

# MANUAL

## FIPRON CORD and FIPRON STICKER

### *version 1.0*



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[www.firesi.cz](http://www.firesi.cz)

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## 1. Introduction

This manual is intended to describe microencapsulation technology and FIPRON products: FIPRON CORD and FIPRON STICKER. It also describes the correct assembly, adjustment and principle of "activation" of FIPRON CORD and FIPRON STICKER products.

## 2. Classification of fires

	Solids	Wood, paper, clothing, etc.
	Flammable liquids	Paints, thinners, etc.
	Electrical equipment under voltage	Electrical panel, engine, cabling etc.

## 3. Overview of technology

### 3.1 What is microencapsulation

Microencapsulation is a process in which active substances are coated with a polymer to form extremely small capsules. It is a new technology that is used in the cosmetic sector, as well as in the pharmaceutical, agrochemical and food industries. Among other things, it is used in various acids, oils, and vitamins. The success of this technology is based on the right choice of capsule packaging. For under certain conditions and parameters, this envelope bursts and releases the active agent that is inside the microcapsule.

### 3.2 Microencapsulation of FIPRON

Fipron has developed a unique technology to use the method of microencapsulation of specific gases that are used for fire extinguishing purposes. Our capsules can be in "standby mode" for more than five years and contain fire extinguishers that are automatically released when needed, i.e. in the event of a fire.



When the capsules reach the initiation temperature, they burst and release the active agent. Active agents can extinguish class A, B and E fires. Until the initiation temperature is reached, the microcapsules remain intact in the ambient temperature range of -50 °C to +80 °C.

### 3.3 Advantages of FIPRON products

FIPRON products contain miniature capsules that are shaped into stickers (FIPRON STICKER) and cords (FIPRON CORD) of any length, which provides the following advantages:

- Any size, including miniature dimensions, which allows them to be installed in hard-to-reach places.
- Completely self-operating – they do not require any power source.
- Wide range of operating temperatures (from -50 °C to +80 °C) and humidity (up to 90%).
- Extinguishes Class A, B and E fires.
- Easy installation due to shape; does not require modifications to existing equipment.
- Zero maintenance costs for five years from installation.
- Protection of equipment against fire directly at the source.
- Innovative technology.

## 4. Overview of products

### 4.1 FIPRON CORD

FIPRON CORD is a local fire extinguishing element in the form of a cord. It is a new generation of fire extinguishing products made of composite materials that contain microcapsules. Because of fire and at a temperature of 170 °C in the place, where the cord is installed, the heated substance will be initiated with a subsequent chemical reaction along the entire length cords. This reaction results in the bursting of the microcapsules and the release of environmentally friendly fire extinguishers.

FIPRON CORD is designed for extinguishing fires in junction boxes, substations, servers and other electrical equipment with limited space up to 1200 litres.

FIPRON CORD extinguishes the fire in the initial stages of the fire, thereby preventing its spread beyond the boundaries of the protected space and prevents re-ignition in the given space for up to 30 minutes (depending on the tightness of the space). Thanks to the flexibility of the cord (FIPRON CORD), it is easy to install, requires no power source and remains in standby mode for five years. The activation temperature is 170 - 200°C, the operating temperature is -50°C to +80°C at a relative humidity of up to 90%.



### 4.2 FIPRON STICKER

FIPRON STICKER P is a local fire extinguishing element in the shape of a plate (sticker). It is intended for extinguishing fires in electrical sockets, where there are electrical connections in a small space (0.2 and 15 litres).

FIPRON STICKER is intended for extinguishing class A, B, E fires and for protecting any electrical connections. The activation temperature is 120 °C, the operating temperature is -50 to +80 °C at a relative humidity of up to 90%. The FIPRON STICKER is placed directly in a protected socket or in a place where a potential short circuit, overheating, sparking or fire may occur.





## 5. Scope of use

All FIPRON products have an unlimited range of use. It is possible to apply them in any place where electrical connections and distributions are located. Thanks to the miniature size and variability of FIPRON CORD lengths, these products can be installed in different spaces. FIPRON products can be installed in mains sockets, connectors, electrical panels, control panels, server rooms, computer stations, televisions, refrigerators and many other appliances. FIPRON CORD can be easily installed in small, medium and large electrical cabinets where there is no other alternative for firefighting. Installation is very easy, does not require any modification of the existing ones

electrical devices and thus becomes an innovative and effective means in addition to classic means and systems intended for extinguishing fires.

Commercial use is completely unrestricted. Above all, public spaces such as schools, hospitals, shopping centres and large residential and office buildings can be secured in their entirety thanks to FIPRON technology.

FIPRON products can be used both in fire prevention and fire extinguishing. FIPRON is not a competitor to existing fire extinguishing systems, but has an additional security function for fire solutions

risks directly at the potential source of fire. They are completely electrically independent, which is the opposite of traditional fire extinguishing systems. They can be used in the automotive industry, in the oil industry, on pumps

stations, in public transport, in electrical substations. The products can be used in the mentioned areas FIPRON and can thus potentially reduce all risks and prevent insurance events.

## 6. Technical data about the FIPRON CORD product

The product for independent fire extinguishing "FIPRON CORD" thermally activates its extinguishing properties. It is a new one product intended especially for independent fire extinguishing without human assistance. FIPRON CORD can be installed together with high-voltage electric cable in closed cable ducts without any modifications to the existing equipment.

