



# **FIREX A (III/VA)**

## **- ELECTRIC DETONATOR**

**Product information as of 13 May 2015**

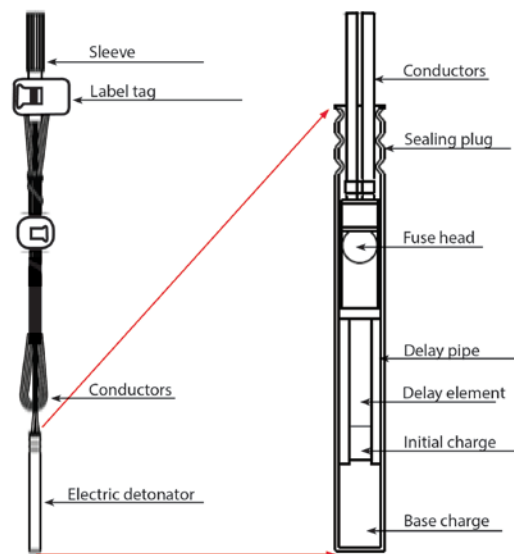
## 1. Product description and use

### General

Firex A (III/VA) electric detonators are manufactured by Austin Detonator S.R.O. in its factory in the Czech Republic.

When using Firex A detonators, please note that the colours of its conductors differ from those of Firex detonators manufactured by Forcitra: In Firex A detonators, one conductor is light blue and the other one is yellow.

Firex A detonators must not be used in connection with the Rockstar III detonators despite the fact that both are VA detonators by the same manufacturer and belong to the same group (C) and class (3), because their electric properties are different.



Right in the image: magnified structural diagram of an electric detonator

### Operating principle of electric detonators

When a sufficiently powerful ignition current is conducted to the conductors, the resistance wire heats up inside the fuse head. The heating causes the pyrotechnic composition to deflagrate and ignite the delay element, which in turn ignites the explosive, initial charge and base charge, at the bottom of the detonator after a predetermined time has lapsed.

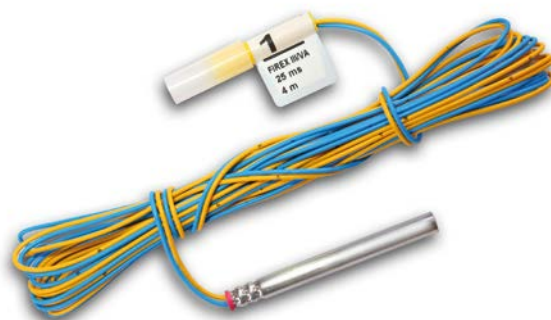
The pyrotechnic delay composition delays the start of the explosion by a predetermined time period, when the ignition impulse has reached the detonator. The delay time of Firex A detonators is 25 ms at numbers 1-20. In Firex A electric detonators, the base charge consists of 720 mg of hexogen (RDX). The initial charge is in a strong steel capsule and it contains volatile initial explosives (such as lead azide).

## 2. Detonator types

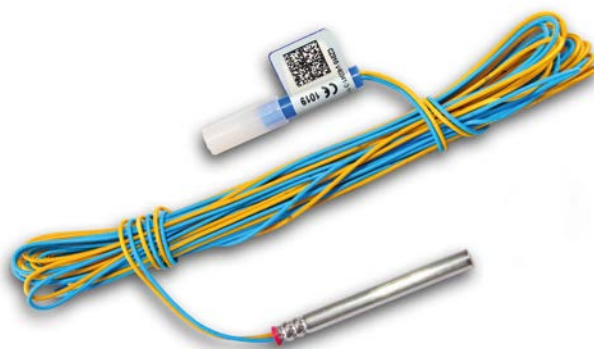
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To facilitate the identification of Firex A (III/VA) electric detonators, the colour of the lower end of the sleeve varies depending on the length of the conductor. The colours are: yellow in a 4 m detonator, blue in a 6 m detonator and green in a 10 m detonator.

4-METRE FIREX A CONDUCTOR:  
YELLOW SLEEVE.



6-METRE FIREX A CONDUCTOR:  
BLUE SLEEVE.



10-METRE FIREX A CONDUCTOR:  
GREEN SLEEVE.



