White Industrial Seismology, Inc.
1206 Schifferdecker • P.O. Box 1256
Joplin, MO 64802-1256
417-624-0164 ♦ 800-641-4538 ♦ Fax: 417-624-9416
www.whiteseis.com

As Found 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	0.920	0.910	0.900	+5% to -3dB	Passed
4	1.00	1.01	1.00	0.990	+/- 5% or +/- 0.02 in/s whichever is greater	Passed
10	1.00	1.02	1.00	1.02	+/- 5% or +/- 0.02 in/s whichever is greater	Passed
30	1.00	1.04	1.02	1.04	+/- 5% or +/- 0.02 in/s whichever is greater	Passed
60	1.00	1.01	1.01	1.01	+/- 5% or +/- 0.02 in/s whichever is greater	Passed
125	1.00	1.03	1.02	1.02	+/- 5% or +/- 0.02 in/s whichever is greater	Passed
200	1.00	0.910	0.910	0.900	+5% to -3dB	Passed
250	1.00	0.740	0.740	0.730	+5% to -3dB	Passed

Acoustic Results Frequency	Input	Acoustic	Tolerance	Pass/Fail
2	134.0	130.2	-3 dB, +/-1 dB	Passed
3	134.0	132.8	-1 dB, +/-1 dB	Passed
4	134.0	133.3	+/-1 dB	Passed
10	134.0	133.6	+/-1 dB	Passed
30	134.0	133.5	+/-1 dB	Passed
60	134.0	134.0	+/-1 dB	Passed
100	134.0	134.1	+/-1 dB	Passed
125	134.0	134.1	+/-1 dB	Passed
200	134.0	133.1	+1 dB to -3 dB	Passed
250	134.0	131.2	+1 dB to -3 dB	Passed

Statement

I certify that all seismic and acoustic components of this instrument were checked as found on a shake table, 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 2022 Edition.

References

Signal Generator for shake table- Model BK Precision 4040B Serial # 365B14181, Shake table with acoustc chamber - Model ST-1S serial # 9013, 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: 2024-01-09

Technician (Bowen Trower): Bowen Trower

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

Radial	Frequency Hz	Amplitude in/s	Deviation %	Tolerance	Pass/Fail
Reference F	30.000	1.000		N/A	N/A
F1 (0.707 x A)	1.770	0.707		F1 <= 2.0 Hz	Pass
F2 (1.270 x F1)	2.250	0.810	-4.71%	F amplitude x 0.85 +/- 10%	Pass
F3 (0.760 x F1)	1.350	0.520	4.00%	F amplitude x 0.50 +/- 10%	Pass
F4 (0.707 x A)	260.000	0.707		F4 >= 250 Hz	Pass
F5 (0.787 x F4)	204.620	0.900	5.88%	F amplitude x 0.85 +/- 10%	Pass
F6 (1.3165 x F4)	342.290	0.460	-8.00%	F amplitude x 0.50 +/- 10%	Pass

Vertical	Frequency Hz	Amplitude in/s	Deviation %	Tolerance	Pass/Fail
Reference F	30.000	1.000		N/A	N/A
F1 (0.707 x A)	1.800	0.707		F1 <= 2.0 Hz	Pass
F2 (1.270 x F1)	2.290	0.810	-4.71%	F amplitude x 0.85 +/- 10%	Pass
F3 (0.760 x F1)	1.370	0.520	4.00%	F amplitude x 0.50 +/- 10%	Pass
F4 (0.707 x A)	259.000	0.707		F4 >= 250 Hz	Pass
F5 (0.787 x F4)	203.830	0.890	4.71%	F amplitude x 0.85 +/- 10%	Pass
F6 (1.3165 x F4)	340.970	0.460	-8.00%	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)	1.800	0.707		F1 <= 2.0 Hz	Pass
F2 (1.270 x F1)	2.290	0.810	-4.71%	F amplitude x 0.85 +/- 10%	Pass
F3 (0.760 x F1)	1.370	0.520	4.00%	F amplitude x 0.50 +/- 10%	Pass
F4 (0.707 x A)	257.000	0.707		F4 >= 250 Hz	Pass
F5 (0.787 x F4)	202.260	0.890	4.71%	F amplitude x 0.85 +/- 10%	Pass
F6 (1.3165 x F4)	338.340	0.460	-8.00%	F amplitude x 0.50 +/- 10%	Pass

