QuickShot™ Plus
Material Safety Data Sheet

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: QuickShot™ Plus Electronic Detonator
Company Address: P O Box 10; Modderfontein; 1645; Rep. of South Africa

2. COMPOSITION/INFORMATION ON INGREDIENTS

Explosive Ingredients: Lead azide, PETN (pentaerythritol tetranitrate), Fusehead composition.

Other Ingredients: Glass, quarts, phosphor bronze, PVC, Nitrile, ink, resin, silicon, tantalum, ceramic, copper, aluminium, gold, tin, Santoprene, Arnite, polypropylene, nickel, chromium, iron.

Chemical Name	CAS No.	%	EC Number	Classification
Lead Compounds	7439-92-1	<1	231-100-4	Repr. Cat. 1;R61 Repr. Cat. 3;R62 Xn; R20/22 R33 N; R50/53
Lead Azide	13424-46-9	<1	236-542-1	E; R3 Repr. Cat. 1;R61 Repr. Cat. 3;R62 Xn; R20/22 R33 N; R50/53
Pentaerythritol Tetranitrate (PETN)	78-11-5	<2	201-084-3	E; R3
Zirconium	7440-67-7	40	231-176-9	F; R15, 17 S2, 7/8, 43
Potassium Perchlorate	7778-74-7	40	231-912-9	O, Xn, N; R9, 11 S2, 13, 22, 27
Leadpicramate		<20		F; R11 S16, 33, 37/39
Nitrocellulose	9004-70-0	<1		F; R11 S16, 33, 37/39

See Section 17 for the full text of the R and S phrases declared above.

Recommended use: A precision initiation system for explosive charges used in commercial mining.

Appearance: A copper tube of 7,5mm OD and 94.0 ±0,25mm or 88.9 ±0.25mm in length and may have the wording DANGEROUS - BLASTING CAP - EXPLOSIVE and DANGER – DETONATEUR - EXPLOSIF printed on the tube. The symbols E and M are stamped into the end of the tube in the case of the 94mm tube. No bottom markings on the 88.9mm tube. A red coloured cable is secured in the tube by means of a pliable/elastic PVC crimp plug.

3. HAZARDS IDENTIFICATION

Electronic Detonators are designed to explode with a substantial release of energy and should therefore be handled with care. Detonators must not be subjected to impact, friction or exposed to heat or flame. . There is a danger of high velocity penetrating shrapnel within a radius of ±10 metres around a detonator.

Classification: E; R3

Additional Hazards: After detonation dust and fumes may be harmful by inhalation on repeated exposure (lead poisoning)

Effects and symptoms:

Pre use: Hazardous materials are encapsulated, no exposure during normal handling is therefore expected.

Post use: Minimal exposure risk is expected as quantities of hazardous components used are small.

For more details on the toxicological properties of the hazardous components, see section 11.

4. FIRST AID MEASURES

Specific immediate treatment:

Ingestion: Not normal route of entry, but obtain medical attention A.S.A.P. Make physician aware of explosive properties of ingested material.

Eye Contact: Unlikely, unless detonator is fired. Obtain medical attention immediately.

Skin Contact: Not harmful, unless detonator is fired. Treat for high velocity trauma, stop bleeding and obtain medical attention A.S.A.P.

Inhalation: Unlikely, unless detonator is fired in a confined space and not in an open ventilated environment. Remove patient from NO_2 exposure to clean air and obtain medical attention. Administer oxygen if possible.

Notes to physician: Treat symptomatically. Keep under observation for Lead poisoning.

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5. FIRE FIGHTING MEASURES

DO NOT FIGHT FIRES INVOLVING EXPLOSIVES.

Specific hazards: Severe explosion when exposed to heat.

Evolves toxic fumes (hydrogen chloride and phosgene) from the PVC when heated to the decomposition state.

Fire fighting further advice: Evacuate the area. Allow fire to burn. Withdraw from fire and let it burn. Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. First move people out of line-of-sight of the scene and away from windows.

6. ACCIDENTAL RELEASE MEASURES

Damaged or cracked detonators may be very sensitive to sources of ignition. Do not pick up or move damaged detonators. Shut off all possible sources of ignition. Evacuate the area and then inform the relevant Authorities or responsible person immediately. In the case of a transport accident, notify the local Authorities/Police Station, the transporting company and supplier. Refer to section 19 for emergency numbers.

7. HANDLING AND STORAGE

Handling: Handle with great care. Impact, heat or flame may cause an explosion.

Storage: In well-ventilated magazine suitably licensed for IMCO Class 1.1B or 1.4S (specified on packaging) and in accordance to the specifications of the relevant Acts on the storage of explosives. The product has a 3 year shelf life from date of manufacture when stored in accordance with relevant regulatory requirements.

