UTM-00229 | DigiShot Plus Detonator | Rev 4

APPROVER: 2019/01/21

Vinesh Naidoo yyyy/mm/dd

APPROVED

1 USERS OF THIS MANUAL

DetNet endeavours to upgrade software to comply with new challenges and needs faced by users in the market. As new software becomes available, the DetNet version control policy requires that all control equipment be upgraded to ensure support is provided on the latest software version installed on equipment as deployed on customer sites.

1.1. End User

- Only trained personnel, and personnel found competent, are allowed to operate the system.
- Users of the system shall be aware of the recommended procedures for using the DigiShot® Plus Detonator as per manufacturer's recommendations.
- These recommendations do not supersede the method as required by local mine, explosives or statutory regulations/procedures/codes of practise regarding the use of detonators. In such cases, the MOST STRINGENT set of rules between the mine, explosives or local regulations/procedures/codes of practise and the manufacturer must be followed.

1.2. Training

Training and software upgrades shall only be performed by a DetNet SA subject matter expert.
Contact the DetNet head office for additional information.

All Users operating the DigiShot® Plus Detonators shall have successfully completed the specific training before performing any work with the device(s).

1.3. Information

Refer to http://www.detnet.com/ for additional detail and documentation.

2 DIGISHOT® PLUS SYSTEM PRODUCT SAFETY

ELECTRONIC DETONATORS ARE TOTALLY DIFFERENT TO CONVENTIONAL ELECTRIC DETONATORS AND ABSOLUTELY NO CONNECTION WITH CONVENTIONAL ELECTRIC DETONATORS OR ANY OTHER ELECTRONIC DETONATORS IS POSSIBLE AS IT CAN LEAD TO UNINTENDED INITIATION. ALL USERS OPERATING THE ELECTRONIC INITIATION SYSTEM SHALL HAVE SUCCESSFULLY COMPLETED THE SPECIFIC TRAINING BEFORE PERFORMING ANY WORK WITH THE DEVICE(S). DO NOT USE ANY DEVICES OTHER THAN THOSE SPECIALLY DESIGNED FOR THIS TYPE OF ELECTRONIC DETONATOR.

2.1. DetNet Safety Philosophy

DetNet safety philosophy is to design, manufacture and provide control equipment, detonators and accessories to the highest safety standards.

- All products must conform to local and international standards before it is sold for use.
- DetNet complies to ISO 9001, SANS 551:2009, CEN/TS 13763-27 which is acceptable to countries we operate in; in countries not subscribing to the above marks, we advise users to engage with DetNet to ensure that all equipment comply to local regulations.

2.2. User Safety

Safety is ensured when the user supplements the product's in-built safety systems through adequate training in the safe use of the product:

- Induction training
- Refresher training

DetNet continuously upgrades software to make our products more user friendly and to ensure that users stay abreast on latest developments, it is important that users get trained on the relevant changes before their equipment is updated.

2.3. Transportation, Storage and Handling

Equipment must be transported, stored, handled and used in conformity with all federal, state, provincial and local laws and regulations. Control equipment and accessories should be handled with due care and not dropped, mishandled, subjected to excessive vibration or exposed to any chemical agents. Connectors should be kept clean and the equipment must be kept in a safe environment to avoid misappropriation or misuse.

2.4. Maintenance Schedule

All equipment in the field will need to be returned to DetNet, or its repair centres, for service at the following intervals:

- Handheld Equipment (Tagger, etc.) – 18 Months.
- Other equipment (Excluding accessories) – 24 Months.

2.5. Information in case of emergency

Refer to http://www.detnet.com/ for additional detail and documentation.

2.6. Warning, Caution, and Note Statements

WARNING, ***CAUTION***, and ***NOTE*** statements are used throughout this manual to emphasise important and critical information. Observe these statements to ensure safety and to prevent product damage. The statements are *defined as follows:*

A WARNING MEANS THAT INJURY OR DEATH IS POSSIBLE IF THE INSTRUCTIONS ARE NOT OBEYED.

Warnings draw special attention to anything that could injure or kill the reader/user. *Warnings* are generally placed before the step in the procedure they relate to. Warning messages are repeated wherever they apply.

A CAUTION MEANS THAT DAMAGE TO EQUIPMENT IS POSSIBLE.