Date: 2024-01-09

Technician (Bowen Trower): Bowen Trower

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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	0.890	0.900	+5% to -3dB	Passed
4	1.00	0.990	0.990	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	1.01	1.01	1.01	+/- 5% or +/- 0.02 in/s whichever is greater	Passed
125	1.00	1.03	1.02	1.02	+/- 5% or +/- 0.02 in/s whichever is greater	Passed
200	1.00	0.910	0.910	0.900	+5% to -3dB	Passed
250	1.00	0.740	0.740	0.730	+5% to -3dB	Passed

Acoustic Results Frequency	Input	Acoustic	Tolerance	Pass/Fail
2	134.0	131.5	-3 dB, +/-1 dB	Passed
3	134.0	133.4	-1 dB, +/-1 dB	Passed
4	134.0	133.9	+/-1 dB	Passed
10	134.0	134.2	+/-1 dB	Passed
30	134.0	134.1	+/-1 dB	Passed
60	134.0	134.0	+/-1 dB	Passed
100	134.0	134.1	+/-1 dB	Passed
125	134.0	134.1	+/-1 dB	Passed
200	134.0	133.1	+1 dB to -3 dB	Passed
250	134.0	131.2	+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 2022 Edition.

References
Signal Generator for shake table- Model BK Precision 4040B Serial # 365B14181, Shake table with acoustc chamber - Model ST-1S serial # 9013, 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: 2024-01-09 Technician (Bowen Trower): Bowen Trower

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As Found Certificate

Instrument Model: MS III 10 IPS Instrument SN: 7380 Seismic SN: 7360 Acoustic SN: 7380

Seismic Results (in/s)

Frequency	Input	Radial	Vertical	Transverse	Tolerance	Pass/Fail
2	1.00	0.890	0.880	0.890	+5% to -3dB	Passed
4	1.00	0.990	0.970	0.990	+/- 5% or +/- 0.02 in/s whichever is greater	Passed
10	1.00	0.990	0.980	0.990	+/- 5% or +/- 0.02 in/s whichever is greater	Passed
30	1.00	0.990	0.990	0.990	+/- 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	0.980	0.990	0.990	+/- 5% or +/- 0.02 in/s whichever is greater	Passed
200	1.00	0.860	0.880	0.880	+5% to -3dB	Passed
250	1.00	0.730	0.760	0.760	+5% to -3dB	Passed

Acoustic Results

Frequency	Input	Acoustic	Tolerance	Pass/Fail
2	134.0	131.7	-3 dB, +/-1 dB	Passed
3	134.0	133.0	-1 dB, +/-1 dB	Passed
4	134.0	133.5	+/-1 dB	Passed
10	134.0	134.1	+/-1 dB	Passed
30	134.0	134.0	+/-1 dB	Passed
60	134.0	134.1	+/-1 dB	Passed
100	134.0	134.0	+/-1 dB	Passed
125	134.0	133.9	+/-1 dB	Passed
200	134.0	132.9	+1 dB to -3 dB	Passed
250	134.0	131.5	+1 dB to -3 dB	Passed

Statement

I certify that all seismic and acoustic components of this instrument were checked as found on a shake table, 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 2022 Edition.

References

Signal Generator for shake table- Model BK Precision 4040B Serial # 365B14181, Shake table with acoustic chamber - Model ST-1S serial # 9013. 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: 2024-02-01 Technician (Bowen Trower): Bowen Trower

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Phase Response Document

Instrument Model: MS III 10 IPS Instrument SN: 7380 Seismic SN: 7360

Radial	Frequency Hz	Amplitude in/s	Deviation %	Tolerance	Pass/Fail
Reference F	30.000	1.000		N/A	N/A
F1 (0.707 x A)	1.530	0.707		F1 <= 2.0 Hz	Pass
F2 (1.270 x F1)	1.940	0.870	2.35%	F amplitude x 0.85 +/- 10%	Pass
F3 (0.760 x F1)	1.160	0.480	-4.00%	F amplitude x 0.50 +/- 10%	Pass
F4 (0.707 x A)	258.000	0.707		F4 >= 250 Hz	Pass
F5 (0.787 x F4)	203.050	0.850	0.00%	F amplitude x 0.85 +/- 10%	Pass
F6 (1.3165 x F4)	339.660	0.500	0.00%	F amplitude x 0.50 +/- 10%	Pass