Based on their electric properties, the Firex A (III/VA) electric detonators manufactured by Austin Detonator S.R.O belong to class 3 (VA).

The European standard (EN 13763-1) divides the detonators in four classes. Class III corresponds to group C (VA)

Denomination	Finnish classification	Denomination in Finland	European classification	Denomination in Sweden and Norway
Firex A	Group C	VA detonator	Class 3	Group 2

#### Electrotechnical values of Firex A

Specification	Firex A
Detonator's total resistance $\Omega$	$3.6 \pm 0.3$
Ignition current, minimum A	1.2 A/ 5 min
Ignition current in series, A	3.5 A/ 4 ms
Ignition energy, minimum mJ/ $\Omega$	80
Ignition energy mJ/ $\Omega$	140

#### NOTE!

ELECTRIC DETONATORS BELONGING TO DIFFERENT GROUPS/CLASSES MUST NOT BE USED IN THE SAME COUPLING.

IN ADDITION, DO NOT USE ELECTRIC DETONATORS WITH DIFFERENT PRODUCT DENOMINATIONS IN THE SAME COUPLING UNLESS THEIR ELECTRIC PROPERTIES ARE IDENTICAL.

Never cut the conductors of electric detonators. If the conductors have been cut, short circuit the detonator by connecting the conductors together and dispose of the detonator in the manner described below in this document.

Firex A detonator packages show the conductor materials and strengths.

### 3. Detonator packages and delay times

Conductor lengths, serialisation and package sizes of Firex A detonators

Name	Conductor length (m)	Numbers (series)	Pcs/inner package	Pcs/Transport package
Firex A III/VA 4 m	4.0	1-5, 6-10	50	250
Firex A III/VA 6 m	6.0	11-15, 16-20	30	150
Firex A III/VA 10 m *)	10.0		20	100

\*) Special order product

Serial time number	Delay ms
1	25
2	50
3	75
4	100
5	125
6	150
7	175
8	200
9	225
10	250
11	275
12	300
13	325
14	350
15	375
16	400
17	425
18	450
19	475
20	500

## 4. Main raw materials and their hazard statements

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Name of hazardous substance	CAS registry number	Warning symbols; R phrases
Hexogen	121-82-4	E; T; N; R2-11-25-51/53
Lead azide	13424-46-9	E; T; N; R33; R61-62; R20/22; R50/53
Barium chromate	10294-40-3	T; O; R45; R20/22
Lead (II, IV) oxide	1314-41-6	T; O; R8; R45; R20/22

## 5. Storage life and weather resistance

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The recommended operating and storage temperature for Firex A electric detonators is in the range of -30... +40 degrees Celsius. The relative humidity of air should be below 80 %. The recommended service life of detonators is 24 months from the date of manufacture, provided that the products are stored in conditions recommended by the manufacturer. Storage and transport must comply with the legislation in force.

The detonators are not intended for use in circumstances with danger of gas or dust explosion.

Firex A electric detonators endure well extremely wet conditions. They endure water pressure of 3 bar, which corresponds to a depth of 30 metres under water, for at least 24 hours.

The detonator has a tensile strength of at least 5 kilos for 2 minutes when pulled at both cables.

## 6. Handling safety

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The detonators may explode due to flame, heat, impact, rubbing, electric current, static electricity or radio wave energy. An exploding detonator causes a splinter hazard. Wear protective goggles when handling detonators. In case of fire, let the product burn and isolate the danger zone. Attempts to extinguish the fire may increase the risk of explosion.

High tension cables, radio, TV and radar transmitters are risk factors when handling electric detonators. The safety distances of these are defined in Council of State Ordinance 644/2011 on Safety of Blast and Quarry Sites, and in the Blast and Quarry Work Safety Instructions of the Centre for Occupational Safety. The safety distances defined in these instructions must be applied.

## 7. Environmental impact

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No environmental impact is foreseen.

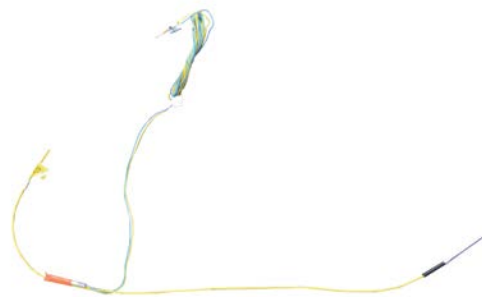
## 8. Operating instructions

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Make a hole in the explosive for the detonator. The hole must be made in the explosive cartridge in lengthwise direction. Place the detonator in the hole and attach the conductors around the cartridge. Lower carefully the cartridge suspended by the conductors into the hole.

