

Final Calibration Certificate

Instrument Model: MS III 10 IPS Instrument SN: 7762 Seismic SN: 7762 Acoustic SN: 7762

Seismic Results (in/s)

Frequency	Input	Radial	Vertical	Transverse	Tolerance	Pass/Fail
2	1.00	0.900	0.900	0.900	+5% to -3dB	Passed
4	1.00	0.990	1.00	0.990	+/- 5% or +/- 0.02 in/s whichever is greater	Passed
10	1.00	1.00	1.00	1.00	+/- 5% or +/- 0.02 in/s whichever is greater	Passed
30	1.00	1.00	1.00	1.00	+/- 5% or +/- 0.02 in/s whichever is greater	Passed
60	1.00	1.00	1.00	1.00	+/- 5% or +/- 0.02 in/s whichever is greater	Passed
125	1.00	1.01	1.01	1.01	+/- 5% or +/- 0.02 in/s whichever is greater	Passed
200	1.00	0.900	0.890	0.890	+5% to -3dB	Passed
250	1.00	0.730	0.730	0.720	+5% to -3dB	Passed

Acoustic Results

Frequency	Input	Acoustic	Tolerance	Pass/Fail
2	1.0	0.7	-3 dB, +/-1 dB	Passed
3	1.0	0.9	-1 dB, +/-1 dB	Passed
4	1.0	1.0	+/-1 dB	Passed
10	1.0	1.0	+/-1 dB	Passed
30	1.0	1.0	+/-1 dB	Passed
60	1.0	1.0	+/-1 dB	Passed
100	1.0	1.0	+/-1 dB	Passed
125	1.0	1.0	+/-1 dB	Passed
200	1.0	0.9	+1 dB to -3 dB	Passed
250	1.0	0.7	+1 dB to -3 dB	Passed

Statement

I certify that all seismic and acoustic components of this instrument were calibrated on a shake table or electronically, and in an acoustic chamber, at the listed input level and frequencies. The results are within the International Society of Explosives Engineers (ISEE) Performance Specifications for Blasting Seismographs 2017 Edition.

References

Signal Generator for shake table- Model BK Precision 4040B Serial # 365L17102, Shake table with acoustic chamber- Model ST-1S serial # 9031, Shake table reference- Vibe metrics Accelerometer Model 1020s serial # 3367, Acoustic Reference- Piston Phone is B & K Type 4228. Serial number 1504026. All references are traceable to NIST.

Notes

Frequencies at and above 60 Hz were tested electronically in order to remove shake table distortion error.

Date: 2020-10-19

Technician (Leslie Haynes):





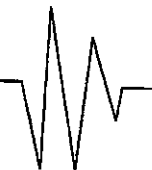
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Phase Response Document

Instrument Model: MS III 10 IPS Instrument SN: 7762 Seismic SN: 7762

Radial	Frequency Hz	Amplitude in/s	Deviation %	Tolerance	Pass/Fail
Reference F	30.00	1.000		N/A	N/A
F1 (0.707 x A)	1.28	0.707		F1 ≤ 2.0 Hz	Pass
F2 (1.270 x F1)	1.63	0.900	5.88%	F amplitude x 0.85 +/- 10%	Pass
F3 (0.760 x F1)	0.97	0.450	-10.00%	F amplitude x 0.50 +/- 10%	Pass
F4 (0.707 x A)	258.00	0.707		F4 ≥ 250 Hz	Pass
F5 (0.787 x F4)	203.05	0.890	4.71%	F amplitude x 0.85 +/- 10%	Pass
F6 (1.3165 x F4)	339.66	0.450	-10.00%	F amplitude x 0.50 +/- 10%	Pass
Vertical	Frequency Hz	Amplitude in/s	Deviation %	Tolerance	Pass/Fail
Reference F	30.00	1.000		N/A	N/A
F1 (0.707 x A)	1.29	0.707		F1 ≤ 2.0 Hz	Pass
F2 (1.270 x F1)	1.64	0.900	5.88%	F amplitude x 0.85 +/- 10%	Pass
F3 (0.760 x F1)	0.98	0.450	-10.00%	F amplitude x 0.50 +/- 10%	Pass
F4 (0.707 x A)	257.00	0.707		F4 ≥ 250 Hz	Pass
F5 (0.787 x F4)	202.26	0.880	3.53%	F amplitude x 0.85 +/- 10%	Pass
F6 (1.3165 x F4)	338.34	0.450	-10.00%	F amplitude x 0.50 +/- 10%	Pass
Transverse	Frequency Hz	Amplitude in/s	Deviation %	Tolerance	Pass/Fail
Reference F	30.00	1.000		N/A	N/A
F1 (0.707 x A)	1.28	0.707		F1 ≤ 2.0 Hz	Pass
F2 (1.270 x F1)	1.63	0.910	7.06%	F amplitude x 0.85 +/- 10%	Pass
F3 (0.760 x F1)	0.97	0.450	-10.00%	F amplitude x 0.50 +/- 10%	Pass
F4 (0.707 x A)	256.00	0.707		F4 ≥ 250 Hz	Pass
F5 (0.787 x F4)	201.47	0.880	3.53%	F amplitude x 0.85 +/- 10%	Pass
F6 (1.3165 x F4)	337.02	0.460	-8.00%	F amplitude x 0.50 +/- 10%	Pass

Date: 2020-10-19

Technician (Leslie Haynes):