Product trade name: "FIPRON CORD" independent fire extinguishing product with thermally activated fire extinguishers properties.

The FIPRON CORD product is produced in four versions MS, 1, 2 and 3 for the protection of spaces with a volume of 50 to 1200 litres. The recommended maximum length of one type is 4 meters.



FIPRON CORD works as an intelligent fire suppression system. The effect of temperature on its active components causes the release of all extinguishing components inside the cord.

The main distinguishing features of the FIPRON CORD product:

- Flexibility and variability allow installation in different spaces.
- Low weight ensures easy transportation of the product.
- The product can be used in a wide range of temperatures.

The FIPRON CORD product can be used to protect electrical equipment (electrical cabinets) with forced ventilation. Depending on the number and size of the holes in the structure, it is necessary to use longer cord lengths - FIPRON CORD.

Microcapsules contain gaseous extinguishing agent (GEA) 3MTM Novec™ 1230 FIRE PROTECTION FLUID 1,1,1,2,2,4,5,5,(5F-Kno-5n-a1f-11u2o; rCidFe3-4C-F2O(O)CF(CF3)2; (trifluoromethyl)-3-pentanone) – these gases do not damage the ozone layer.

## 7. Technical characteristics of FIPRON CORD

Name	FIPRON CORD
Space protection (volume)	Up to 1200 litres
Activation temperature	170–200 °C
Fire class	A, B, E
Degree of coverage of the product	IP20
Optimum operating temperature	-50 °C to +80 °C
1 meter of MS product (cords) / protected area (volume)	1 m / 50 litres
1 meter of product 1 (cords) / protected area (volume)	1 m / 100 litres
1 meter of product 2 (cords) / protected area (volume)	1 m / 200 litres
1 meter of product 3 (cords) / protected area (volume)	1 m / 300 litres



## 8. Technical data about FIPRON STICKER

FIPRON STICKER is an independent fire extinguishing product with thermally activated extinguishing agent "FIPRON" in a microcapsule and is intended especially for fire protection in small spaces, such as electrical sockets and connectors.

Trade name of the product: FIPRON STICKER.

FIPRON STICKER is produced in two versions, STICKER P and STICKER 15, for the protection of closed spaces with a volume of 0.2 and 15 litres.



The main distinguishing features of the FIPRON STICKER P product:

- Flexibility and variability allow installation in different spaces.
- Low weight ensures easy transportation of the product.
- The product can be used in a wide range of temperatures.

The microcapsules contain a gaseous extinguishing agent (GEA) 3MTM Novec™ 1230 FIRE PROTECTION FLUID (FK-5-1-12; CF<sub>3</sub>CF<sub>2</sub>O(O)CF(CF<sub>3</sub>)<sub>2</sub>; 1,1,1,2,2,4,5,5,5-nonafluorid-4-(trifluoromethyl)-3-pentanone) – these gases do not damage the ozone layer.

## 9. Technical characteristics of FIPRON STICKER

Name	FIPRON STICKER
Space protection (volume)	0.2 and 15 litres
Activation temperature	120 ±5 °C
Fire class	A, B, E
Degree of coverage of the product	IP20
Optimum operating temperature, °C	-50 °C to +80 °C

## 10. General principles for operation and installation

- a. FIPRON products can be installed in electrical sockets, connectors, electrical cabinets, control cabinets, large safes, safes. The FIPRON CORD product can be installed together with a high voltage electrical cable into closed cable ducts in indoor and outdoor locations with operating temperatures from -50 °C to +80 °C.
- b. During the installation of products in electrical sockets, connectors, electrical cabinets, control cabinets and other electrical equipment, it is necessary to comply with the regulations for the installation and operation of electrical equipment and to observe the safety instructions regarding working with electrical equipment.
- c. During installation, the device must be disconnected from the power supply and measures must be taken to eliminating the possibility of electric shock.  
If it is not possible to disconnect the power supply to the equipment under voltage during the installation of the products, it is  
it is necessary to take measures to comply with electrical safety instructions (work with dielectric gloves, use of a dielectric pad and other applicable regulations regarding work with electrical equipment). If the products are used in multiple sector control cabinets, each section must be protected independently for the respective sector volume.
- d. After activating the product (FIPRON CORD: the sheath fibre will burn; FIPRON STICKER: the product or part of it darkens), if there are visible signs of damage to the electrical equipment (darkening of the casing, wires, signs of overheating and sparking), the defect must be eliminated and the FIPRON product must be installed anew.
- e. Do not subject the product to impacts and do not work near the surface of the product open fire.
- f. Reuse of the disassembled product is prohibited.
- g. The product must be replaced if it is damaged on the outside, if there are visible signs of ignition or after the warranty period has expired.

## 11. Safety rules

### WARNING!

During installation, it is necessary to disconnect the power supply and take measures to exclude the possibility of connecting the power.

In case of fire:

- disconnect the power supply with the local or main switch.
- proceed in accordance with the valid fire regulations in the given building.
- do not attempt to open the protected object (space).
- call the fire brigade (tel. no. 150).

After extinguishing the fire, the area must be ventilated.

The components of the product are not toxic in terms of the impact on human health and the environment, so the used products can be disposed of as normal municipal waste.

## 12. Manufacturer's warranty

- a. The manufacturer guarantees efficient operation when the products are installed in protected objects manufactured and serviced by qualified professionals certified in electrical work and holding a FIPRON installation certificate.
- b. The warranty period for FIPRON CORD and FIPRON STICKER products is 2 years (12 months).

