

FlexRope

DESIGN, INSTALLATION AND MAINTENANCE MANUAL

FOR

FLEXROPE KITS



Models:

981000-SML – Small Kit

981000-MED – Medium Kit

981000-LRG – Large Kit

981000-XLG – Extra Large Kit

DIM-800094

Firetrace USA LLC.

8435 N. 90th St, Suite 2
Scottsdale, AZ 85258 USA

Telephone: 480-607-1218

Website: www.firetrace.com

Email: firetrace@firetrace.com

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DESIGN, INSTALLATION AND MAINTENANCE
800094 FOR FLEXROPE FIRE SUPPRESSION
KITS

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1. Introduction

1.1. General

This manual is written for the user that designs, installs, and maintains the FlexRope fire suppression product.

The FlexRope products are to be designed, installed, inspected, tested, maintained by qualified trained personnel in accordance with the following:

- All instructions, limitations contained in the DIM manual 800094
- All information contained on the product packaging and accompanying documentation
- Local Authority having jurisdiction
- All relevant local codes and requirements

1.2. Safety Precautions

Safety precautions are essential when any electrical or mechanical equipment is involved. These precautions should be followed when installing, servicing, and maintaining the FlexRope product installations. If safety precautions are overlooked or ignored, personal injury or property damage may occur. Failure to follow the instructions contained within this DIM manual and the product accompanying documentation, may result in the product not suppressing a fire as designed, cause damage to the protected enclosure or present serious health hazards or even death to those in the proximity of the enclosure.

Please ensure all warnings, cautions, and danger notices provided in the document are always observed and followed.

The following safety precautions should always be followed:

WARNING

Heat sensitive products are extremely hazardous and if not handled properly can cause bodily injury, death, or property damage

WARNING

Discharge of agent can result in a potential hazard to personnel from the natural form of the agent. Avoid unnecessary exposure



WARNING

If the FlexRope kit activates due to fire, isolate and de-energize equipment within the protected enclosure



WARNING

Ensure the Protected by FlexRope label is visible and securely fastened to the protected enclosure, and that awareness of the product and its use are in place

1. Read and understand this manual and the other documents referenced herein.
2. Wear safety glasses when working with the FlexRope product. It is recommended to wear heat resistant gloves and clothing to avoid any burns should the product be ignited accidentally.
3. Follow all the safety procedures included in the accompanying documentation with the product and in this DIM manual.
4. Never assume that the FlexRope product is cool to touch after an ignition event – always handle with temperature resistant gloves and with care.

Any questions concerning the information contained in this manual should be addressed to:

Firetrace USA LLC.

8435 N 90th St, Suite 2
Scottsdale, AZ 85258 USA

Telephone: +1-480-607-1218

Email: flexrope@firetrace.com

The following web site should be visited for frequent technical announcements

www.firetrace.com/flexrope

2. System Description

2.1. Product Description

The FlexRope is a fire suppression product that responds to the heat from a fire. Due to the inherent flexibility of the FlexRope, it can be installed in narrow spaces and close to all potential ignition points. This will allow for the FlexRope to detect a fire as early as possible and extinguish the fire before it spreads.

The FlexRope will both detect the fire and automatically release the fire suppressant to suppress the fire. No external power or other devices are required for the product to operate.

The intention of the product is to contain and suppress a fire within an electrical cabinet (or similar) to prevent the spread of fire outside of this enclosure. The hazard or enclosure can be any layout or shape provided that the hazard being protected is within the limitations described in this manual.

Each FlexRope product when installed is a self-contained fire suppression system, meaning that it is equipped with its own automatic (non-electric) detection system, which automatically releases the suppression agent into the hazard area.

Local authorities having jurisdiction should be consulted as to the acceptability for hazards and requirements covering installation where appropriate.

The FlexRope system is designed for use in a total flooding application where the hazard is not occupied by a human being.

2.2. Components

The FlexRope is comprised of a proprietary blend of fire suppression material held in a granule form. The granules are wrapped in a vinyl membrane and then covered in a woven fiber glass braid. Each end of the FlexRope is closed with a cap to prevent the granules from spillage.

In case of damaged to the FlexRope product – do not use under any circumstance, please contact your local distributor to obtain a replacement.

Never cut or try to shorten or tie two lengths together – the product has been designed for a full discharge regardless of where heat or fire is detected, by modifying this device the product may not result in a full activation or discharge.

2.3. Properties

The FlexRope product detects fire and discharges the fire suppression material when activated by temperatures exceeding 660°F (350°C).

