



FUSES

F-CORD 10

PRIMACORD 5

SAFETY FUSE

Product information December 11, 2013

1. Product description and use

The explosive of a DETONATING CORD is pentrite (PETN). Two layers of polypropylene thread have been twined around the explosive and the cord resulting from this process has been coated with plastic. The plastic may be PVC or more environmentally friendly thermoplastic.

Detonating cord is used for example in quarries and in precision stoping as well as smooth wall blasting when several boreholes are to be detonated simultaneously. Often in the aforementioned work, the charging used is so light that the detonation is not transmitted securely without a detonating cord. A detonating cord is used also in open pit mining to ensure continuation of the detonation.

Primacord 5 detonating cord is recommended for igniting NONEL detonation caps and DYNOLINE signal tube.

SAFETY FUSE is a ductile cord twined of cotton threads and coated with black polyethylene plastic. The core of the fuse contains black powder. Safety fuse is primarily used in quarrying and in small blasts with detonating cord caps (number 8).

Primacord 5 and Safety fuse are imported by Forcitr.

2. Packages

Product	φ/mm	Quantity m/spool	Quantity m/case	Net weight/case	Thread colour
F-cord 10	*	200	1000	10 kg	Yellow
Primacord 5	4.0±0.2	400	800	4.2 kg	Red
Safety fuse	5.1±0.1	250	1000	6.1 kg	Black

*F-cord is mangled so that its cross-section is oval in shape. In round threads, the diameter of F-cord 10 is about 5 mm.

Transportation classification	
RID/ADR	1.1D FUSES, DETONATING, flexible CORD (FUSE), DETONATING
IMDG	1.1 D
UN number	0065
Hazard class	1.1

Transportation classifications	
RID/ADR	1.4 S FUZE, SAFETY
IMDG	1.4 S
UN number	0105
UN number	0065

3. Explosion technical features

Specifications	Unit	F-cord 10	Primacord 5
Coating		Yellow plastic	Red plastic
Oxygen balance	%	Negative	Negative
Quantity of explosive	g/m	10-12	5.3±15 %
Velocity of detonation	m/s	> 6 000	> 6 000
Initiation sensitivity Detonation cap		Detonator sensitive	Detonator sensitive
Operation reliability		Operation reliable down to -30°C	Operation reliable down to -30°C

Specifications	Unit	Delayed detonating cord
Coating		Black plastic
Quantity of black powder	g/m	6.1
Burning velocity	s/m	120 ± 12
Initiation sensitivity		Ignites according to ignition instructions
Operation reliability		Operation reliable from -30 °C to +50 °C

4. Main raw materials and their hazard clauses

Raw material	Exploding detonating cord	Delayed detonating cord
Pentrite (PETN)	E; R3	-
Black powder (S, KNO ₃)	-	R8

5. Storage and weather resistance

The shelf life of detonating cords and safety fuse is several years. The products are stored in a dry and cool location in accordance with valid legislation.

The detonating cords and the safety fuse have good frost resistance. The products ignite reliably down to -30 degrees C.

The water resistance of detonating cords is good. Note, however, that if an open end of the cord is under the water surface, water will absorb into the pentrite core of the cord, especially when under hydrostatic pressure.

The water resistance of the safety fuse is good. Note, however, that humidity absorbed into the cord through its open end results in the cord not igniting in the wet spot, see chapter 8.

6. Handling safety

The detonating cords F-cord 10 and Primacord 5 and the safety fuse are CE approved products fulfilling the essential safety requirements of the EU decree. The products must fulfil for example the following minimum requirements describing handling safety:

Test	Requirement
Shock sensitivity (BAM)	≥ 10 J
Thermal stability	75°C, 48 h (no reaction)

Avoid skin contact with the explosive contained by the cord.

7. Environmental impact

Unexploded or otherwise residual pentrite does not dissolve into water but remains as such in nature. Dry pentrite causes danger of explosion. Residual pentrite in the ground is wetted and collected for disposal, see chapter 8.

The quantity of harmful combustion gases (CO, NO_x) generated by the explosion can be reduced by correct use of the products. (See Operating instructions, chapter 8.)

As a general rule, the generation of gases in the explosion depends on the oxygen balance and on how complete the explosion is. In ideal conditions, in which the oxygen balance is zero and the explosion is complete, the main explosion products are carbon dioxide, water vapour and nitrogen gas. However, in practice this ideal situation is not reached and the oxygen balance is usually either slightly negative or positive.

In open space, the oxygen balance of a detonating cord is negative, which means that small amounts of NO_x gases and carbon monoxide are generated in the explosion. The more negative the oxygen balance, the more CO gases are generated in proportion to nitrogen oxides. In an open space, these gases dissipate quickly. When blasting in a confined space, underground, in an excavation or other location in which toxic or harmful explosion gases may accumulate, one should not enter the blast site until the explosion gases have dissipated (for example by ventilation) enough to no longer pose a health hazard. NOTE! Since carbon monoxide is heavier than air, it accumulates in locations that are lower than the surroundings, such as the bottom of a well.

The spools of detonating cord can be returned to the factory for reuse.