## 13. FIPRON CORD installation instructions

### 13.1 Preparatory work

- a. Prepare the necessary tools and materials: measuring tape, electrical tape, scissors, pliers, standard self-adhesive pads, cable clamps (compensating elements).
- b. Determine the linear dimensions of the protected volume: measure (in centimetres) the length (d), width (w), height (in).
- c. Determine the size of the protected volume (V) (in litres):  $V = (l \times w \times h) / 1000$ .
- d. Calculate the required length (D) of the FIPRON CORD product in meters depending on volume of the protected object, 1 meter of the product

FIPRON CORD MS for 50 litres of protected volume:  $D = V/50$

FIPRON CORD 1 for 100 litres of protected volume:  $D = V/100$

FIPRON CORD 2 for 200 litres of protected volume:  $D = V/200$

FIPRON CORD 3 for 300 litres of protected volume:  $D = V/300$

- e. Measure the required length (d) of the FIPRON CORD product (in meters) based on the installed internal electrical equipment or circuit breakers located in the protected object to ensure that the FIPRON CORD product covers all connections. The FIPRON CORD product must be installed near all potential sources of fire in the protected object. This ensures the elimination of all potential risks of fire.

- f. Select the optimal length (D) of the FIPRON CORD product in meters according to the calculations above.
- g. Cut the specified length (D) of the FIPRON CORD product.
- h. Wrap both ends of FIPRON CORD with electrical tape to prevent fraying protective braiding.

### 13.1 Installation work

- a. Disconnect the power source from the electrical equipment.
- b. During installation, the voltage must be disconnected, and precautions must be taken to prevent it supply of electricity. If it is necessary to install the FIPRON CORD product in live equipment, measures must be taken to comply with electrical safety regulations according to the applicable national legislation (work in dielectric gloves, use a dielectric mat).
- c. The surface of the FIPRON CORD product must be located at the shortest possible distance from potential source of ignition.

*If the required length is selected based on the calculated volume of the protected object and if a certain part of the FIPRON CORD product remains, it is possible to leave the remaining part of the product anywhere inside protected device. But without splitting the CORD into multiple parts! Always keep it in one piece on one device.*

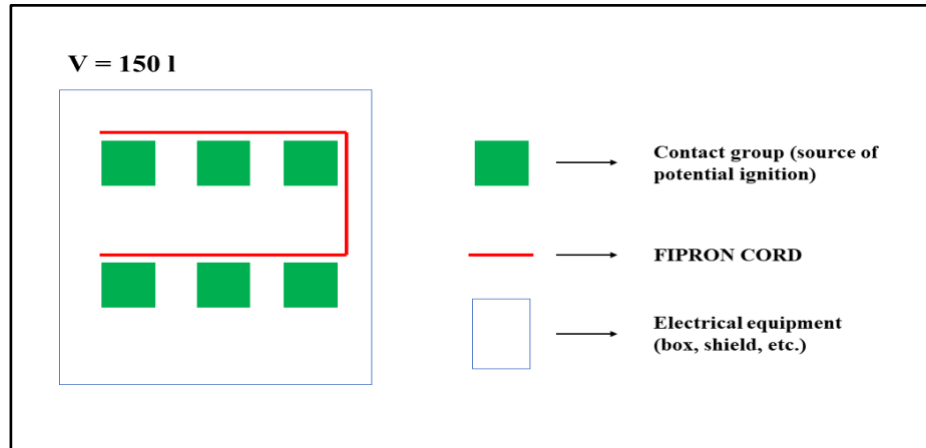
- d. Instal By installing the product, we must ensure its location around the perimeter of the protected device from above and then it is it is necessary to carry out an even installation inside the protected object according to the calculated dimensions and its shape. The FIPRON CORD product can be attached in any possible way, e.g. using standard self-adhesive (double-sided) tapes or plastic clips. When used of plastic clamps TIGHTEN THE CLAMPS WITH FIPRON CORD SO THAT THERE IS ENOUGH SPACE BETWEEN THE CORD AND THE CLAMP (THIS THE CORD WAS NOT TOO NICE IN THE CLAMP).
- e. It is forbidden to subject the FIPRON CORD product to impacts and to carry out work with an open flame near the surface of the product. IT IS NOT PERMISSIBLE TO REMOVE THE OUTER SHELL FROM THE FIPRON PRODUCT CORD.

ATTENTION: when assembling the FIPRON CORD product, do not pierce it and install it as close as possible to potential source of fire.

## 14. Schemes of possible installation of FIPRON CORD MS

### 14.1 Scheme 1:

In diagram 1, the volume of the protected space is 50 liters and there are 2 rows of contact groups. By measuring, we found that we need 1 meter of the FIPRON CORD MS product to protect the volume. When measuring the distance of contact groups, we found that we still need 80 cm of FIPRON CORD MS to cover all possible contact groups that are potential sources of ignition. Final decision: use 1.8 meters of FIPRON CORD MS product to protect the equipment.