Cautions draw special attention to anything that could damage equipment or cause the loss of data and will normally describe what could happen if the caution is ignored. *Cautions* are generally placed before the step in the procedure they relate to.

Notes are added to provide additional information.

Notes are used to emphasise important information by visually distinguishing this from the rest of the text. Notes can contain any type of information except safety information, which is always placed in cautions or warnings.

Refer to http://www.detnet.com/ for additional detail and documentation.

2.7. DISCLAIMER

This document forms part of the User Manual for the BlastWeb System and is considered to be confidential. This document contains restricted information for company and channel partners' application only.
Should any of the restricted information contained in this document be disclosed to any third party either intentionally or unintentionally, DetNet South Africa will not be held responsible, accountable or liable for any resulting event and or issue.

2.8. RF Compliance - FCC (USA) and ICES (Canada)

2.8.1. Unauthorised Changes

DetNet South Africa has not approved any changes or modifications to this device by the user. Any changes or modifications could void the user's authority to operate the equipment.

DetNet South Africa *n'approuve aucune modification apportée à l'appareil par l'utilisateur, quelle qu'en soit la nature. Tout changement ou modification peuvent annuler le droit d'utilisation de l'appareil par l'utilisateur.*

2.8.2. Radio Interference

This device complies with Part 15 of the FCC Rules and Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

2.8.3. RF Exposure

This equipment complies with FCC and IC radiation exposure limits set forth for an uncontrolled environment. The antenna should be installed and operated with minimum distance of 20 cm between the radiator and your body. Antenna gain must be below 30 dBm
This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Cet appareil est conforme aux limites d'exposition aux rayonnements de la IC pour un environnement non contrôlé. L'antenne doit être installé de façon à garder une distance minimale de 20 centimètres entre la source de rayonnements et votre corps. Gain de l'antenne doit être ci-dessous 30dBm
L'émetteur ne doit pas être colocalisé ni fonctionner conjointement avec à autre antenne ou autre émetteur.

2.8.4. FCC Class B digital device notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- - Reorient or relocate the receiving antenna.
- - Increase the separation between the equipment and receiver.
- - Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- - Consult the dealer or an experienced radio/TV technician for help.

2.8.5. Labelling Requirements for the Host device

The host device shall be properly labelled to identify the modules within the host device. The certification label of the module shall be clearly visible at all times when installed in the host device, otherwise the host device must be labelled to display the FCC ID and IC of the module, preceded by the words "Contains transmitter module", or the word "Contains", or similar wording expressing the same meaning, as follows:
Contains FCC ID: 2ARNH-09230850

L'appareil hôte doit être étiqueté comme il faut pour permettre l'identification des modules qui s'y trouvent. L'étiquette de certification du module donné doit être posée sur l'appareil hôte à un endroit bien en vue en tout temps. En l'absence d'étiquette, l'appareil hôte doit porter une étiquette donnant le FCC ID et le IC du module, précédé des mots « Contient un module d'émission », du mot « Contient » ou d'une formulation similaire exprimant le même sens, comme suit:
Contains IC: 24476-09230850

2.8.6. CAN ICES-3 (B) / NMB-3 (B)

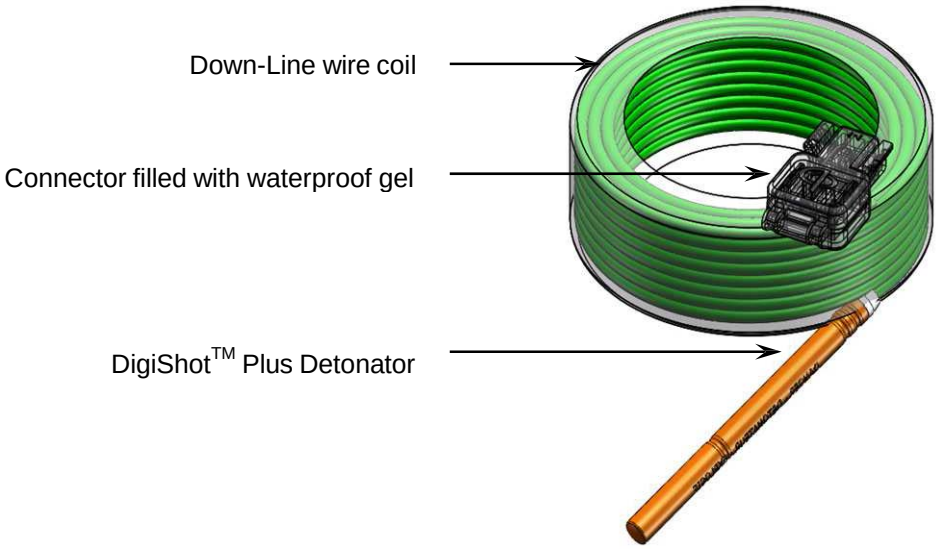
This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de classe B est conforme à la norme canadienne ICES-003.

