

## Summary Blue Aluminum\* Sensitiveness Testing

Sample Description	Ignition Temperature [Notes 1-5]	Friction Sensitiveness Rating [Note 6]	50% Impact Sensitiveness [Note 7]	50% ESD Sensitiveness [Note 8]
7:3 (Obron GD)	675 °C	Mildly Sensitive	25 inches	0.5 J
7:3 (2011-01*)	> 775 °C	Relatively Insensitive	38 inches	3.5 J
7:3 (2011-01* + Obron GD)	> 775 °C	Relatively Insensitive	27 inches	2.5 J
7:3:1 (Obron GD)	425 °C	Sensitive	7 inches	0.2 J
7:3:1 (2011-01*)	650 °C	Relatively Insensitive	9 inches	2.5 J
7:3:1 (2011-01* + Obron GD)	625 °C	Relatively Insensitive	7 inches	1.5 J

### Notes:

- 1) Temperature to the nearest 25 °C in which at least one of three trials produced an ignition within 10 seconds.
- 2) Sulfur has a boiling point of 445 °C. In all trials above this temperature, when sulfur was present and did not result in an ignition, the sulfur vaporized on contact with the ignition surface. In at least one case, the sulfur ignited and burned in air without igniting the flash powder.
- 3) Potassium perchlorate has a decomposition temperature of approximately 610 °C. In all trials above this temperature that did not produce an ignition, the potassium perchlorate decomposed, leaving a residue of potassium chloride.

- 4) Aluminum has a melting point of 660 °C. In all trials above this temperature and did not result in an ignition, the aluminum melted on contact with the ignition surface. In several cases, a number of aluminum particles did ignite and burn in air as sparks, but without igniting the flash powder.
- 5) The reported ignition temperatures are accurate to approximately  $\pm 25$  °C. A temperature of 775 °C is the maximum temperature of the apparatus.
- 6) A series of 10 friction sensitivity trials were performed for each test sample, using methods we have previously published.
- 7) A series of at least 30 trials were performed for each test sample, using a 5 kg drop-hammer. Results are reported to the nearest inch of impact height, the approximate level of precision in the results.
- 8) A series of at least 30 trials were performed for each test sample, using a 10 ohm series resistance and the deep well sample tray. Results are reported to the nearest 0.5 joule or one significant figure, the approximate level of precision in the results.

## Blue Aluminum Friction Sensitiveness Testing

Sample Description	Number of Ignitions in Ten Trials			Sensitiveness Rating
	Steel on Steel	Wood on Steel	Wood on Wood	
7:3 (Obron GD)	2	0	---	Mildly Sensitive
7:3 (2011-01*)	0	---	---	Relatively Insensitive
7:3 (2011-01* + Obron GD)	0	---	---	Relatively Insensitive
7:3:1 (Obron GD)	6	2	0	Sensitive
7:3:1 (2011-01*)	0	---	---	Relatively Insensitive
7:3:1 (2011-01* + Obron GD)	0	---	---	Relatively Insensitive

## Blue Aluminum Sound Output Testing

Sample Description	Peak Overpressure [Note 1]	Duration of Positive Phase [Note 2]	Sound Pressure Level [Note 3]
7:3 (Obron GD)	5.83 psi	0.82 ms	186.1 dB
7:3 (2011-01*)	5.79 psi	0.82 ms	186.1 dB
7:3 (2011-01* + Obron GD)	5.89 psi	0.82 ms	186.2 dB
7:3:1 (Obron GD)	6.02 psi	0.83 ms	186.4 dB
7:3:1 (2011-01*)	6.14 psi	0.80 ms	186.6 dB
7:3:1 (2011-01* + Obron GD)	6.17 psi	0.81 ms	186.6 dB

Notes:

- 1) The average of 3 trials using the previously published method (weak confinement, fired with an inverted and shrouded electric match at the bottom of the powder charge, using a free-field piezoelectric blast gauge, at a distance of 4 feet suspended in a blast chamber).
- 2) The average of 3 trials. It is thought that the duration of positive phase affects the perceived tonal quality of the sound of the explosion, with longer versus shorter durations corresponding to more mellow and more sharp impulse sounds, respectively.
- 3) Based on the average peak over-pressure using the relationship for peak –linear sound pressure level, of  $\text{dB} = 170.8 + 20 \log P$ .

**\* 2011-01 IS Blue Aluminum, production run, 2011-01. When 2011-01 + Obron GD is seen, this refers to a mixture of 80% Blue Aluminum and 20% German Dark aluminum.)**