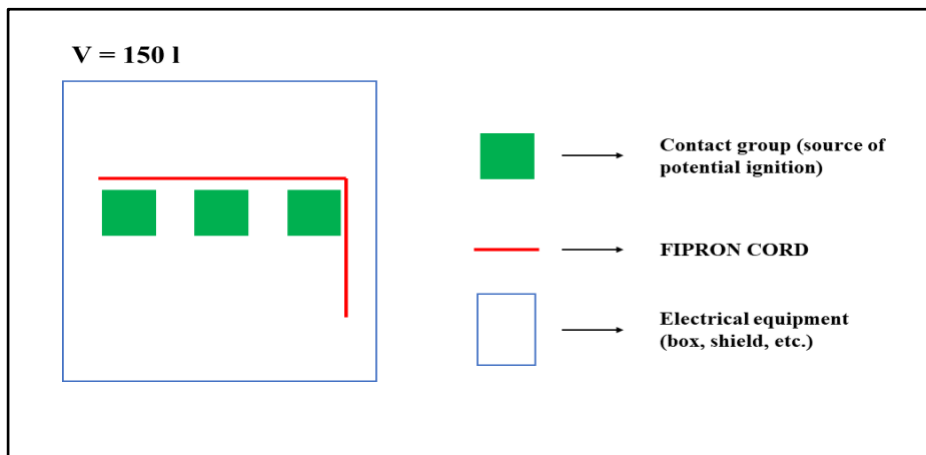


*Legend: contact group; FIPRON CORD; Electrical equipment switchboard, fuse box, etc.)*

#### 14.2 Scheme 2:

In diagram 2, the volume of the protected space is 50 litres and there is 1 row of contact groups. By measuring we found that we need 1 meter of FIPRON CORD MS to protect the volume. When measuring the distance of the contact groups, we found that we only need 0.5 meters of the FIPRON CORD MS to cover all possible contact groups that are potential sources of ignition. But it is necessary to ensure that the released extinguishing agent covers the total volume of the space in the first place.

Final decision: use 1 meter of FIPRON CORD MS product to protect the equipment.

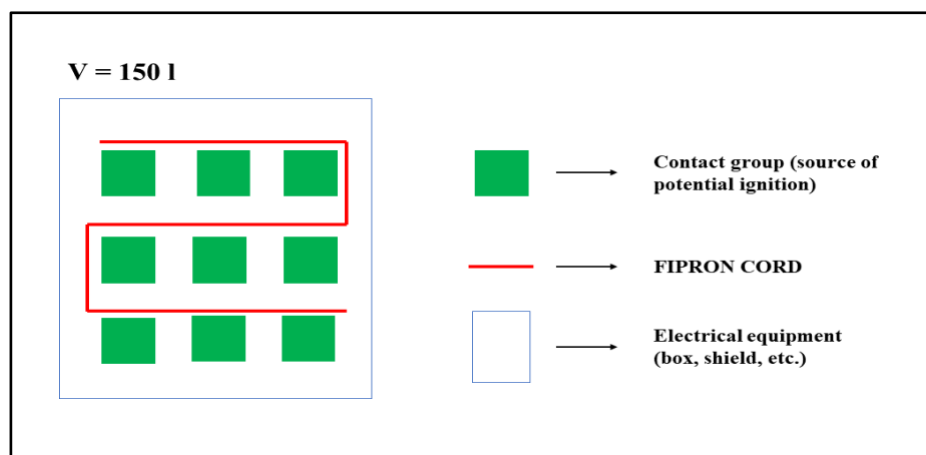


*Legend: contact group; FIPRON CORD; Electrical equipment (switchboard, fuse box, etc.)*

#### 14.3 Scheme 3:

In diagram 3, the volume of the protected space is 100 litres and there are 3 rows of contact groups. After measuring, we found that we need 2 meters of FIPRON CORD MS to protect the volume. When measuring distance of contact groups, we found that we need 2 meters of FIPRON CORD MS product to cover all possible contact groups that are potential sources of ignition.

Final decision: use 2 meters of the FIPRON CORD MS product to protect the equipment, thus ensuring both the filling of the volume of the space with fire extinguisher and the protection of all contact points.



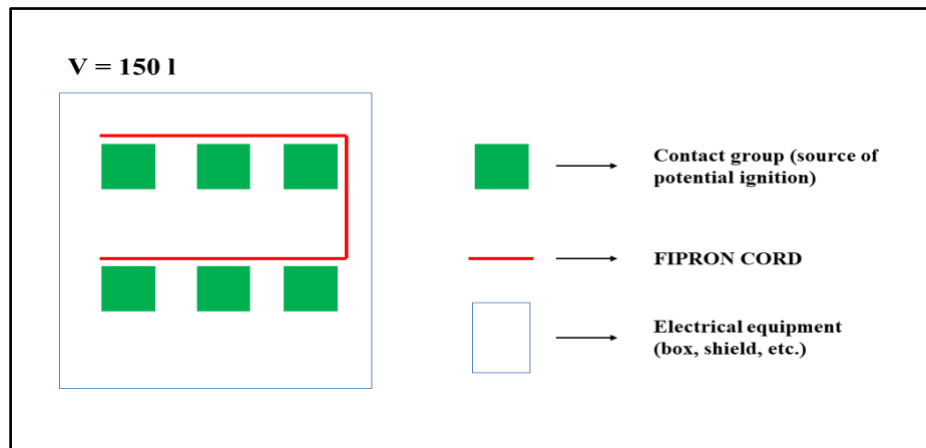
*Legend: contact group; FIPRON CORD; Electrical equipment (switchboard, fuse box, etc.)*



## 15. Schemes of possible installation of FIPRON CORD 1

### 15.1 Scheme 1:

In diagram 1, the volume of the protected space is 150 litres and there are 2 rows of contact groups. After measuring, we found that we need 1.5 meters of FIPRON CORD 1 product to protect the volume. When measuring the distance of the contact groups, we found that we still need 30 cm of FIPRON CORD 1 to cover all possible contact groups that are potential sources of ignition. Final decision: use 1.8 meters of FIPRON CORD 1 product to protect equipment.

