



**DESIGN, INSTALLATION, OPERATION, AND
MAINTENANCE MANUAL**

FOR

**PRE-ENGINEERED AUTOMATIC INDIRECT LOW
PRESSURE CLASS D DRY POWDER SUPPRESSION UNIT**

Designed for use in:

CNC Processing of Reactive Metals

DOT Systems:

941009 CYLINDER ASSEMBLY, DOT, ILP, CLASS D DRY POWDER, 10LB

942009 CYLINDER ASSEMBLY, DOT, ILP, CLASS D DRY POWDER, 20LB

Document: 800103 (DIOM, ILP, CLASS D DRY POWDER, 195 PSI)

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1 FOREWORD

1.1 General

This Manual is written for the fire protection professional that designs, installs, and maintains Firetrace Pre-Engineered Automatic Indirect Class D Dry Powder Suppression Units.

Firetrace Class D Dry Powder Automatic Indirect Fire Suppression Units are to be designed, installed, inspected, tested, maintained, and recharged by qualified trained personnel in accordance with the following:

- NFPA 17 – Standard for Dry Chemical Extinguishing Systems
- UL 711 – Rating and Fire Testing of Fire Extinguishers
- All instructions, limitations, etc. contained in this Manual P/N 800103
- All information contained on the agent cylinder nameplate(s)
- Local Authority having jurisdiction

1.2 Warnings

Safety precautions are essential when any electrical or mechanical equipment is involved. These precautions should be followed when handling, servicing, and recharging Firetrace Dry Powder Fire Suppression Units and Equipment. If safety precautions are overlooked or ignored, personal injury or property damage may occur.

The following symbols are used throughout this Manual. Always heed these precautions. They are essential to the safe use of the equipment described in this Manual.



DANGER:

This danger symbol identifies immediate hazards and provides specific instructions or procedures, which if not correctly followed **WILL** result in severe personal injury or death.



WARNING:

This warning symbol identifies specific instructions or procedures, which if not correctly followed, **COULD** result in severe personal injury or death.



CAUTION:

This caution symbol identifies specific instructions or procedures, which if not correctly followed, **COULD** result in minor personal injury or equipment or property damage.

1.3 Safety Precautions

The following safety precautions should always be followed:



WARNING

Pressurized (charged) cylinders are extremely hazardous and if not handled properly are capable of causing property damage, bodily injury, or death. Always wear safety glasses and make sure the discharge port safety plug(s) and cap(s) are properly in place before unit installation, servicing, or other general handling.

1. Read and understand this Manual and the other documents referenced herein.
2. The valve discharge outlet safety plugs **MUST** be installed on the cylinder valve at all times and only removed when connected into the discharge tubing, or when performing charging, testing, or salvaging operations in accordance with the procedures contained in this Manual.
3. Wear safety glasses when working with pressurized cylinders and charging equipment.
4. Make sure that the ball valve (attached to the top of the cylinder valve) is closed (lever is in "OFF" position), the detection tubing has been removed from the cylinder valve, and the safety caps installed before removing the cylinder from the installation and before performing any charging, leak tests, or salvage operations.
5. Follow all of the safety procedures included on the cylinder nameplate and in this Manual.
6. Never assume that a cylinder is empty. Treat all cylinders as if they are fully charged.

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

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2 INTRODUCTION

The Firetrace Indirect Class D Dry Powder Automatic Fire Suppression Unit is designed for CNC cutting areas and collection bins, using Class D Dry Powder. The Firetrace Class D Dry Powder Self-Contained Automatic Suppression Units have been tested to limits from inputs by NFPA 17 and UL/ULC 711 in compliance with the requirements.

Each installed unit is equipped with detection tubing, discharge piping, and nozzles. The pre-engineered concept minimizes the amount of engineering involved in application/system design. When the discharge piping and nozzles are installed within the limitations stated in this Manual, no hydraulic calculations are required to determine pressure drop, agent flow, or discharge time.

The hazard being protected can be any CNC cutting area or collection bin provided that the hazard being protected is within the limitations described in this Manual. When installed, each suppression unit is a self-contained unit, meaning that it is equipped with its own automatic (non-electric) detection system. This system, when actuated, automatically releases the suppression agent into the hazard area.

Two (2) suppression units may be configured for simultaneous manual or electric actuation to protect one hazard within the limitations described in this Manual. More than two suppression units **cannot** be combined to protect a larger size hazard since the configuration/performance has not been validated for simultaneous actuation of (3) or more units and therefore not recommended.

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

2.1 Class D Dry Powder Extinguishing Agent

The Class D dry powder extinguishing agent used in Firetrace Class D Self-Contained Automatic Indirect Fire Suppression Units is a special blend Sodium Chloride (NaCl) based extinguishing agent, also known as Super D Dry Powder.

