration sensors at very low frequencies 0.2 Hz to 160 Hz, e.g. seismic sensors with a weight of up to 3 Kilogram and sensors of whole-body vibration

CS18 LF System for the comparison calibration of sensors with a weight of up to 250 gram or 500 gram (with optional extra) in frequency range 3 Hz to 5 kHz, in particular for crash sensors

CS18 MF System for the calibration of vibration sensors in frequency range 5 Hz to 10 kHz; standard system for common vibration sensors
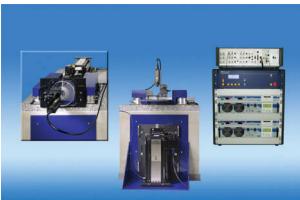

CS18 HF System for the comparison calibration of sensors in a working frequency range from 5 Hz to 20 kHz and for resonance search up to 50 kHz

Users: DKD calibration labs, quality management divisions in industry, sensor manufacturers

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Systems for Absolute Calibration

CS18P VLF, horizontal or vertical excitation, for the absolute calibration at very low frequencies in the range from 0.2 Hz to 160 Hz, e.g. seismic, shock and human vibration sensors

CS18P HF, System for the absolute method of vibration calibration in frequency range 5 Hz to 20 kHz

Users: National offices of metrology, DKD calibration laboratories, quality management divisions in industry, sensor manufacturers

Systems for Shock Calibration

CS18 LS, system with shock pendulum for calibrating sensors at low shock acceleration up to 200 g_n. Efficient system for calibrating crash sensors up to a mass of 300 gram

CS18 MS, system for calibration of sensors with medium shock acceleration up to 40.000 g_n. Efficient system for calibrating shock sensors

CS18 HS, system for calibration of sensors with high shock acceleration up to 100.000 g_n. Efficient system for calibrating shock sensors

Users: Quality assurance in automotive industries

Systems for Sound Pressure Calibration

CS18 FF[1], *System for the free-field calibration of microphones and sound level meters in the frequency range 125 Hz to 20 kHz by the substitution*

CS18 SPL, *System for the pressure calibration of ½" and ¼" measuring microphones by the comparison method in the frequency range 31.5 Hz to 5 kHz*

Users : DKD calibration labs, universities, acoustical research centers

[1] *The anechoic test chamber complies with ISO 3745 precision class 1. It is supplied as part of every CS18 FF. The dimensions of the chamber are 2 m x 2 m x 2.5 m.*

Examples of Combinations from Calibration Systems with Production Facilities

CS18 MF Calibration System in connection with a Thermostream; Calibration under different temperatures in the R&D field.

CS18 VLF in connection with a climatic chamber for use in the sensor development

Hard- and Software Options to increase the range of capacity in the calibration procedure

- **ANA PR** Signal conditioner for making direct connection to piezo-resistive sensors, including software for the determination of electrical quantities
- **CAL-Q-U-ICP®** Module and software for calibrating the magnitude of the transfer coefficient of charge and voltage amplifiers
- **APS 0109** Zero Position Controller
- **HL** To increase the admissible test object weight of a CS18 LF System up to 500 gram
- **Data Base** Database linkage, interface to database of sensors and measuring instruments
- **MS-C** Multi-Sine Calibration
- **PHASE** Phase-calibration of vibration sensors, with the option CAL-Q-U-ICP® also of signal conditioners

- **TEDS** Calibration of sensors using their integrated electronic data sheet (according to IEEE 1541.4)
- **MUB** Drawing up and determination of the individual Measurement uncertainty budget when supplying a CS18 Calibration system
- **CS18 ZK** Accessories bag contains all the means for weighing, mounting, isolating sensors, connecting cables, cable clamps, cable adapters for making connection to an instrument, torque wrench and auxiliary utensils.
- **Mobil** Transportation trolley for CS18 LF / MF and CS18 HF
- **AIR** Supply unit for air bearing shakers
- **CLIMATE** Hygrometer and thermometer for the laboratory
- **SEMINAR** with teaching and training

SPEKTRA does carry out annually **Calibration Seminars** for all users of calibration systems.

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