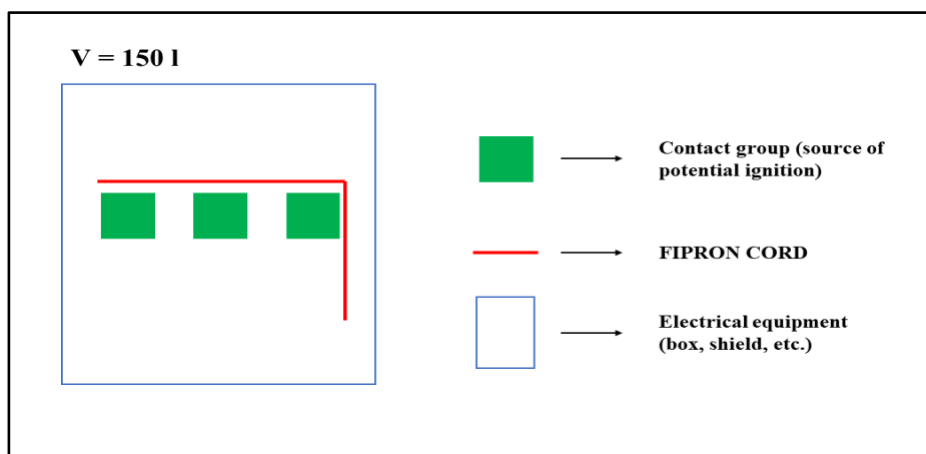


*Legend: contact group; FIPRON CORD; Electrical equipment (switchboard, fuse box, etc.)*

### 15.2 Scheme 2:

In diagram 2, the volume of the protected space is 150 litres and there is 1 row of contact groups. After measuring, we found that we need 1.5 meters of FIPRON CORD 1 product to protect the volume. When measuring the distance of the contact groups, we found that we only need 0.5 meters of FIPRON CORD 1 to cover all possible contact groups that are potential sources of ignition.

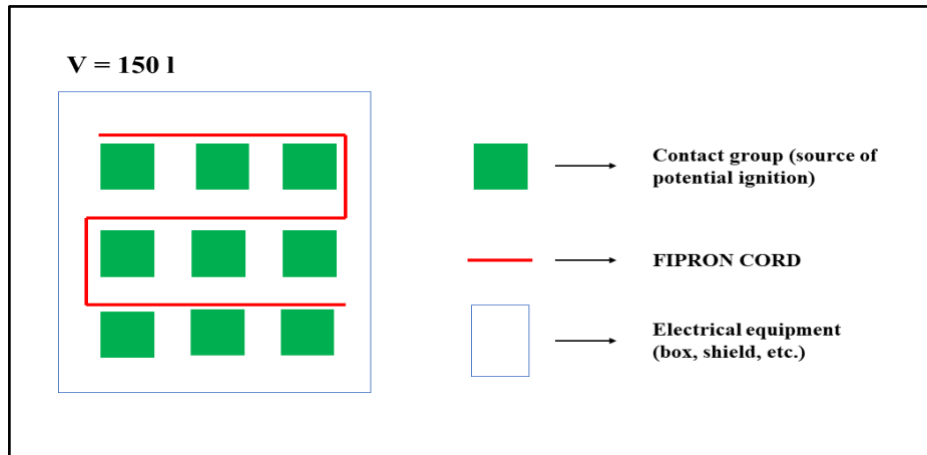
Final decision: use 1.5 meters of FIPRON CORD 1 product to protect the equipment so that the released extinguishing agent covers the total volume of the space.



*Legend: contact group; FIPRON CORD; Electrical equipment (switchboard, fuse box, etc.)*

### 15.3 Scheme 3:

In diagram 3, the volume of the protected space is 300 litres and there are 3 rows of contact groups. After measuring, we found that we need 3 meters of FIPRON CORD 1 product to protect the volume. When measuring the distance of contact groups, we found that we need 3 meters of FIPRON CORD product to cover all possible contact groups that are potential sources of ignition. Final decision: use 3 meters of FIPRON CORD 1 product to protect the equipment.

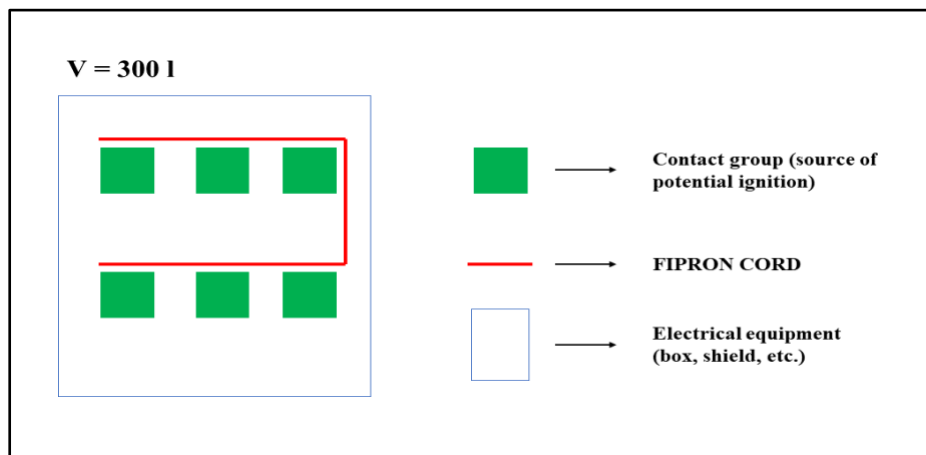


*Legend: contact group; FIPRON CORD; Electrical equipment (switchboard, fuse box, etc.)*