3 DIGISHOT® PLUS DETONATOR

NOTE	**The DigiShot® Plus 4G detonator contains a new ASIC in the detonator and although look and feel is the same as the DigiShot® Plus 3G detonator, it is a new product that can be used in conjunction with the system and will not affect any use of the equipment.**

The DigiShot® Plus and 4G Detonator is a programmable detonator that is suitable for all types of blasting operations requiring precise timing and flexibility of a vast array of inter-hole timing.



The DigiShot® Plus and the DigiShot® Plus 4G Detonator is housed in a copper tube, which protects the circuit board and base charge.

The DigiShot® Plus detonator is attached to a robust green two wire down-line cable that ends in a gel filled connector that clips on a surface harness wire.

The DigiShot® Plus 4G Detonator is attached to a robust green, or black with green stripe, two wire down-line cable

CAUTION	**The DigiShot® Plus Detonator can only be tagged, tested and initiated with the DigiShot® Plus control equipment.**

4 COMPONENTS

4.1. The Crimp Plug

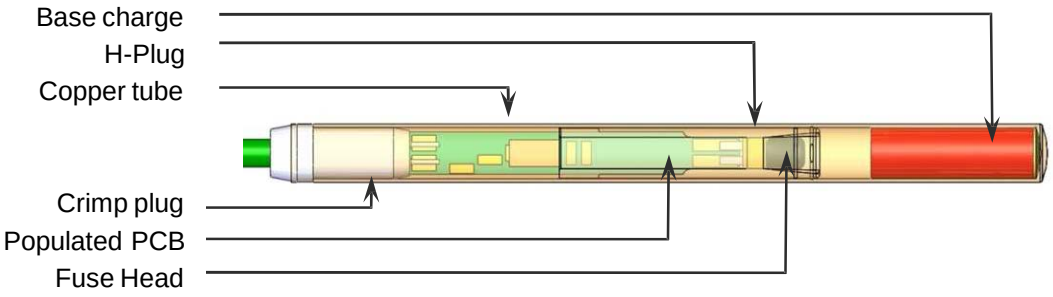
The crimp plug is a seal that is moulded onto the down-line wire preventing ingress of fluid entering the detonator tube between the down-line wire and crimp plug.

4.2. The Printed Circuit Board (PCB)

The PCB is an electronic module that houses components such as resistors and a capacitor.
Resistors: The resistors protect the detonator circuitry against external influences such as:

- Over voltage
- Over current
- Electrostatic Discharge
- Electromagnetic Pulse

Capacitor: The capacitor is an energy storage device that stores the required energy for the detonator to function independently after the blast signal has been sent and the connection between the control equipment and detonator has been destroyed.



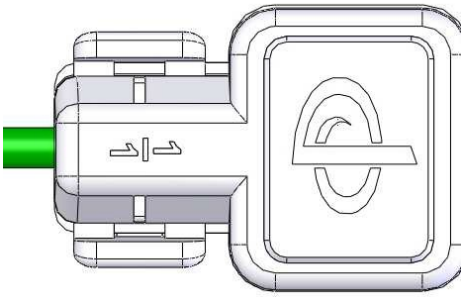
4.3. Fusehead

The Fusehead is an incendiary explosive device that acts as the interface between the electronics and the explosives base charge of the detonator.

4.4. Protective H-Plug:

An anti-static H-plug that is used to centralise the PCB separates the base charge from the circuitry and prevent powder migration into the circuitry.
The second crimp is situated around the H-Plug and provides the seal which separates the explosive powders from the circuit board.

4.5. Connector:



The Connector is used to connect the detonator down-line onto the surface harness-wire bus of the installation.