Vertical	Frequency Hz	Amplitude in/s	Deviation %	Tolerance	Pass/Fail
Reference F	30.000	1.000		N/A	N/A
F1 (0.707 x A)	1.520	0.707		F1 <= 2.0 Hz	Pass
F2 (1.270 x F1)	1.930	0.860	1.18%	F amplitude x 0.85 +/- 10%	Pass
F3 (0.760 x F1)	1.160	0.470	-6.00%	F amplitude x 0.50 +/- 10%	Pass
F4 (0.707 x A)	267.000	0.707		F4 >= 250 Hz	Pass
F5 (0.787 x F4)	210.130	0.860	1.18%	F amplitude x 0.85 +/- 10%	Pass
F6 (1.3165 x F4)	351.510	0.490	-2.00%	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)	1.540	0.707		F1 <= 2.0 Hz	Pass
F2 (1.270 x F1)	1.960	0.860	1.18%	F amplitude x 0.85 +/- 10%	Pass
F3 (0.760 x F1)	1.170	0.480	-4.00%	F amplitude x 0.50 +/- 10%	Pass
F4 (0.707 x A)	268.000	0.707		F4 >= 250 Hz	Pass
F5 (0.787 x F4)	210.920	0.860	1.18%	F amplitude x 0.85 +/- 10%	Pass
F6 (1.3165 x F4)	352.820	0.490	-2.00%	F amplitude x 0.50 +/- 10%	Pass

Date: 2024-02-01 Technician (Bowen Trower):

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Final Calibration Certificate

Instrument Model: MS III 10 IPS Instrument SN: 7380 Seismic SN: 7360 Acoustic SN: 7380

Seismic Results (in/s)

Frequency	Input	Radial	Vertical	Transverse	Tolerance	Pass/Fail
2	1.00	0.890	0.890	0.890	+5% to -3dB	Passed
4	1.00	0.990	0.980	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	0.980	0.990	0.990	+/- 5% or +/- 0.02 in/s whichever is greater	Passed
200	1.00	0.860	0.980	0.880	+5% to -3dB	Passed
250	1.00	0.730	0.760	0.760	+5% to -3dB	Passed

Acoustic Results

Frequency	Input	Acoustic	Tolerance	Pass/Fail
2	134.0	131.5	-3 dB, +/-1 dB	Passed
3	134.0	133.0	-1 dB, +/-1 dB	Passed
4	134.0	133.5	+/-1 dB	Passed
10	134.0	134.1	+/-1 dB	Passed
30	134.0	134.0	+/-1 dB	Passed
60	134.0	134.1	+/-1 dB	Passed
100	134.0	134.0	+/-1 dB	Passed
125	134.0	133.9	+/-1 dB	Passed
200	134.0	132.9	+1 dB to -3 dB	Passed
250	134.0	131.5	+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 2022 Edition.

References

Signal Generator for shake table- Modal BK Precision 4040B Serial # 365B14181, Shake table with acoustic chamber - Model ST-1S serial # 9013, 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: 2024-02-01 Technician (Bowen Trower): Bowen Trower

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Final Calibration Certificate

Instrument Model: MS III 10 IPS Instrument SN: 8231 Seismic SN: 8231 Acoustic SN: 8231

Seismic Results (in/s)

Frequency	Input	Radial	Vertical	Transverse	Tolerance	Pass/Fail
2	1.00	0.910	0.910	0.900	+5% to -3dB	Passed
4	1.00	0.990	0.990	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	0.980	0.960	0.990	+/- 5% or +/- 0.02 in/s whichever is greater	Passed
200	1.00	0.870	0.880	0.880	+5% to -3dB	Passed
250	1.00	0.730	0.750	0.740	+5% to -3dB	Passed

Acoustic Results

Frequency	Input	Acoustic	Tolerance	Pass/Fail
2	134.0	131.6	-3 dB, +/-1 dB	Passed
3	134.0	133.3	-1 dB, +/-1 dB	Passed
4	134.0	133.7	+/-1 dB	Passed
10	134.0	133.9	+/-1 dB	Passed
30	134.0	133.7	+/-1 dB	Passed
60	134.0	134.0	+/-1 dB	Passed
100	134.0	133.9	+/-1 dB	Passed
125	134.0	133.9	+/-1 dB	Passed
200	134.0	132.8	+1 dB to -3 dB	Passed
250	134.0	131.4	+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 2022 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: 2023-10-13