## 16. Schemes of possible installation of FIPRON CORD 2

### 16.1 Scheme 1:

In diagram 1, the volume of the protected space is 300 litres and there are 2 rows of contact groups. After measuring, we found that we need 1.5 meters of FIPRON CORD 2 products. When measuring the contact group distance, we found that we still need 30 cm of FIPRON CORD 2 products to cover all possible contact groups that are potential sources of ignition. Final decision: use 1.8 meters of product FIPRON CORD 2 to protect equipment.

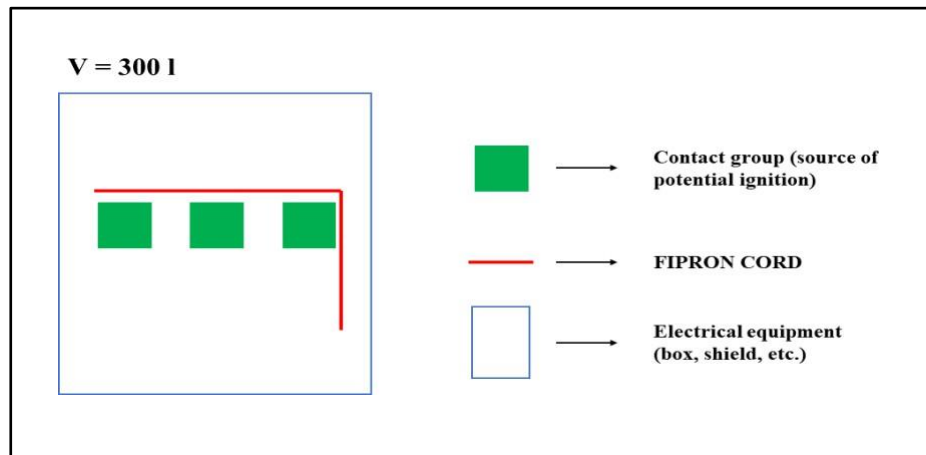


*Legend: contact group; FIPRON CORD; Electrical equipment (switchboard, fuse box, etc.)*

## 16.2 Scheme 2:

In diagram 2, the volume of the protected space is 300 litres and there is 1 row of contact groups. After measuring, we found that we need 1.5 meters of FIPRON CORD 2 products to protect the volume. When measuring the distance of the contact groups, we found that we only need 1 meter of FIPRON product CORD 2 to cover all possible contact groups that are potential sources of ignition.

Final decision: use 1.5 meters of FIPRON CORD 2 products to protect the equipment to cover the protection of the total volume.

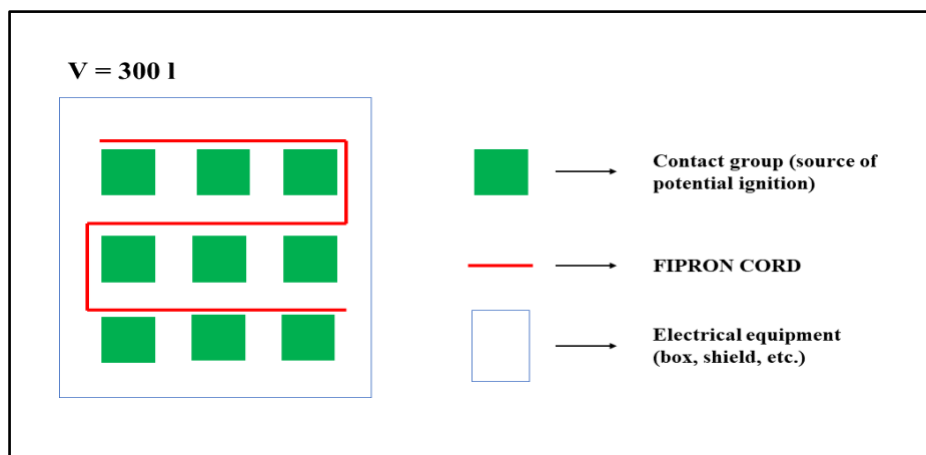


Legend: contact group; FIPRON CORD; Electrical equipment (switchboard, fuse box, etc.)

## 16.3 Scheme 3:

In diagram 3, the volume of the protected space is 400 litres and there are 3 rows of contact groups. After measuring, we found that we need 2 meters of FIPRON CORD 2 products to protect the volume. When measuring the distance of contact groups, we found that we need 2.5 meters of FIPRON CORD 2 products to cover all possible contact groups that are potential sources of ignition.

Final decision: use 2.5 meters of FIPRON CORD 2 products to protect the equipment.