8. Operating instructions

8.1 F-cord 10

F-cord 10 (coated with PVC plastic) and F-cord 10T (coated with thermoplastic) detonating cords are used for example in quarrying as well as precision stoping and smooth wall blasting, when several boreholes are to be detonated simultaneously. Often in the aforementioned work, the charging used is so light that the detonation is not transmitted or does not continue securely without a detonating cord. Detonating cord is used also in open pit mining to ensure continuation of the detonation for example when using pipecharges. F-cord 10T, coated with thermoplastic, generates less soot and is somewhat more rigid than the F-cord 10 coated with PVC.

A detonating cord is completely insensitive to all electric hazard factors such as thunder.

When igniting several boreholes simultaneously using a detonating cord, the detonating cord is attached to the lowest (preferably) cartridge of each borehole for example with rubbered tape. The

detonating cords coming up from the boreholes are connected to each other with the so-called trunkline that is also a detonating cord.

The detonating cord is cut on a piece of wood or other non-metallic surface with a sharp knife or normally in the air with a knife.

Making joints:

The downlines are connected to the trunkline using MULTICLIPS (securest way), rubbered tape (wrapping the cords together at least 10cm with the bottom pointing in the cord's direction) or by a knot (two recommended types of knots are in use).

The trunkline must not be pulled too tense because the pull caused by the explosion may disconnect even a secure connection.

When making special connections, make sure that all connections are done in the direction of propagation of the detonation.

When making knots or using special connectors, make sure that the connections are secure and that the angle of the connected cords is 90° so that detonation can be arranged to reach each charge through two different routes.

The detonating cord is ignited with a detonator cap that is taped to the cord so that the bottom of the cap is toward the direction of propagation of the explosion. See connection examples on the detonating cord package.

Using detonating cords in wet conditions

During rain or other wet conditions the charger must make sure that the ends of detonating cords do not come into contact with water. If the end of the cord has come into contact with water, the charger must cut off the wet end of the cord and dispose of it for example in the charged space to be blasted.

In wet conditions, the charger must provide enough extra cord to the connections so that the possible absorption of water does not reach the point of connection. Based on the tests we have done, water proceeds in the cord at the rate: 10cm -30min, 15cm-one hour, 35cm – six hours.

The absorption of water into the cord can be prevented nearly completely by pressing correctly an appropriate aluminium sleeve to its end.

When using detonating cords, pay attention especially to the following:

- the cords must not be pulled carelessly in rough terrain because the plastic coating must be intact for the cords to function reliably
- The trunkline and downlines must not be too tense so that the pull caused by the detonation front does not damage the cords.
- when unspooling the cord, the spool must be turning freely so that the cord is not twisted
- when unspooling the last part of a spool in frosty weather, make sure the plastic coating does not crack
- cords detonating at different times must not be closer than 20cm to each other
- the charged cords must not have sharp turns.

8.2 Primacord 5

The Primacord 5 detonating cord is used together with NONEL initiation system in many different ways. The said ways to use are described in detail in NONEL CE operating manual.

The handling of Primacord 5 detonating cord does not deviate from the handling of the F-cord 10 detonating cord presented above.

8.3 Safety fuse

The charger must always check the appropriate condition of the safety fuse before blasting. A detonating cap (number 8) is connected to the safety fuse by pressing it tightly into the cord using appropriate pliers or special pressing device. The detonating cap must be emptied of possible impurities by tapping it into the palm of the hand before connecting to the safety fuse. Right before connecting, the end of the safety fuse must be cut perpendicularly with a sharp knife (cut off 1-3cm) to ensure that the gunpowder core functions reliably on the contact surface of the cap. Pressing the cap to the cord must be done to the side of the person pressing it so that the cap is pointed away from dangerous targets.

When charging with gunpowder, the cord and possible detonator cap must be put into the hole so that they reach the middle third of the gunpowder charge. After charging, the fuse must reach at least 0.5 metres away from the mouth of the borehole.

According to the Order Instructions on Blasting and Quarrying Work, the legal minimum length of the safety fuse used in blasting is 60cm. In addition to this, in borehole charging, the cord must reach at least 20cm from the mouth of borehole. In trenching, the length of the safety fuse must be at least 1m and in rocky terrain at least 1.5m.

If water accumulates in the charge hole, the connection between the cap and the fuse must be protected from humidity using a rubbered tape or some other appropriate means.

If there is a doubt that safety fuse will not burn securely and evenly, test burning can be done. For example 10 cm of safety fuse can be used to evaluate burning time and its relation to product specification.

The shelf life of Safety fuse is several years in appropriate storage conditions. The latest use date can be lengthened for 1 year, when testing is done by Forcitr.

8.4 General

Fuses that may not be fit for use must be disposed of in the charged space along with other detonation or by burning with accessory fuels. Only qualified person is allowed to dispose explosives according to given laws and regulations. More detailed disposal instructions are provided by manufacturer or importer.

Forcitr accepts expired explosives for disposal. No compensation is paid for returned explosives and the cost of disposal is agreed separately case by case.

Reclamation instructions:

If the products have detectable defects or they do not function in the expected manner, the following data shall be given immediately to Forcitr explosives factory in writing:

- Product size and manufacturing date marked on the package
- Product appearance and description of the product's manageability/ feel to the touch
- Operating circumstances in the blast site
- Charging conditions and manner of connecting.

Samples gathered of the deviating product and the spool of the same manufacturing batch and possible partly used spool must be delivered to our factory immediately for further examination. Before shipping the product, it must have appropriate denotations to facilitate identification.