8. EXPOSURE CONTROLS/PERSONAL CONTROL

Occupational exposure limits:

Ingredient Name	Occupational Exposure Limits
Lead and lead inorganic compounds	TWA: 0.15 mg/m^2 (8 hours) 80/1107/EEC (Europe, 1998) STEL: 10mg(Pb)/m^3 (OSHA)

TWA - the Time-Weighed Average airborne concentrations over an eight-hour working day, for a five-day working week over an entire working life.

Short term OEL (STEL) - the average airborne concentration over a 15-minute period, which should not be exceeded at any time during a normal eight-hour working day. According to current knowledge these concentrations should neither impair the health of, nor cause undue discomfort to nearly all workers.

Absorption through the skin may be a significant source of exposure. The exposure standard is invalidated if such contact should occur.

Engineering measures: Keep materials in their original packaging to prevent exposure. Provide adequate ventilation and where possible ear protection when firing.

Personal protection: Where possible, wear safety spectacles and non-static producing clothing while handling the detonators.

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9. PHYSICAL AND CHEMICAL PROPERTIES

Form / Colour / Odour: A copper detonator comprising a red wiring harness fitted with a pair of connectors. There may be printed on the side of the body, the words DANGEROUS - BLASTING CAP - EXPLOSIVE and DANGER – DETONATEUR - EXPLOSIF in black.

Specific Gravity (20°C): **N App**	Melting Point (°C): **N App**	Rel Vapour Density (air=1): **N App**
Boiling Point (°C): **N App**	Vapour Pressure (20°C): **N App**	Decomp.Point (°C): **140**
Flash Point (°C): **N App**	Sublimation Point: **N App**	Flammability Limits (%): **N App**
pH: **N App**	Auto-ignition Temp (°C): **140**	Viscosity: **N App**
% Volatile by volume: **N Av**	Evaporation Rate: **N App**	Solubility in water: **N App**

N Av = Not available, **N App** = Not applicable

10. STABILITY AND REACTIVITY

Stability: Contains explosive material. Do not expose to temperatures higher than 100 degrees Celsius.

Decomposition products: CO, CO_2, lead compounds, and oxides of nitrogen.

Hazardous reaction: Impact, heat or flame may cause an explosion.

11. TOXICOLOGY INFORMATION

Inhalation: Lead and fumes may cause effects similar to those described in long term exposure.

Skin contact: When explosion occurs, treat for high velocity trauma, stop bleeding and obtain medical attention A.S.A.P.

Eye contact: Fumes from firing may cause eye irritation.

Ingestion: Fumes from firing may cause irritation to gastrointestinal tract. Keep under observation for possible lead poisoning.

Long-term exposure: Long-term exposure to low concentrations of Lead fumes may result in altered haemoglobin breakdown, kidney damage, anaemia, and central and peripheral nervous system damage.

Acute Toxicity

Ingredient Name	Test	Result	Route	Species
Lead and lead inorganic compounds	LDLo	160 mg/kg	Oral	Pigeon
Pentaerythritol tetranitrate	LD50	1660 mg/kg	Oral	Rat
	LDLo	7000 mg/kg	Oral	Mouse

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Special Remarks on Toxicity to Animals : No additional remark.

Specific Effects

Ingredient Name	Carcinogenic Effects	Mutagenic Effects	Developmental Toxicity	Impairs Fertility
Lead and lead inorganic compounds			Repr.Cat. 1;R61	Repr. Cat. 3;R62
Lead azide			Repr. Cat. 1;R61	Repr. Cat. 3;R62

Special Remarks on Chronic Effects on Humans : TERATOGENIC EFFECTS

Special Remarks on Other Toxic Effects on Humans : Bio accumulative potential (Lead compounds)

12. ECOLOGICAL INFORMATION

Mobility, persistence/degradation, bioaccumulation and ecotoxocity:

Material as supplied and undamaged, presents no ecological problems provided any waste are correctly disposed of. Components are explosive and toxic to aquatic life.

Ecotoxicity Data:

Ingredient Name	Species	Period	Result
Lead and lead inorganic compounds	Trout (LC50)	96 hours	0.14 ppm
	Shrimp (LC50)	48 hours	375 ppm
Pentaerythritol tetranitrate	Pimephales promelas (LC50)	96 hours	27000 mg/l

Ecological information :

Mobility : Not available

Soil/Water Partition Coefficient (K_{oc}) : Not available

Persistence/degradability : Not readily biodegradable

Bio accumulative potential : POSSIBLE

Ingredient Name	Persistence/degradability BOD_5 COD ThOD Aquatic Half-life Photolysis Biodegradability	Bio-accumulative potential $LogP_{ow}$ BCE Potential
Lead and lead inorganic compounds	Not readily	92000 high
pentaerythritol tetranitrate	< 28 day(s).	74 low

Remarks: MAY BE HARMFUL TO ENVIRONMENT IF RELEASED IN LARGE AMOUNTS.

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13. DISPOSAL CONSIDERATIONS

Disposal should be in accordance with the local Explosives Acts and Regulations.