The extinguishing application density is 125 g/m³

The design application density is 168.75 g/m³

Minimum Bend Radius 0.5" (12.5mm)

Maximum Activation Height (distance from ignition point) 2" (50mm)

Suitable for Class A, B & C fire

2.4. Environmental Considerations

The usage and storage temperature of the FlexRope product should be between -40°F to 176°C (-40°C to 80°C)

The storage humidity of the FlexRope product should not exceed 80%

All FlexRope products removed from useful service shall be disposed of or recycled in an environmentally sound manner and in accordance with existing laws and regulations.

2.5. How it works

The FlexRope product is positioned near the potential ignition points within the enclosure. If a fire scenario is to occur, the heat will cause the FlexRope to activate by a chemical reaction within the granules of the FlexRope. Once this reaction starts, the entire length of the FlexRope will be activated – causing a discharge of aerosol like particles to flood the enclosure and suppress the fire.

Within each FlexRope kit there are two lengths of FlexRope. Only one length is required for protection of all ignition points typically, and the two lengths should not be connected. The second length should be used for redundancy, or for continued protection after the first piece has been activated. It can also be used to cover more ignition points, should the enclosure be densely populated and have many ignition points in total. Both the supplied lengths of FlexRope in each kit should be used to protect the application, and no cutting or altering of the length of FlexRope is permitted.

2.6. Particle Size & Toxicity

On discharge of the fire suppressant material, >99% of particles are <1 µm

90-99% of particles are in the 1 – 2 µm size range

The by-products of combustion aside from the fire suppressant material are carbon dioxide, moisture, and NO_x compounds. The PPM levels of these by-products are not considered hazardous as the product is used in a non-occupied space.

2.7. Environmental Parameters

Ozone Depletion Potential = 0

Global Warming Potential = 0

Atmospheric Lifetime = Negligible

Corrosion = Negligible within the parameters for use

2.8. Hazards to Personnel

The discharge of the FlexRope product could potentially create a hazard to personnel due to the nature of the aerosol and heat created by the product on activation. Unnecessary exposure of personnel to the protected enclosure during or after a discharge, or to the by-products generated by the fire or discharge of the product should be avoided.

Noise, turbulence, reduced visibility may be present during the discharge of the FlexRope product. During discharge and for a significant time after, the Line product will remain extremely hot. Do not touch the Line product for 1 hour post a discharge of the product, or until it has returned to a safe temperature.

It is recommended that the appropriate fire and safety personnel are present during the clean up after a fire event has occurred.

3. Design Parameters

3.1. Target Applications

The FlexRope product is intended to be used in electrical panels or cabinets up to 35.3ft³ (1m³). See section 3.3 for enclosure limitations and integrity information.

Electrical panels can include but not limited to:

- Control Panels
- Relay Panels
- Panel boards
- Distribution boards
- Access boards
- Inverter panels
- Fuse panels

The FlexRope product is design to suppress Class A, B and C fires.

The FlexRope product is not to be used in enclosures to protect against flammable liquids, vapors or dusts that may form an explosive air/fuel mixture. It should also not be used to protect an enclosure against a Class D fire – metal fires and substances that can burn without the presence of oxygen. This includes reactive metals, metal hydrides, oxidizers, or mixtures such as cellulose nitrate and gunpowder, or chemicals capable of undergoing auto-thermal decomposition.