Dry Powder is an off-white, non-abrasive and non-combustible fine solid powder blended with additives such as anti-caking and free flowing agents to allow smooth and even discharge through hoses and piping under the influence of an expellant gas. When discharged, dry powder will flow to the targeted area and settle on surface.

Once Class D Dry Powder is discharged onto the fire hazard it will form a sealing crust on the combustible metal fire. This crust creates a barrier from the air and assists in dissipating the heat from the metal fire.

2.2 Cleanliness

Since Class D powder is a Sodium Chloride based powder, it has a pH level of approximately 6.7 - 7.3, which is less acidic than standard ABC Dry Chemical extinguishing agent. However, due to some of the other chemical properties in the Class D dry powder agent it may corrode some types of metal surfaces after long exposure. To minimize possible staining or corrosion, the exposed areas should be cleaned off once sufficiently cooled and deemed safe to do so. Class D Dry Powder can be cleaned up by one of the following methods: After a fire incident, the surface will remain hot at the time of discharge, the powder must be scraped/shoveled off the surface and transferred into a metal drum or container with a minimum melting point of 2500°F (1370°C). Wipe, vacuum, or wet sweep the exposed areas containing excess powder, while avoiding dust formation.

2.2.1 Properties of Class D Dry Powder

For hazard information, decomposition information, and physical properties of Class D Dry Powder please refer to the Safety Data sheet located in Appendix C.

3 SYSTEM DESCRIPTION

3.1 General

The Firetrace Class D Dry Powder Indirect Suppression Units are available in 2 sizes.

- 941009 - CYLINDER ASSEMBLY, DOT, ILP, M10X1 GAUGE, CLASS D DRY POWDER, 10LB
- 942009 - CYLINDER ASSEMBLY, DOT, ILP, M10X1 GAUGE, CLASS D DRY POWDER, 20LB

These systems are designed for use in CNC cutting areas and Collection Bins.

The Firetrace Indirect Class D Units can be used, but are not limited to protect the following CNC processing workspaces:

- Cutting Area
- Collection Drum & Bins

Class D Dry Powder is a finely divided powder that has been approved in Firetrace Systems for use on:

- Class D – Magnesium, Titanium & Zirconium Metal Fires

Dry Powder should not be used where the following materials may be present.

- Pyrotechnic chemicals containing their own oxygen supply
- Reactive metals such as lithium, uranium and plutonium
- Metal hydrides
- Chemicals capable of undergoing autothermal decomposition, such as certain organic peroxides and hydrazine

For hazards beyond the scope described above it is recommended that the designer consult with Firetrace, and the local authority having jurisdiction as to the suitability on the use of dry powders for a particular hazard, for personnel exposure effects from the design concentration, and for installation requirements.

Firetrace Dry Powder Automatic Indirect Units consists of the following major components:

- Cylinder/Valve assembly
- Cylinder Bracket
- Heavy duty cylinder bracket (Optional)
- Firetrace detection/actuation tubing and fittings (No substitute)
- Discharge nozzles
- Pressure switch (Optional)
- Firetrace Flex Hose (Optional)
- Discharge piping and fittings (Furnished by others)

Once installed, the Firetrace Automatic Unit becomes a self-contained, self-actuating unit that does not require an external source of power or electricity.

The unit utilizes a UL recognized (per UL standard 521) linear heat detector known as Firetrace Detection Tubing (FDT), which when pressurized with Dry Nitrogen, will allow the fire suppression valve to remain in the closed position. This tubing acts as a continuous linear thermal detector that ruptures upon direct flame impingement or at temperatures above 383°F (195°C). Once the detection tubing is ruptured, the fire suppression valve automatically opens, allowing the dry powder to flow through the discharge piping, distributing the extinguishing agent through the nozzle(s) into the protected area.

Upon actuation the optional pressure switch can be used to indicate discharge, shutdown ventilation, close openings, shut-off electrical power, etc. as may be required.

3.2 Component Descriptions

For a more comprehensive list of technical illustrations and part numbers, please see **APPENDIX A**.

3.2.1 Dry Powder Cylinders (101200, 120020)

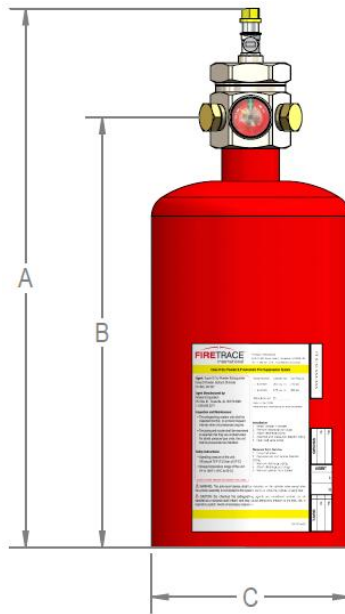
Dry powder is stored in steel cylinders pressurized with nitrogen to 195 psig at 70°F (13.5 bar at 21°C). Table 1 describes the 10 lb, and 20 lb system assemblies. Each cylinder is equipped with a straight siphon tube and can only be mounted in a vertical (upright) position.