Methods of disposal:	Waste must be disposed of in accordance with National, provincial and local environment control regulations. Call for assistance on disposal. **Disposal of this product should only be undertaken by trained personnel.**
Waste classification:	Hazardous waste.
European Waste Catalogue:	Not available.

14. TRANSPORT INFORMATION

UN Number:	UN 0030
IMDG Class:	1.1B
Packaging Group:	2
Shipping name:	Detonators, Electric

Or,

UN Number:	UN 0456
IMDG Class:	1.4S
Packaging Group:	2
Shipping Name:	Detonators, Electric

15. REGULATORY INFORMATION

South African users should ensure that they comply with the Explosives Act, Act no. 13 of 2003 as amended or the latest official act in force. International users should comply with the Acts and Regulations as applicable in their respective countries.

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16. APPLICATION LIMITATIONS

Recommended Safety distances for transmitters within the frequency range of 150 KHz to 2.5GHz. These are general recommendations and specific frequencies can be tested for on request if shorter distances are required.

Unconnected or non-powered units, a minimum of 0.2m distance for devices under 25W power output and a minimum recommend distance of 5m for devices with a higher than 25W must be observed. (This is the general DetNet rule. Use table 2 for more specific transmitter distances.)

Table 1

Transmitter strength	Typical device	Low voltage state (During testing and programming		High Voltage state (Arming and ready to blast)
		Minimum distance to operate the system safely[1]	Minimum distance to enable full system functionality[2]	
< 2 watt	Cellular phones	0.5 m	1.5 m	2.0 m
< 5 watt	Handheld Radios	1.0 m	2.0 m	3.0 m
< 20 watt	Truck radios	1.5 m	4.0 m	10 m
> 20 watt	Other	5 m	10 m	15 m

Table 2 indicates the safety distances applicable to the unconnected or non-powered units for RF transmitters according to their power output.

Table 2

Antenna Gain (Lin) = 2 (3 dBi) — Transmitter power (W)

Distance (m)	0.25	0.5	1	2	5	10	20	25	50	100
0.1										
0.2										
0.3										
0.5										
1										
1.5										
2										
3										
4										
5										
10										
15										
20										
25										
30										
50										
100										

>200V/m Detonators may be unsafe for handling at these distances (Possible unintended initiation)

<200V/m Detonators safe for handling at these distances

[1] The distance at which the system may experience intermittent communication problems at specific frequencies.
[2] The distance at which the system is not susceptible to RF interference over the frequency band 150 KHz - 2.5GHz.

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17. OTHER INFORMATION

Full text of R-Phrases with number appearing in Section 2:

- R3 - Extreme risk of explosion by shock friction, fire or other sources of ignition.
- R9 - Explosive when mixed with combustible material
- R11 - Highly flammable
- R15 - Contact with water liberates extremely flammable gases
- R17 - Spontaneously flammable in air
- R22 - Harmful if swallowed
- R33 - Danger of cumulative effects.
- R20/22 - Harmful by inhalation and if swallowed.
- R36/37 - Irritating to eyes and respiratory system.
- R36/38 - Irritating to eyes and skin
- R50/53 - Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
- R51/53 - Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
- R61 - May cause harm to the unborn child.
- R62 - Possible risk of impaired fertility.

Full text of S-Phrases with number appearing in Section 2:

- S2 - Keep out of reach of children
- S13 - Keep away from food, drink and animal feeding stuffs
- S16 - Keep away from sources of ignition - No smoking
- S22 - Do not breathe dust
- S27 - Take off immediately all contaminated clothing
- S33 - Take precautionary measures against static discharges
- S43 - In case of fire use dry powder, foam, water, sand
- S7/8 - Keep container tightly closed and dry
- S37/39 - Wear suitable gloves and eye/face protection

Text of classifications appearing in Section 2:

- E - Explosive
- F - Highly flammable
- Xn - Harmful
- Xi - Irritant
- N - Dangerous for the environment
- O - Oxidising
- Repr. Cat.1 - Toxic for reproduction Category 1
- Repr. Cat.3 - Toxic for reproduction Category 2

Other special considerations: None.

This Material Safety Data Sheet summarises at the date of issue our best knowledge of the health and safety hazard information of the product. Since DetNet South Africa (Pty) Ltd. cannot anticipate or control the conditions under which the product may be used, each user must prior to usage, review this Material Safety Data Sheet in the context of how the user intends to handle and use the product in the workplace. In the event of uncertainty or for further information on these products and their safe storage and use, contact your local sales office.

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18. REFERENCE DOCUMENTATION

Lead Azide	P102E (AEL)
PETN	No 075 (AEL)
Vulcan Fusehead	P339E (AEL)
HiFire DetNet Fusehead	PRS-00063 (Schaffler)
SDN Primed Detonator	MSD-00097 (Sasol)

19. CONTACT DETAILS

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