Figure 1 Example of a Relay Panel



Figure 2 Example of a Control Panel with FlexRope Installed

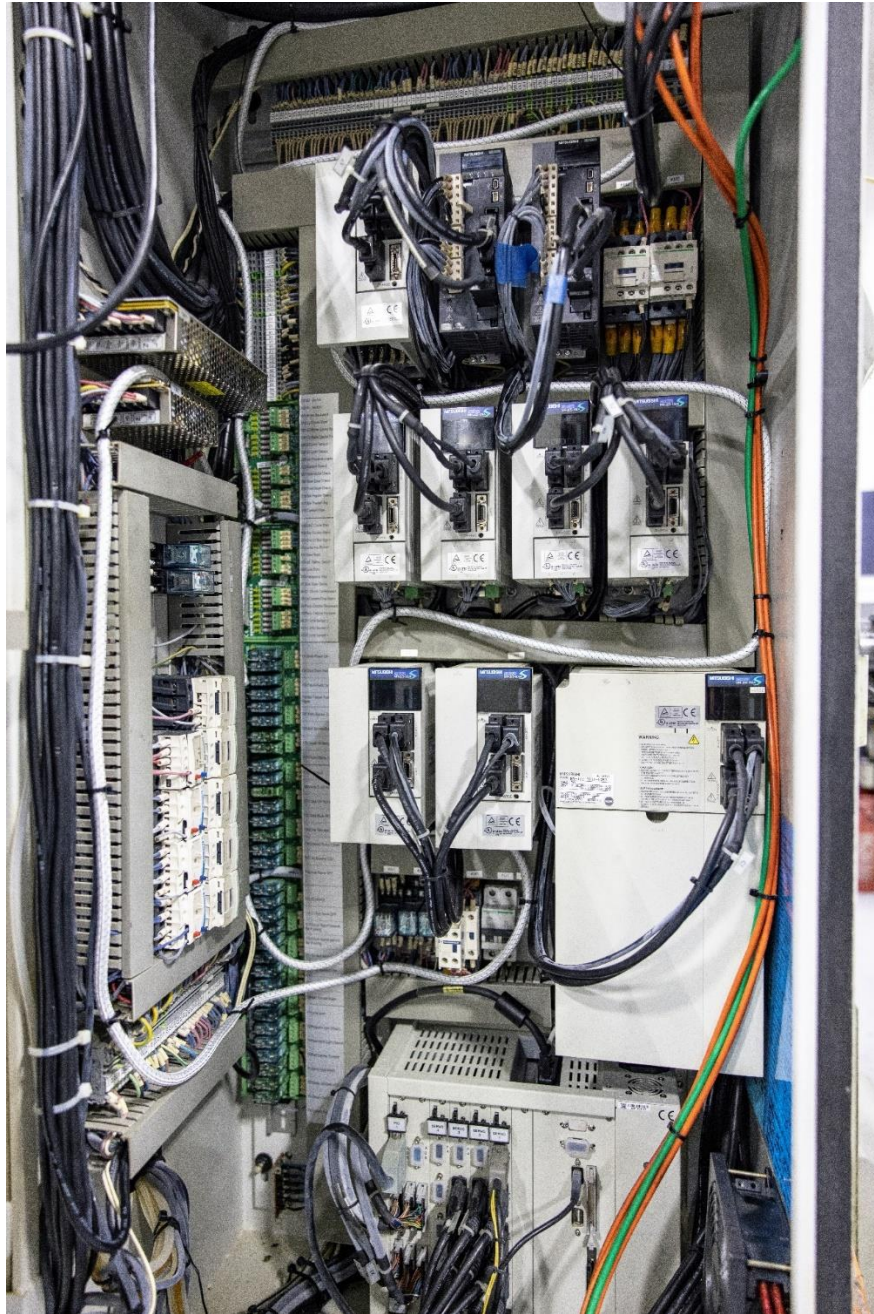


Figure 3 Example of a CNC Machine Control Panel with FlexRope Installed

3.2. FlexRope Kits and the Protected Volumes

There are 4 standard kit sizes available:

Part Number	Description	Protected Volume (m ³)	Protected Volume (ft ³)	FlexRope Lengths Included
981000-SML	Small Enclosure Kit	< 0.30	<10.6	2x 44" (2x 1.1m)
981000-MED	Medium Enclosure Kit	0.30 to <0.50	10.6 to <17.6	2x 73" (2x 1.8m)
981000-LRG	Large Enclosure Kit	0.50 to <0.80	17.6 to <28.2	2x 116" (2x 2.9m)
981000-XLG	Extra Large Enclosure Kit	0.80 to 1.00	28.2 to 35.3	2x 145" (2x 3.6m)

Each kit contains two lengths of FlexRope product of a pre-defined length. Each length is designed to suppress fire based on the protected volume. Both lengths of FlexRope are designed to be installed within the same enclosure, to ensure all ignition points are covered and in case of redundancy.