Technician (Leslie Haynes): 

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Phase Response Document

Instrument Model: MS III 10 IPS Instrument SN: 8231 Seismic SN: 8231

Radial	Frequency Hz	Amplitude in/s	Deviation %	Tolerance	Pass/Fail
Reference F	30.000	1.000		N/A	N/A
F1 (0.707 x A)	1.260	0.707		F1 <= 2.0 Hz	Pass
F2 (1.270 x F1)	1.600	0.910	7.06%	F amplitude x 0.85 +/- 10%	Pass
F3 (0.760 x F1)	0.960	0.460	-8.00%	F amplitude x 0.50 +/- 10%	Pass
F4 (0.707 x A)	261.000	0.707		F4 >= 250 Hz	Pass
F5 (0.787 x F4)	205.410	0.850	0.00%	F amplitude x 0.85 +/- 10%	Pass
F6 (1.3165 x F4)	343.610	0.480	-4.00%	F amplitude x 0.50 +/- 10%	Pass

Vertical	Frequency Hz	Amplitude in/s	Deviation %	Tolerance	Pass/Fail
Reference F	30.000	1.000		N/A	N/A
F1 (0.707 x A)	1.240	0.707		F1 <= 2.0 Hz	Pass
F2 (1.270 x F1)	1.570	0.910	7.06%	F amplitude x 0.85 +/- 10%	Pass
F3 (0.760 x F1)	0.940	0.450	-10.00%	F amplitude x 0.50 +/- 10%	Pass
F4 (0.707 x A)	264.000	0.707		F4 >= 250 Hz	Pass
F5 (0.787 x F4)	207.770	0.860	1.18%	F amplitude x 0.85 +/- 10%	Pass
F6 (1.3165 x F4)	347.560	0.480	-4.00%	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)	1.265	0.707		F1 <= 2.0 Hz	Pass
F2 (1.270 x F1)	1.610	0.910	7.06%	F amplitude x 0.85 +/- 10%	Pass
F3 (0.760 x F1)	0.960	0.460	-8.00%	F amplitude x 0.50 +/- 10%	Pass
F4 (0.707 x A)	263.000	0.707		F4 >= 250 Hz	Pass
F5 (0.787 x F4)	206.980	0.860	1.18%	F amplitude x 0.85 +/- 10%	Pass
F6 (1.3165 x F4)	346.240	0.480	-4.00%	F amplitude x 0.50 +/- 10%	Pass

Date: 2023-10-13

Technician (Leslie Haynes): _____

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As Found Certificate

Instrument Model: MS III 10 IPS Instrument SN: 8231 Seismic SN: 8231 Acoustic SN: 8231

Seismic Results (in/s)

Frequency	Input	Radial	Vertical	Transverse	Tolerance	Pass/Fail
2	1.00	0.890	0.900	0.900	+5% to -3dB	Passed
4	1.00	0.970	0.980	0.990	+/- 5% or +/- 0.02 in/s whichever is greater	Passed
10	1.00	0.990	0.990	0.990	+/- 5% or +/- 0.02 in/s whichever is greater	Passed
30	1.00	0.990	0.990	0.980	+/- 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	0.980	0.990	0.990	+/- 5% or +/- 0.02 in/s whichever is greater	Passed
200	1.00	0.870	0.880	0.880	+5% to -3dB	Passed
250	1.00	0.730	0.750	0.740	+5% to -3dB	Passed

Acoustic Results

Frequency	Input	Acoustic	Tolerance	Pass/Fail
2	134.0	131.6	-3 dB, +/-1 dB	Passed
3	134.0	133.3	-1 dB, +/-1 dB	Passed
4	134.0	133.7	+/-1 dB	Passed
10	134.0	133.9	+/-1 dB	Passed
30	134.0	133.7	+/-1 dB	Passed
60	134.0	134.0	+/-1 dB	Passed
100	134.0	133.9	+/-1 dB	Passed
125	134.0	133.9	+/-1 dB	Passed
200	134.0	132.2	+1 dB to -3 dB	Passed
250	134.0	131.4	+1 dB to -3 dB	Passed

Statement

I certify that all seismic and acoustic components of this instrument were checked as found on a shake table, 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 2022 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: 2023-10-13

Technician (Leslie Haynes): _____