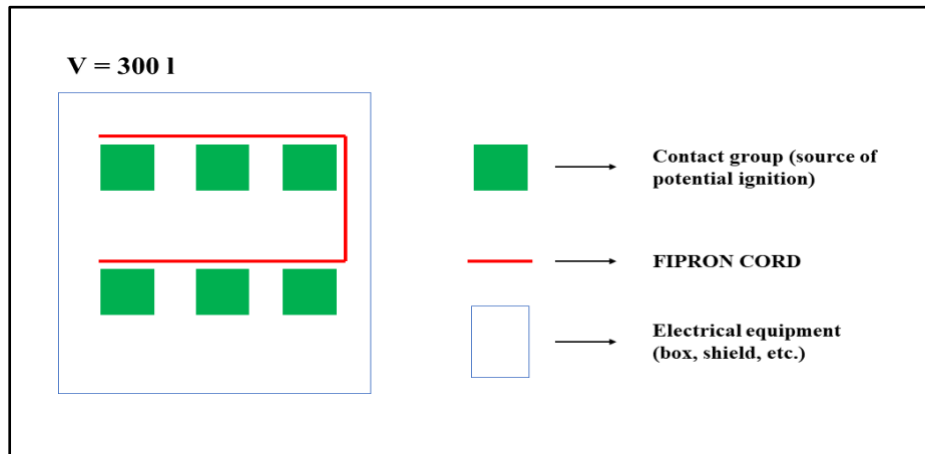
Legend: contact group; FIPRON CORD; Electrical equipment (cabinet, shielding, etc.)

## 17. Schemes of a possible installation of FIPRON CORD 3

### 17.1 Scheme 1:

In Diagram 1, the volume of the protected space is 600 litres and there are 2 rows of contact groups. After measuring, we found that we need 2 meters of FIPRON CORD 3 products. When measuring the contact group distance, we found that we still need 30 cm of FIPRON CORD 3 products to cover all possible contact groups that are potential sources of ignition.

Final decision: use 2.3 meters of product FIPRON CORD 3 to protect equipment.

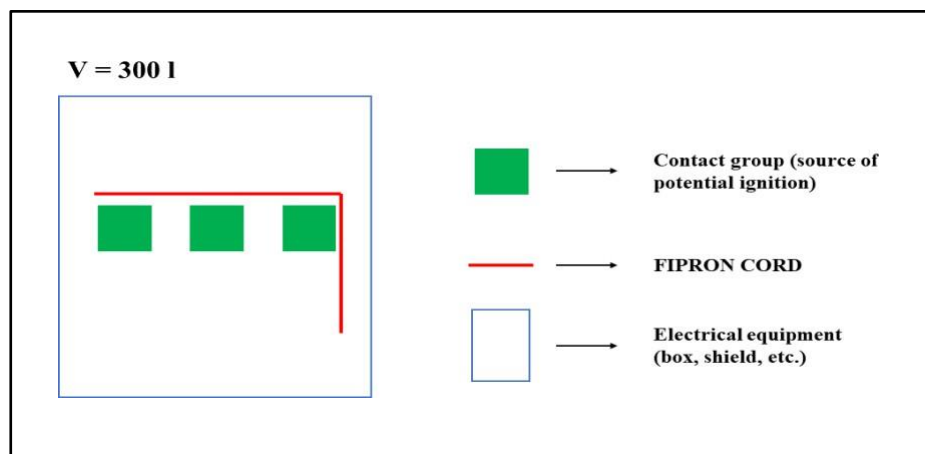


Legend: contact group; FIPRON CORD; Electrical equipment (switchboard, fuse box, etc.)

### 17.2 Scheme 2:

In diagram 2, the volume of the protected space is 600 litres and there is 1 row of contact groups. After measuring, we found that we need 2 meters of FIPRON CORD 3 products to protect the volume. When measuring the distance of contact groups, we found that we only need 1.5 meters of FIPRON CORD 3 products to cover all possible contact groups that are potential sources of ignition.

Final decision: use 1.5 meters of FIPRON CORD 3 products to protect the equipment to cover the protection of the total volume.

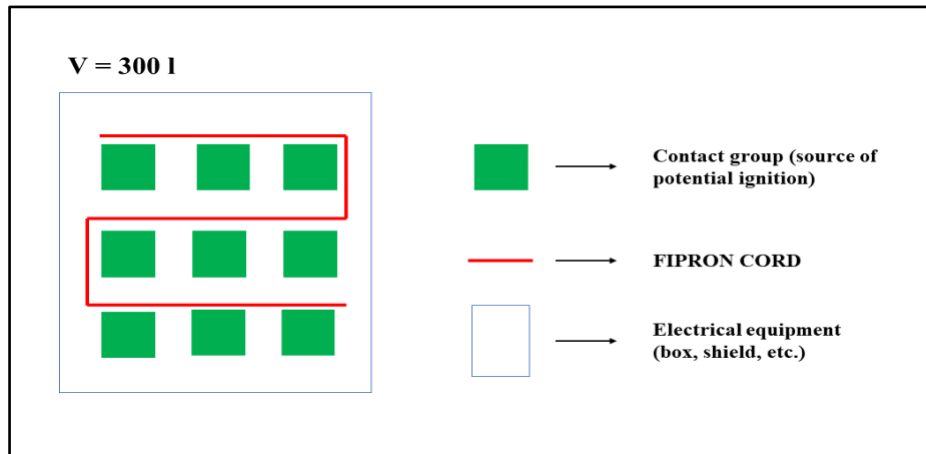


Legend: contact group; FIPRON CORD; Electrical equipment (switchboard, fuse box, etc.)