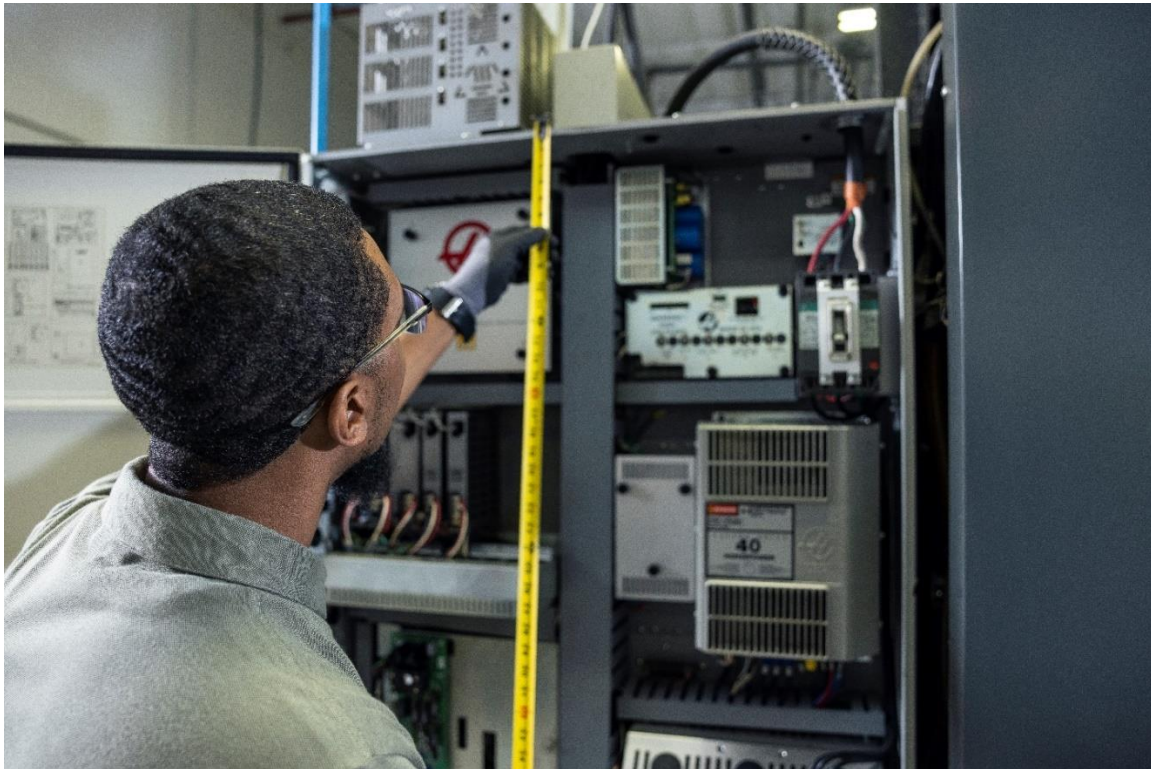


Figure 4 Measuring of an electrical panel to check the protected volume

3.3. Enclosure Limitations

The maximum volume of the enclosure is 35.3ft³ (1m³), there are 4 sizes of FlexRope product available that can cover various volumes up to this limitation.

When calculating the volume of the enclosure, the gross volume (enclosure) should be used, and no deductions for equipment contained inside may be deducted from this protected volume.

The enclosure is required to have an IP rating greater than IP20 and/or a NEMA rating greater than 1.

NEMA 1 – Enclosures are constructed for indoor use to provide a degree of protection to personnel against access to hazardous parts and to provide a degree of protection of the equipment inside the enclosure against ingress of solid foreign objects (falling dirt).

IP20 – IP ratings have two numbers, the first digit in the rating indicates the enclosure's ability to protect against the ingress of foreign solid objects, such as dust; the second digit indicates the level of protection against the ingress of water or other liquids.

Our minimum IP rating of IP20, the "2" indicates protection against solid objects $> \frac{1}{2}$ " (12.5mm) diameter, the "0" indicates no protection against water.

Where openings are uncloseable, a maximum surface area opening of 0.36% is permissible, this is calculated by dividing the sum of all openings, by the sum of total surface of each side of the enclosure

3.4. Ignition Points

As part of the initial hazard assessment and installation, care must be taken to ensure the FlexRope is installed within 2" (50mm) of all the identified potential ignition points to ensure maximum effectiveness.

It is recommended that the FlexRope is installed horizontally above ignition points. Placing the FlexRope vertically or below, may significantly delay the response time.

Examples of ignition points within an electrical enclosure could be but not limited to electrical terminations, electrical connections, electrical wiring with a significant bend radius, electrical components.