If heavy blasting mats are used, it is important to measure the resistance of the round throughout the covering process so that possible breaks in the circuit or changes in the total resistance of the round are immediately discovered.

When a Firex A detonator is used to ignite an impulse hose, according to the manufacturer's instructions, the detonator must be attached away from the direction of the blast. This reduces the risk of damages in the ignition system resulting from splinters caused by the exploding detonator.



### Use of the sleeve

The Firex A electric detonators sold by OY FORCIT AB are equipped with a sleeve. The sleeve facilitates coupling the conductors together and gives additional protection to the coupling.

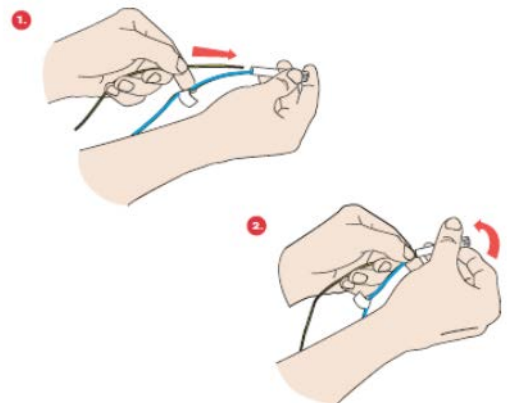
The sleeve is used as follows:

Pull the conductor not attached to a sleeve from inside the sleeve and connect it to the sleeve of the next detonator you want to connect.

Twist the sleeve 5-6 full turns.

Make sure the connection is solid by pulling lightly at the conductors.

You can make sure that this is not a case of only intertwined isolation by pulling of the top of the sleeve.

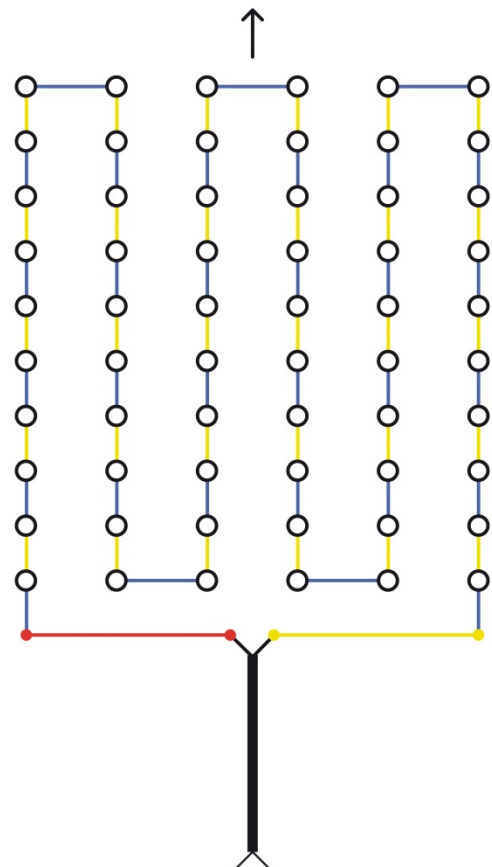


**Series and parallel connections**
**Connection in series**

Checking a round connected in series is done so that the nominal resistance of one detonator is multiplied by the number of detonators. Then, the resistance of the round is measured with an ohmmeter approved for this purpose. The result of the measurement must match the calculated resistance. Resistance may vary slightly, if an extension cord is used in the connection or when measuring.

An example of calculating the resistance of a round connected in series before measuring:

The circuit consists of 60 Firex A detonators with a resistance of 3.6 ohm ( $\Omega$ ) connected in series. A total of 100 metres of extension cord (long red and yellow in the image) has been connected. Extension cord resistance is 6.1  $\Omega$  / conductor / 100 m. The measured resistance of the main is 3.8  $\Omega$ .



