

CS18P Seis

Calibration System for Seismic Sensors



Features

- ✓ Primary calibration system according to the ISO 16063-11 standard
- ✓ Frequency range 0.1 Hz ... 100 Hz for sensors < 25 kg and 0.1 Hz ... 400 Hz for sensors < 5 kg weight
- ✓ Sensor mass up to 25 kg for horizontal and up to 35 kg for vertical excitation
- ✓ Air bearing shaker with 450 mm stroke for horizontal excitation
- ✓ Air bearing shaker for vertical excitation with patented load compensation
- ✓ Digital laser vibrometer as primary reference
- ✓ Upgradeable to calibration systems, e.g. type CS18P VLF / HF

Applications

- ✓ Primary calibration of seismometer, geophones and other heavy vibration velocity transducers
- ✓ Primary calibration of reference standard low frequency accelerometers
- ✓ Calibration of seismic sensors and determination of sensors
- ✓ Secondary calibration of vibration sensors, calibrators

Range of use

- ✓ Authorized calibration laboratories
- ✓ Quality assurance in sensor production
- ✓ National metrology laboratories



System Components

Vibration control system	SRS-35
Vibration exciter	SE-13 (vertical) APS 600 (horizontal)
Power amplifiers	APS 125 (vertical & horizontal excitation)
Electronic zero position controller, horizontal	APS 0109
Reference standard accelerometer	BN-07 or BN-21 for secondary calibration according to ISO 16063-21
Digital laser vibrometer	PLV-01 as primary reference standard according to ISO 16063-11
Vibration isolation	VI-02 for positioning the laser vibrometer
Software	Software CS18P with primary operation modes: Sensor Calibration, Measurement, Vibration Generation



⊕ Specifications of CS18P VLF with SE-13

Frequency range	0.1 Hz... 400 Hz
Sensor mass	up to 35 kg
Temperature	23 °C (± 2 °C)
Relative humidity	30 %... 75 %

Frequency Range		Max. Payload of DUT vertical	Expanded Uncertainty ²⁾ Amount ³⁾ / Phase ¹⁾
0.1 Hz	0.4 Hz	35 kg	1.5 % / 1.5°
> 0.4 Hz	16 Hz		0.7 % / 1.0°
> 16 Hz	40 Hz		1.5 % / 1.5°
> 40 Hz	100 Hz	20 kg	2.0 % / 2.0°
> 100 Hz	400 Hz	10 kg	2.0 % / 2.0°
Reference frequency: 1 / 4 / 8 / 16 Hz		25 kg	0.7 % / 1.0°

Working Range (peak value)	
Minimum limited by velocity	0.1 Hz... 400 Hz: 1.0 mm/s 1 Hz Ref. Freq.: 0.2 mm/s
Maximum⁴⁾ limited by displacement, velocity or acceleration	10 mm in the range of 0.1 Hz... 4 Hz 250 mm/s in the range of 4 Hz... 6.5 Hz 10 m/s² in the range of 6.5 Hz... 400 Hz
Maximum⁵⁾ limited by displacement, velocity or acceleration	10 mm in the range of 0.1 Hz... 4 Hz 250 mm/s in the range of 4 Hz... 25 Hz 40 m/s² in the range of 25 Hz... 120 Hz 40 m/s² ... 25 m/s² in the range of 120 Hz... 400 Hz

1) Only in combination with optional extra PHASE

2) Determined according to GUM (ISO Guide to the expression of uncertainty in measurement) with $k = 2$ (coverage factor). The measurement uncertainty is specified for the best possible device under test (DUT): „Nanometrics Trillium Compact“ (plus its mounting adapter) in two configurations: first the DUT and secondly the DUT with additional dummy mass. Best uncertainty values only valid for symmetric centered mounting of the DUT and the mass with a center of gravity <80 mm at 35 kg above exciter table. Any other type of DUT can be calibrated. But they must meet the maximum payload limits given by the data sheet of the vibration exciter. Measurement uncertainties need to be determined individually, especially for frequencies above 20 Hz.

3) Valid for electrical sensor signals $\geq (1 \text{ mV or } 1 \text{ pC})$

4) Maximum vibration amplitude for maximum payload (DUT)

5) Maximum vibration amplitude without any payload (DUT)



⊕ Specifications of CS18P VLF with APS 600

Frequency range	0.1 Hz... 100 Hz
Sensor mass	up to 25 kg
Temperature	23 °C (± 2 °C)
Relative humidity	30 %... 75 %

Frequency Range		Max. Payload of DUT	Expanded Uncertainty ²⁾ Amount ³⁾ / Phase ¹⁾
0.1 Hz	0.4 Hz	25 kg	1.5 % / 1.5°
> 0.4 Hz	16 Hz		0.7 % / 1.0°
> 16 Hz	40 Hz		1.5 % / 1.5°
> 40 Hz	100 Hz	15 kg	2.5 % / 2.0°
Reference Frequency: 1 / 4 / 8 / 16 Hz		25 kg	0.7 % / 0.7°

Vibration Performance (peak value)	
Minimum limited by velocity	0.1 Hz... 400 Hz: 1.0 mm/s 1 Hz Ref. Freq.: 0.2 mm/s
Maximum⁴⁾ limited by displacement, velocity or acceleration	200 mm in the range of 0.10 Hz... 0.315 Hz 0.4 m/s in the range of 0.315 Hz... 0.8 Hz 2.0 m/s² in the range of 0.8 Hz... 10 Hz 2.0 m/s² in the range of 10 Hz... 40 Hz 0.5 m/s² in the range of 40 Hz... 100 Hz
Maximum⁵⁾ limited by displacement, velocity or acceleration	200 mm in the range of 0.1 Hz... 0.315 Hz 0.4 m/s in the range of 0.315 Hz... 4.0 Hz 10 m/s² in the range of 4.0 Hz... 10 Hz 10 m/s²... 2.0 m/s² in the range of 10 Hz... 40 Hz 1.0 m/s² in the range of 40 Hz... 100 Hz

1) Only in combination with optional extra PHASE

2) Determined according to GUM (ISO Guide to the expression of uncertainty in measurement) with $k = 2$ (coverage factor). The measurement uncertainty is specified for the best possible device under test (DUT): „Nanometrics Trillium Compact“ (plus its mounting adapter) in two configurations: first the DUT and secondly the DUT with additional dummy mass. Best uncertainty values only valid for symmetric centered mounting of the DUT and the mass with a center of gravity <80 mm at 35 kg above exciter table. Any other type of DUT can be calibrated. But they must meet the maximum payload limits given by the data sheet of the vibration exciter. Measurement uncertainties need to be determined individually, especially for frequencies above 20 Hz.

3) Valid for electrical sensor signals $\geq (1 \text{ mV or } 1 \text{ pC})$

4) Maximum vibration amplitude for maximum payload (DUT)

5) Maximum vibration amplitude without any payload (DUT)



Accessories (optional)

Adapter base plates	APS 600, SE-13
Adapter sets for the following seismometers	CMG-3T, CMG-40T-1, STS-2/ STS-2.5, CMG-3TB, ES-DH, STS-5A, ES-T, Trillium Compact, Trillium Horizon