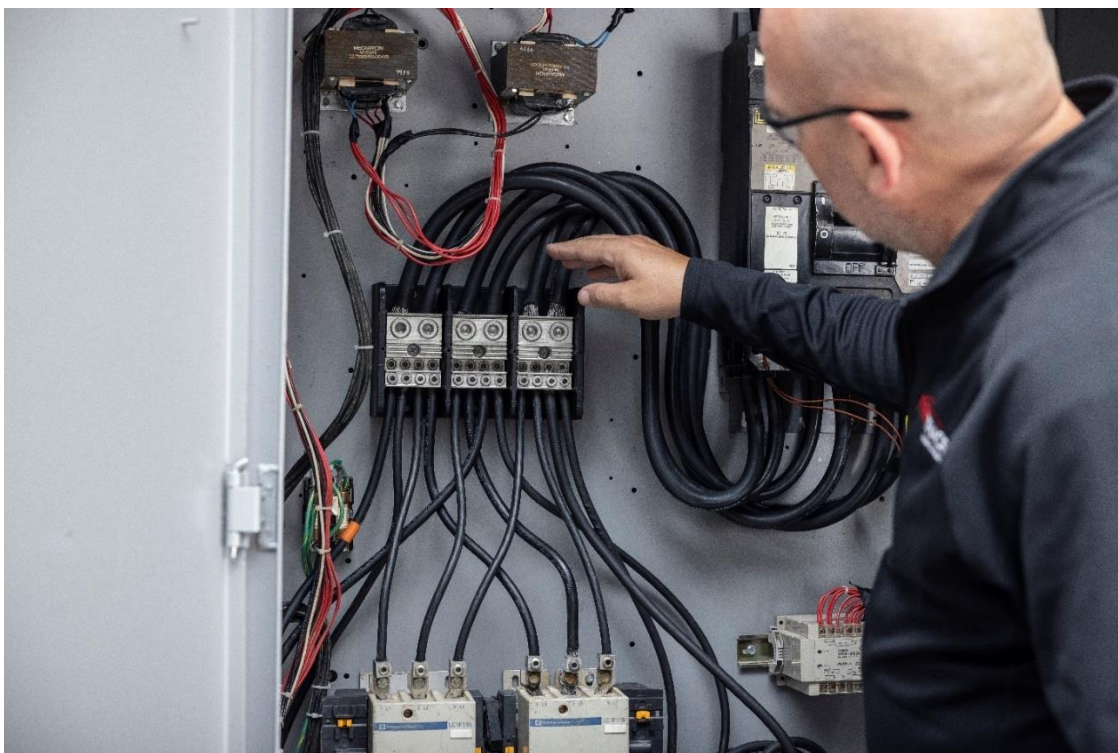


Figure 5 Checking the Ignition Points inside an electrical cabinet

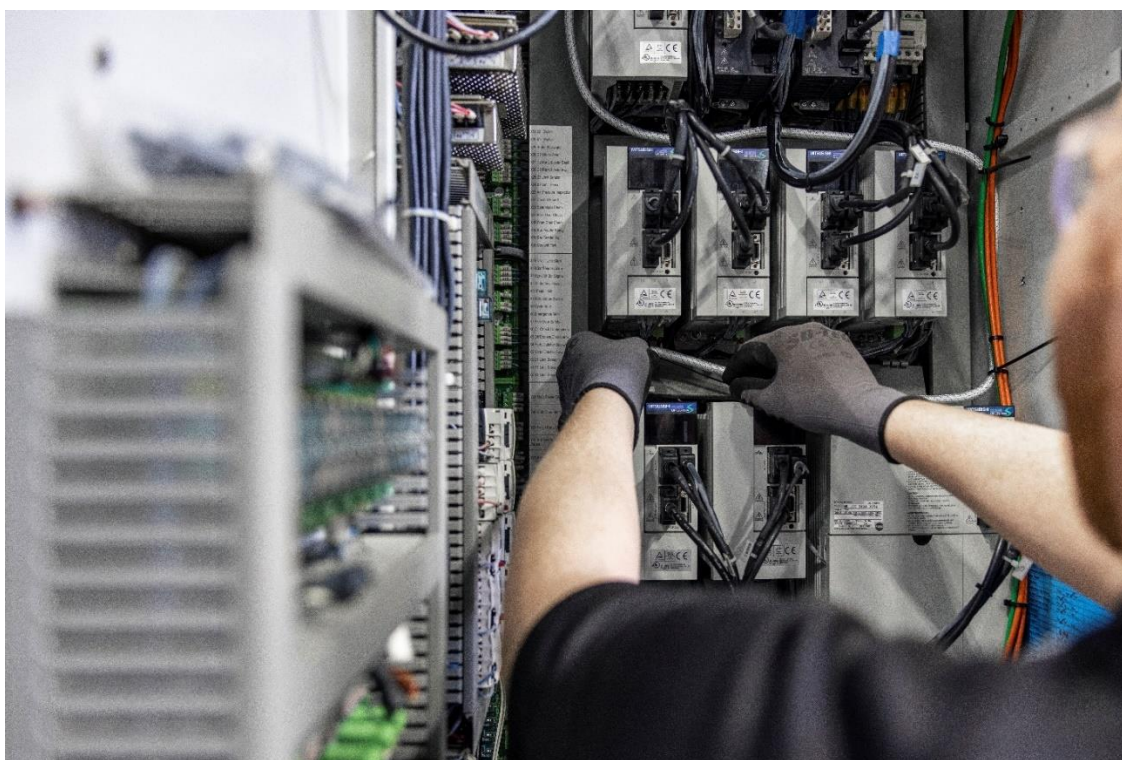


Figure 6 Installing FlexRope above the ignition points in an electrical cabinet



Figure 7 Terminating the FlexRope at the lowest ignition point

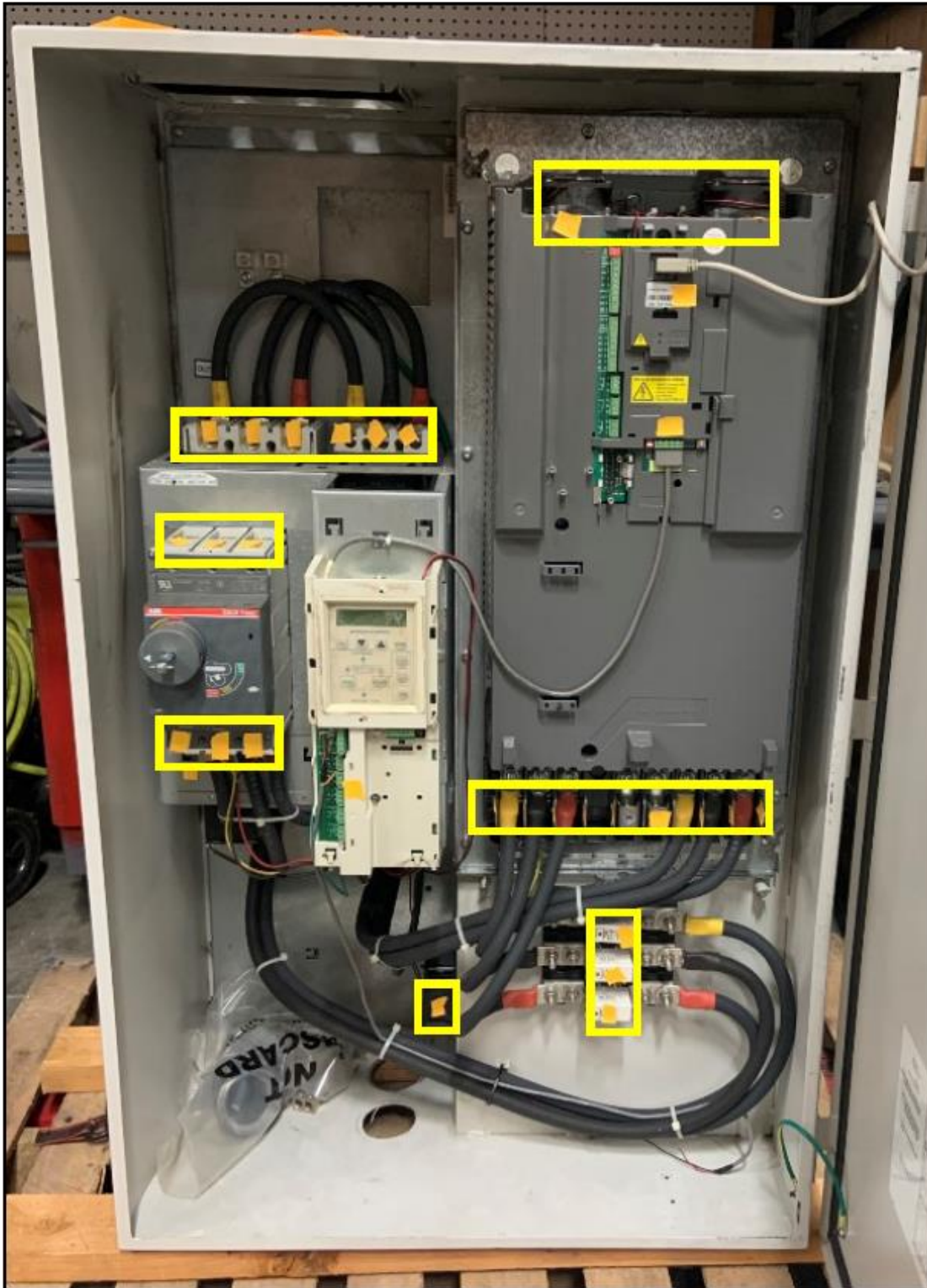


Figure 8 Example of ignition points highlighted in an electrical panel

3.5. Design Procedure

A hazard analysis to be performed of the enclosure, integrity, and component layout within. This should consist of:

- Enclosure volume (measuring the length x width x height) of the protected space
- Potential ignition points – identify these, ensure suitable mounting area is available for the FlexRope by each of these points.
- Identify the routing of the FlexRope and ensure sufficient length is available in the kit sizes provided.
- Uncloseable openings – assuming the NEMA 1 rating and/or IP20 is satisfied, ensure there are no additional cutouts to the enclosure that would reduce the integrity of the enclosure.