Resistance of the detonators  $60 \times 3.6 = 216 \Omega$   
 Resistance of the extension cord  $6.1 \Omega = 6.1 \Omega$   
 Resistance of the main  $3.8 \Omega$   
 Total resistance of the circuit  $= 216 + 6.1 + 3.8 = 225.9 \Omega$

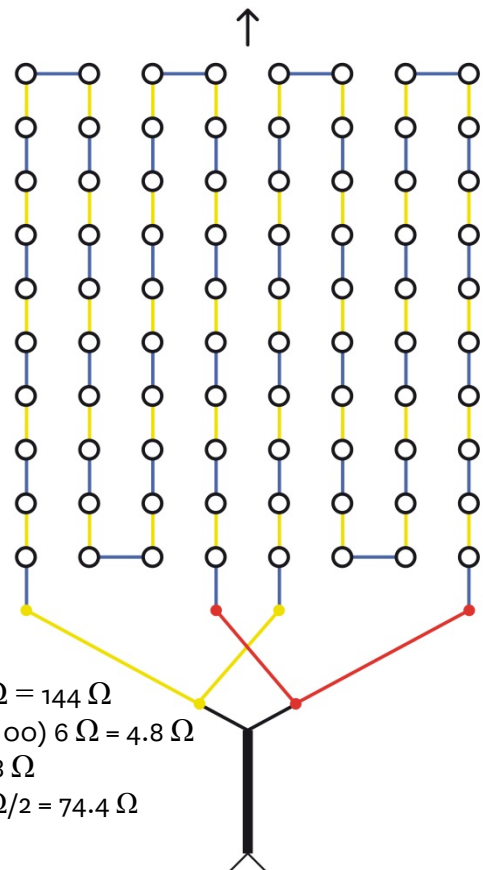


**Parallel connection** (connection to parallel series)

When connecting detonators to parallel series, first check that the resistances of the series are equal. The maximum allowed deviation in resistance between the series is 5 %. Then the series are connected together in parallel and the resistance of the entire round is measured. A good basis for a successful parallel connection is that each series has an equal number of detonators.

An example of calculating the resistance of a round connected in parallel:

The circuit consists of 80 Firex A detonators connected in 2 series, each of which has 40 detonators. The resistance of the detonators is 3.6 Ω. Each series has 80 metres of extension cord (long red and yellow). The resistance of the extension cord is 6.1 Ω = / conductor / 100 m. The resistance of the main is 3.8 Ω.



The resistance of the detonators of each series =  $40 \times 3.6 \Omega = 144 \Omega$   
 The resistance of the extension cords of each series =  $(80/100) 6 \Omega = 4.8 \Omega$   
 The total resistance of each series =  $144 \Omega + 4.8 \Omega = 148.8 \Omega$   
 The resistance of two series connected in parallel =  $148.8 \Omega / 2 = 74.4 \Omega$   
 Total resistance of the circuit =  $74.4 \Omega + 3.8 \Omega = 78.2 \Omega$

## 9. Disposal

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Detonators that are suspected to be faulty or too old (past their best-before date) must not be used; they must be disposed of. A blaster and blasting technical manager is permitted to dispose of individual detonators. The disposal consists of either detonating a maximum of five detonators attached to an intact detonator or individual detonators taped to a cartridge of explosive. If a defective detonator is taped to an explosive cartridge, the cartridge, suspended by a string, must be carefully lowered into the borehole. The detonators to be disposed of must not be pushed into the cartridge.

Forcitr accepts expired detonators for disposal. No compensation is paid for the detonators received for disposal and the cost of disposal is agreed case by case.



## 10. Instruction for claims

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If the product is discovered to be defective, or it does not function in the expected manner, the following information must immediately be dispatched to Forcitr customer management or technical staff:

- Product name, size and manufacturing date on the package, and purchase and batch info on the cart
- Product appearance and description of its manageability / feel to the touch
- Circumstances of product use on work site

Defective products must be delivered to the closest Forcitr service station from which they are forwarded to the manufacturing plant for further investigation. The product return form available on Forcitr homepage ([http://www.forcitr.fi/forcitr-explosives\\_valikko\\_tuotteet](http://www.forcitr.fi/forcitr-explosives_valikko_tuotteet)) must be filled out and delivered with the returned product. Before returning products, contact our customer management or technical staff.