### 17.3 Scheme 3:

In diagram 3, the volume of the protected space is 800 litres and there are 3 rows of contact groups. After measuring, we found that we need 2.66 meters of FIPRON CORD 3 products to protect the volume, we round up to 2.7 meters. When measuring the distance of the contact groups, we found that we needed 3 meters of FIPRON CORD 3 products to cover all possible contact groups that are potential sources of ignition.

Final decision: use 3 meters of FIPRON CORD 3 products to protect the equipment.



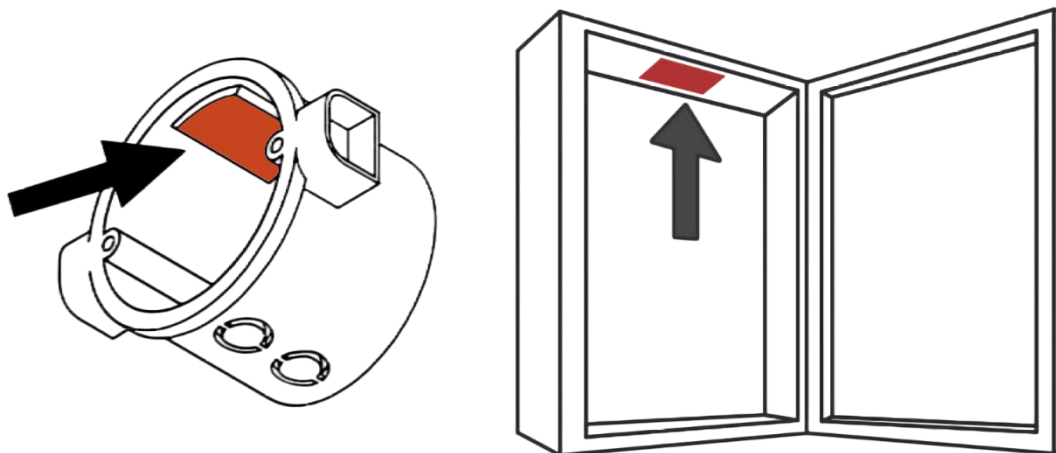
Legend: contact group; FIPRON CORD; Electrical equipment (cabinet, shielding, etc.)

## 18. Image of FIPRON CORD installed





## 19. FIPRON STICKER installation instructions



### 19.1 Installation work

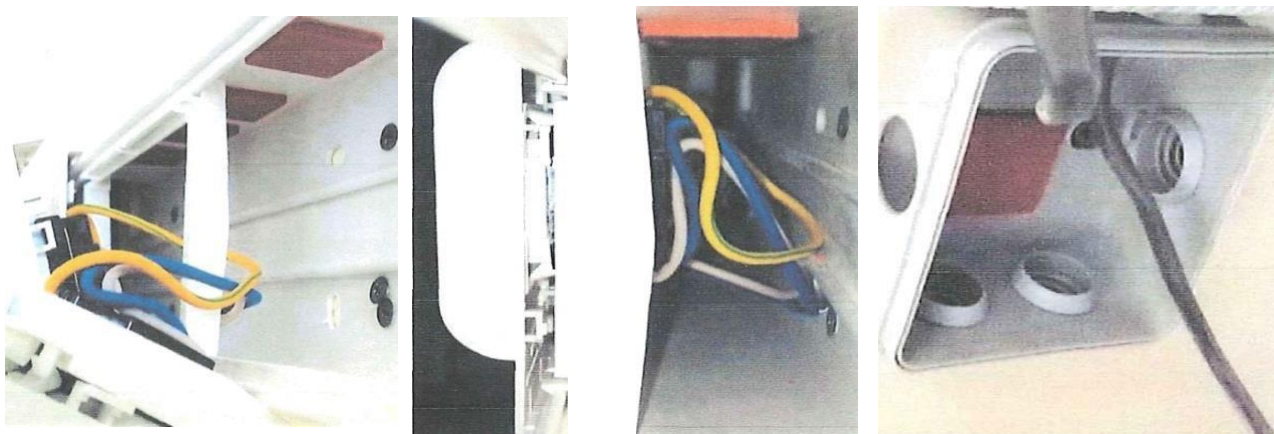
The FIPRON STICKER product should be installed directly inside the panel or socket above the contact group in the upper part of the space with the active layer of the STICKER facing down.

Prepare the surface for product installation - remove dust, dirt and grease from the surface.

Carefully remove the protective film of the adhesive layer of the product.

Firmly press the product with the adhesive layer onto the prepared surface and hold it for a few seconds. The FIPRON STICKER product is installed and ready for use. During installation, it is forbidden to perform actions that could lead to mechanical damage to the FIPRON STICKER product or heat it above 80 °C.

## 20 Images of installed FIPRON STICKER



## 21 Conclusion

This manual contains all the basic information about FIPRON technology and products (FIPRON CORD and FIPRON STICKER) that is required for their correct use and installation.

When working with FIPRON technology, follow the instructions described in this manual. Do not use the product for anything other than what it is intended for. Improper handling may result in injury.

Never intentionally expose the FIPRON product to direct fire or high temperature. Never handle FIPRON products in the presence of fire or high temperatures.

Eye and lung irritation may occur upon contact with the fire extinguisher. In the case of the FIPRON CORD product, burns may occur when activated, as the fire extinguisher will be released along the entire length of the cord.

FIPRON products are intended for direct assembly after unpacking. Do not handle FIPRON products for longer than is strictly necessary for assembly.

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