The pre-engineered FlexRope kits, providing the guidance depicted within this DIM manual are followed ensure that no further calculations of agent quantity should be required.



Figure 9 Preparing for FlexRope installation after performing the hazard analysis of an electrical panel

4. Installation Instructions

4.1. Environment Safety

Ensure any electrical panel is completely safe to access and fully de-energized before installing the FlexRope product.

The FlexRope product must be handled with care, do not crush, or kink the product as the granules contained inside may be disturbed and affect the performance of the product.

Do not place the FlexRope product on a hot surface or where the ambient temperature exceeds 176°F (80°C).



Figure 10 Ensure the electrical panel is de-energized before commencing any activity

4.2. Tools and Equipment

All standard fixings are contained within each kit.

Cable tie cutters or equivalent may be required to ensure no excessive material remains once the cable ties are securely fastened.

4.3. Fixings and Spacing

Ensure the FlexRope product is securely fastened within the electrical panel, at a recommended 6" (150mm) spacing for all fixings, where possible.

It is recommended that the FlexRope is installed horizontally above ignition points. Placing the FlexRope vertically or below, may significantly delay the response time.

Ensure the cable ties are pulled snug to the FlexRope but not impinging on it – this may result in deforming the product and affect the suppression capability.

When fastening the FlexRope product near to an ignition point, ensure the cable tie is not directly between the ignition point and the FlexRope product – to ensure the earliest possible detection and product performance.



Figure 11 Securely fastening the FlexRope using the provided cable tie inside an electrical panel



Figure 12 Preparing cable tie and mounting post



Figure 13 Pass the FlexRope through prepared cable tie and tighten

5. Service and Maintenance

5.1. General

Service and maintenance to be performed by competent and authorized personnel only, in accordance with the instructions contained within this manual, the accompanying product documentation and any other regulations and codes that may apply.

Regular inspection of the FlexRope product is recommended, visually inspecting all surfaces of the product looking for any damage, cuts, abrasions that may inhibit the ability to suppress a fire should the need occur.

A periodic maintenance schedule is recommended, maintaining an inspection log for reference. At a minimum, the log must record: Inspection interval, Inspection procedure performed, Maintenance performed if any – because of inspection, and the name of the inspector performing the task.

When accessing any enclosure protected by the FlexRope, ensure that the enclosure has been safely de-energized, and this action is performed by competent and authorized personnel.

5.2. Periodic Service and Maintenance

5.2.1. Monthly

- Make a visual inspection of the FlexRope product, checking for abrasion, distortion, cuts, any other damage that may prevent the product from sensing or suppressing a fire should one occur

5.2.2. Semi-annually

- Ensure the protected enclosure is fit for purpose – no changes since initial hazard analysis was performed – no new holes/cut-outs/ventilation added

After 5 years since the product was installed, it shall be replaced.

5.3. Post Fire Maintenance

If a fire has been detected by the FlexRope product, and the system activated, ensure the emergency services have deemed the area safe before accessing the protected enclosure.

If the emergency services were not involved, ensure that the appropriate competent person has deemed the enclosure safe for access by de-energizing the equipment inside.

Do not open the enclosure immediately after the FlexRope product has discharged, as there is a potential for re-ignition until the equipment has been fully de-energized.

Ensure the product has fully cooled after a discharge scenario has occurred – wait a minimum of 1 hour before handling the product.

6. Appendix

6.1. Available Kits

There are 4 kits available for each Ignitame Line product length. These can be broken down as follows:

	981000-SML Small FlexRope Kit	
Item Number	Description	Quantity
281000-SML	FlexRope Assembled - SML	2
281100-25	Zip Tie Kit (25ct)	1
862783	Label, Protected by FlexRope	1

	981000-MED Medium FlexRope Kit	
Item Number	Description	Quantity
281000-MED	FlexRope Assembled - MED	2
281100-25	Zip Tie Kit (25ct)	1
862783	Label, Protected by FlexRope	1

	981000-LRG Large FlexRope Kit	
Item Number	Description	Quantity
281000-LRG	FlexRope Assembled - LRG	2
281100-25	Zip Tie Kit (25ct)	2
862783	Label, Protected by FlexRope	1

	981000-XLG Extra Large FlexRope Kit	
Item Number	Description	Quantity
281000-XLG	FlexRope Assembled - XLG	2
281100-25	Zip Tie Kit (25ct)	2
862783	Label, Protected by FlexRope	1