The Connector has two spade connectors that ensures a secure connection on each harness-wire and has two grooves enabling the user to align each wire with these connectors and also facilitates ease of use. These connections are not polar sensitive and can be connected in any configuration

The transparent polycarbonate connectors allow for improved visual inspection of the wires inside the connector to ensure correct connection.

The connector is filled with a transparent gel to facilitate water resistance during use. It is advisable not to submerge connectors in water.

4.6. Down-line wire:

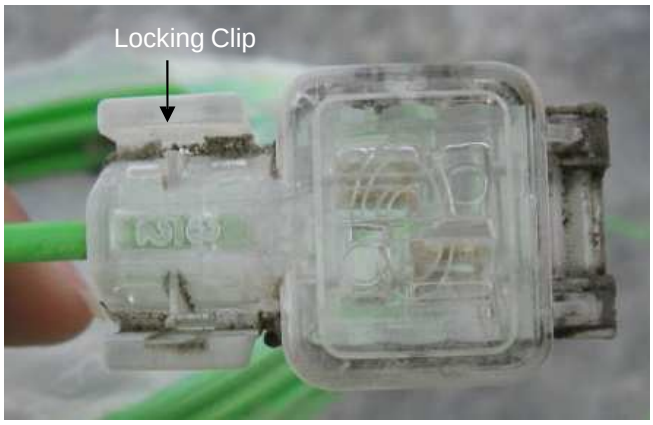
The down-line wire is a cable comprising 2 steel or copper wire conductors which are individually sheathed and an outer green insulation. .

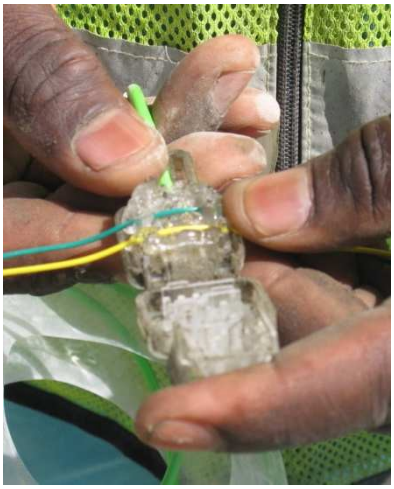
The down-line wire is manufactured in various lengths and can be supplied to user's requirements

5 CONNECTING UP

5.1. Connector

1. Using one hand, hold the down-line wire with the connector facing away from your body.
2. With the other hand, pinch the locking clips together to release the connector and release the top lid.
3. Flip the connector lid open.
4. Ensure that there are no small stones and grit inside the connector.





5. Align the harness wire with the spade connectors inside the connector and press them down. There are guiding grooves on either side of the connector housing to facilitate the ease of this operation.
6. When closing the connector, ensure the connector clicks home to ensure a secure and proper connection and prevent the connector from opening

CAUTION	**Place connectors away from normal operational movement of vehicles and users. Walking or driving over these connectors will result in damaged connectors, requiring the replacement of detonators.** **Avoid contamination inside the connector by keeping the connector closed at all times before final connection to the harness-wire.** **Do not remove the gel because it assists with preventing moisture accumulating inside the connector that will lead to corrosion of the connectors and leakage.** **A connector that is not closed correctly could result in a poor connection which may cause communication problems with the detonator and ultimate misfire.** **Avoid contamination inside the connector by keeping the connector closed at all times.** **Do not remove gel because small stones and grit can cause damage to contacts causing loss of communication to the detonator.** **A connector that is not closed correctly could result in a poor connection which may cause communication problems with the detonator.**

6 APPLICATION OF DETONATOR

Refer to Application document OPI-00390 for guidelines.

The guideline does not supersede those required by local mine, explosives or statutory regulations/procedures/codes of practise regarding the use of DigiShot® detonators. In such cases, the MOST STRINGENT set of rules between the mine, explosives or local regulations/procedures/codes of practise and the manufacturer must be followed.

7 HANDLING PRECAUTIONS

Refer to the Electronic Detonator Material Data Sheet available on the DetNet website for detailed information on Precautions for safe handling, Conditions for safe storage, Disposal methods and Regulatory information.

7.1. Storage

- Store DigiShot® Plus detonators in accordance with relevant regulatory/legal requirements.
- No smoking or open flames near DigiShot® Plus detonators
- Always keep storage facilities clean and dry
- Ensure rotation of stock, ordering and shelf life

7.2. DigiShot® Plus Detonator Care

- Avoid dropping or applying any physical shock to DigiShot® Plus detonators because all detonators are impact sensitive.
- The connector is splash proof; water inside the connector could cause a poor connection that could result in DigiShot® Plus detonators malfunctioning.
- Keep detonators a minimum of 0.1m from cellular phones and 2m away from handheld radios while priming and loading blastholes.
- Keep detonators a minimum of 2m from cellular phones and 2 way radios when preparing for blasting as interference could cause the DigiShot® Detonator to malfunction.
- Never attempt to open the DigiShot® Plus detonator as it could initiate.
- Keep the connectors closed when not in use to prevent corrosion of the connector's pins.
- Grit and dirt inside the connector could damage the connector pins and result in poor connection
- Explosives inside the connector may cause corrosion on the connector pins that could result in in poor connection and leakage.

DETONATORS MAY ONLY BE CONNECTED TO THE DIGISHOT® PLUS BENCH BOX IN ACCORDANCE WITH LOCAL LEGISLATION AND PRESCRIBED BLASTING PRACTICES ON SITE WHICH MAY REQUIRE THE BENCH TO BE CLEARED FOR BLASTING BEFORE CONNECTION TO A BLAST DEVICE IS ALLOWED.

8 SPECIFICATIONS

8.1. Number of DigiShot® Plus detonators

A maximum of 300 DigiShot® Plus detonators (dependent on down-hole wire length) can be accommodated per channel.

8.1.1. Automated detonator capacity check

Due to the expanded non-volatile memory capacity of the new 4G Detonator, the cable length is now stored in the detonator during assembly. With this information stored in the detonator, the software on the Control Equipment will automatically verify the cumulative detonator down-hole length and warn the user should the installation limits be exceeded.

8.2. Maximum number of detonators per down hole length

DigiShot® detonator Length (m)	Maximum number of DigiShot® detonator per Bench Box
< 30 m	300
40	240
50	190
60	160
70	135
80	120

8.3. Decking

The system can accommodate decking applications with up to 15 DigiShot® Plus detonators per hole.

8.4. Out of Pattern DigiShot® Plus detonators

A maximum of 255 out-of-pattern holes or out of sequence holes (referred to “Special” detonators) can be accommodated per blast.

8.5. Maximum delay times and increments

DigiShot® Plus detonators can be programmed from 0ms in 1ms increments to a maximum delay of 20 000 ms.

8.6. Temperature Limitations

The following temperature limitations apply to the DigiShot® Plus and 4G Detonator:

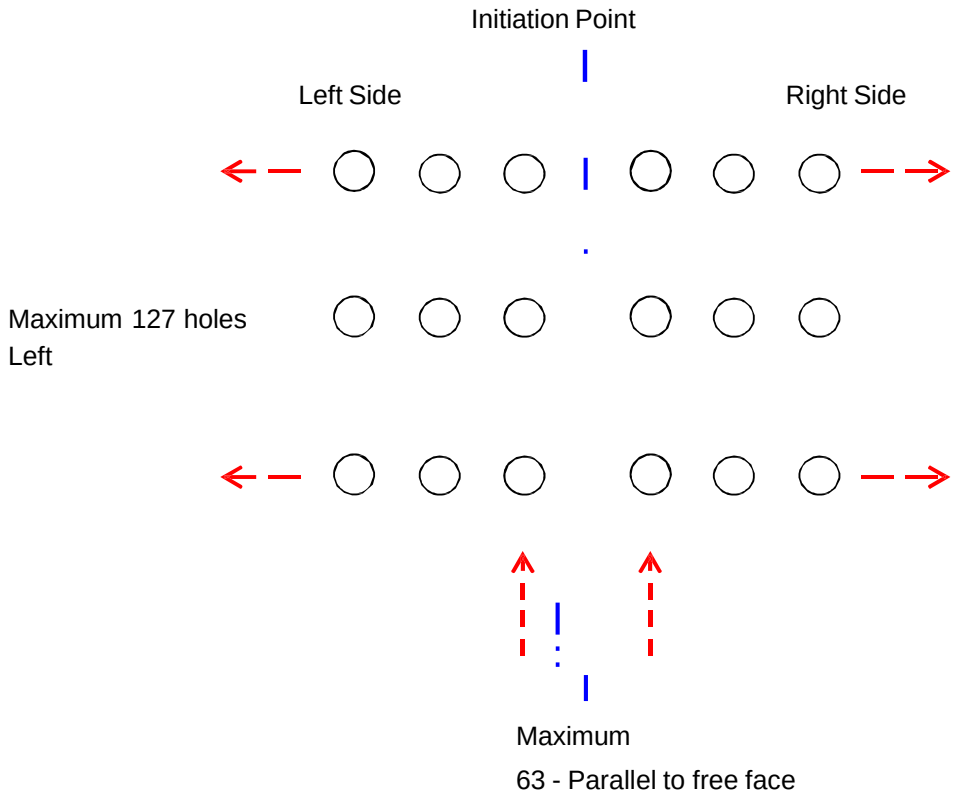
- -40°C to +80°C
- -40°F to +176°F

8.7. Rows and Hole Tagging Limitations

The blast is divided up into a Left and Right side at the initiation point. Row 1 is located nearest the free-face or cut.

Maximum holes per side - 127 holes, do not exceed 300 detonators per channel (depending on down line

wire lengths)
Maximum rows - 63 rows, do not exceed 300 detonators per channel (depending on down line wire lengths)



8.8. Storage Life and Equipment Life

Storage in a well-ventilated magazine suitably licensed for IMCO Class 1.1B or 1.4S (specified on packaging) and in accordance to specifications of the relevant Acts on the storage of explosives. The product has a 5 year shelf life from date of manufacture when stores in accordance with relevant regulatory requirements.

8.9. Electrostatic Discharge, Over Voltage, Over Current and EMP Immunity

The DigiShot® Plus detonators have resistors which provide the following safety features:
Over voltage protection - Over current protection
Static - Electrostatic discharge (ESD) Electromagnetic Pulse (EMP)
As per SANS 1717-1 and CEN 13763-27

CAUTION	LIKE ALL OTHER DETONATORS DIGISHOT® DETONATORS ARE SENSITIVE TO SHOCK AND TEMPERATURE AND USERS MUST REFRAIN FROM EXPOSING THEM TO EXCESSIVE SHOCK AND HEAT .

8.10. Safety

The DigiShot® Plus Detonator cannot be initiated by the Tagger. The Tagger is incapable of producing the required firing voltage and cannot produce the required 'Fire' command to initiate a DigiShot® Plus detonator.

NEVER CONNECT ANY THIRD PARTY OR OTHER UNAPPROVED DETONATORS TO THE DIGISHOT™ PLUS SYSTEM.

The 4G detonator contains a new ASIC in the detonator and although look and feel is the same as the 3G detonator, it is a new product that can be used in conjunction with the system and will not affect any use of the equipment.

9 SAFETY WARNINGS

9.1. User and Safety Tips

	ALWAYS keep connectors closed when not in use to avoid damage and/or contamination. **ALWAYS ensure all the DigiShot® Plus detonators are connected to the system before leaving the bench.** **DigiShot® Plus detonators are impact sensitive and should ALWAYS be handled with care**

9.2. Risks

	**HANDLE MECHANICALLY DAMAGED DIGISHOT® PLUS DETONATOR AS PER APPROVED PROCEDURES. NEVER CONNECT THE DIGISHOT® PLUS DETONATOR TO ANY UNAPPROVED VOLTAGE SOURCE. NEVER CONNECT THE DIGISHOT® PLUS DETONATOR TO ANY EQUIPMENT OTHER THAN A DIGISHOT® PLUS TAGGER WHILE ON THE BENCH UNTIL THE BENCH IS CLEARED FOR BLASTING. THE 4G DETONATOR MAY BE CONNECTED TO THE COMMANDER AS PER LOCAL LEGISLATIVE REQUIREMENTS AND PRESCRIBED BLASTING PRACTICES ON SITE WHICH MAY REQUIRE THE BENCH TO BE CLEARED FOR BLASTING BEFORE CONNECTION TO A BLAST DEVICE IS ALLOWED.**

10 DESTRUCTION OF DIGISHOT® DETONATORS

Refer to Destruction of Shot Detonators document OPI-00202 for guidelines.

The guideline does not supersede those required by local mine, explosives or statutory regulations/procedures/codes of practise regarding the use of DigiShot® detonators. In such cases, the MOST STRINGENT set of rules between the mine, explosives or local regulations/procedures/codes of practise and the manufacturer must be followed.