Figure 14 Example of what a FlexRope kit contains



Figure 15 FlexRope - a product from Firetrace International

6.2. SDS of the FlexRope Product

FlexRope

SAFETY DATASHEET

1. IDENTIFICATION OF THE PRODUCT AND THE MANUFACTURER

Product name	FlexRope
Manufacturer	Firetrace International 8435 N. 90th Street, Suite 2, Scottsdale, Arizona 85258 Telephone: +1 (480) 607-1218 E-mail: flexrope@firetrace.com
Technical description	FlexRope, composed of fire suppressant granules, enclosed in a membrane, and surrounded by an outer sheath
Sphere of application	Autonomous installation that when directly exposed to fire releases a fire suppressing agent that can suppress fire within an enclosure. Suitable for class A, B and C fires in an ambient temperature range from -40°C to 150°C

2. IDENTIFICATION OF HAZARDS

Classification of the product	Hard flammable Non-irritant
Safety phrases	S2 - Keep out of the reach of children. S41 - In case of fire and/or explosion do not breathe fumes S45 - In case of accident or if you feel unwell seek medical advice immediately (show the label where possible)
Other hazards	Ingredient "Potassium nitrate - KNO ₃ " (CAS № 7757-79-1) is classified as "May be harmful if swallowed", "May intensify fire; oxidizer", "May cause respiratory irritation", "Causes skin irritation", "Causes serious eye irritation", "Harmful to aquatic life with long lasting effects"

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3. INGREDIENTS

INGREDIENTS	WEIGHT	CAS-RN
Epoxy Resin Polyepichlorohydrin	26 %	24969-06-0
Potassium nitrate	35 %	7757-79-1
Potassium Carbonate	9 %	584-08-7
Fiber glass continuous Filament	15 %	65997-17-3
Polyester Yarn	2 %	None
Vinyl Chloride	10 %	9002-86-2
Natural Rubber	3 %	9006-04-6

4. FIRST AID MEASURES

Common information	The product does not pose a danger, requiring resuscitation measures.
In case of inhalation of combustion products	Move person to fresh air, keep calm. According to the situation, seek medical help.
In case of swallowing	Induce vomiting. According to the situation seek medical help.

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5. FIRE SAFETY

The product does not pose a fire hazard. The product is designed to suppress fire.

The product refers to combustible substances.

The product does not support self-burning.

Exact fire risk indices were not defined.

Prohibited types of fire-fighting means: none.

6. MEASURES TO PREVENT AND ELIMINATE ACCIDENTS

The product may not be a cause or an aggravating factor in an emergency or disaster.

7. REGULATION OF STORAGE PRODUCTS AND HANDLING

Common information	Storage and handling – according to the operational documentation. No special requirements for storage and handling. The product is not dangerous cargo.
Storage and operating	-40 °C to 150 °C Humidity < 80 %
Expiration period	5 years
Warnings	Do not expose to sunlight and water. Transporting only in the manufacturer's packaging.

8. PERSONAL PROTECTIVE EQUIPMENT

During storage, transportation, installation, and operation of the product does not require the use of personal protective equipment.

FlexRope

9. PHYSICO-CHEMICAL PROPERTIES

Common information	The product is a flexible line containing solid granules
Physical condition	Solid
Color	Variable
Solubility	This product is soluble in water and organic compounds

10. STABILITY AND REACTIVITY

In compliance with the conditions of storage and use - a stable product.
Chemically neutral.

11. TOXICITY

The product is not an obvious toxicological hazard.
Toxicity of combustion products is not determined.

12. IMPACT ON THE ENVIRONMENT

This product does not contain environmentally harmful substances
Ingredient "Potassium nitrate - KNO₃" (CAS № 7757-79-1) is classified as "harmful to aquatic life with long lasting effects"

13. DISPOSAL CONSIDERATIONS

Dispose of contents/container through a waste management company authorized by the local government.

FlexRope

14. TRANSPORT INFORMATION

14.1. UN number

UN number is not set (not a hazardous material)

14.2. UN proper shipping name

Solid state material, non-hazardous

14.3. Transport hazard classes

This product is not classified as dangerous for IATA Transport

14.4. Packing group

Unknown

14.5. Environmental hazards

Not a hazardous material

14.6. Special precautions for user

Do not expose to the sunlight, must comply with storage temperature range

14.7. Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code

Unknown

15. REGULATORY INFORMATION

15.1. Safety, health, and environmental regulations/legislation specific for the substance or mixture

No specific regulatory

15.2. Chemical safety assessment

Not applicable

16. OTHER INFORMATION

Website: www.firetrace.com/flexrope