Cylinder Part No.	Nominal Capacity	Cylinder Diameter		Cylinder Height		Cylinder Volume		Agent Mass	
		in.	cm.	in.	cm	in ³	cm ³	lb	kg
101200	10 lb	6.32	16.05	12.73	32.33	300	4,916	10	4.54
120020	20 lb	7.13	18.11	20.05	50.90	676	11,077	20	9.07

Table 1 – Dry Powder Cylinder Dimensions

Cylinder Part No.	Nominal Capacity	Volume		Cylinder Specification	Cylinder Service Pressure		Cylinder Test Pressure	
		in ³	cm ³		psig	kPa	psig	kPa
101200	10 lb	300	4,916	DOT 4B360	360	2,482	720	4,964
120020	20 lb	676	11,077	DOT 4B240	240	1,655	480	3,310

Table 2 – Dry Powder Cylinder Specifications



941009 / 942009

Figure 1 – Unit Assembly

Unit Assembly Part Number	Cylinder Part No.	Agent		Dimension "A"		Dimension "B"		Dimension "C"	
		lb	kg	in	cm	in	cm	in	cm
941009	101200	10	4.54	17.2	43.7	13.7	34.8	6.3	16.0
942009	120020	20	9.07	24.5	62.2	21.0	53.3	7.1	18.0

Table 3 – Unit Assembly Dimensions

Table 2 describes the Specifications used for the manufacturing of the dry powder cylinders. Each cylinder is equipped with a nickel-plated brass valve, a pressure gauge to monitor cylinder pressure, and a quarter turn ball valve that interfaces with the Firetrace detector tubing. The ball valve must be kept closed at all times when the cylinder is not in service.

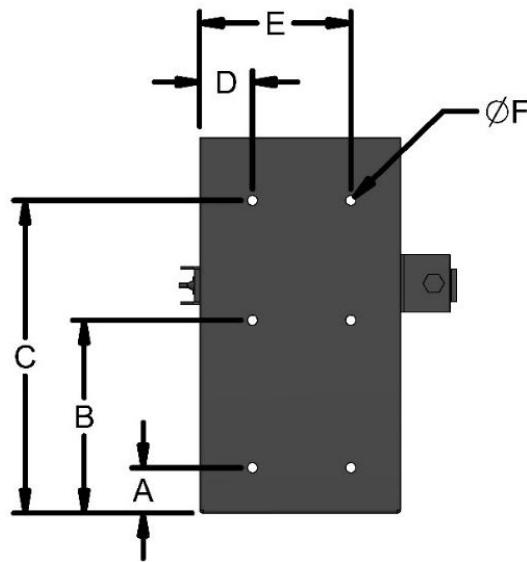
! WARNING

The safety plugs must be installed in the valve discharge outlets at all times, except when connected into the units discharge piping or hoses. Failure to follow these instructions could result in property damage, personal injury, or death.

3.3 Cylinder Mounting Bracket (111206, 111020)

The cylinder mounting brackets are manufactured from steel with a primed and powder coated paint finish. Each cylinder mounting bracket is designed to fit properly around the cylinder. The cylinder mounting bracket is equipped with finger tabs which allow easy access. The cylinder mounting bracket must be secured to a surface appropriate for retaining the weight of the cylinder in the event of a discharge. This precaution is intended to safely support the weight of the cylinder and the reaction force of the Class D Dry Powder discharge.

All cylinders must be mounted vertically only, with the valve on top. Please refer to Figure 2 – Cylinder Mounting Bracket Bolt Pattern, Table 4 – DOT Cylinder Mounting Bracket Dimensions.



941009 / 942009

Figure 2 – Cylinder Mounting Bracket Bolt Pattern

DOT System	Bracket	"A"		"B"		"C"		"D"		"E"		"F"	
		in	cm	in	cm	in	cm	in	cm	in	cm	in	cm
941009	111206	1.4	3.6	5.9	15.0	9.4	23.9	1.4	3.5	4.6	11.7	7/16	1.1
942009	111020	2.3	5.8	7.4	18.8	12.0	30.5	1.5	3.8	6.5	16.5	7/16	1.1

Table 4 – DOT Cylinder Mounting Bracket Dimensions

3.4 Cylinder Valves (302119, 302119-PS)

NOTE: The ball valve must be kept closed at all times when the cylinder is not in service.

Each cylinder is equipped with a nickel-plated brass valve. The cylinder valves are force balance type design. A piston in the valve bore is equipped with a seat seal that keeps the Class D Dry Powder under pressure within the cylinder. A small hole in the piston allows cylinder pressure to equalize on both sides of the piston. Since the surface area above the piston is greater than the surface area below the piston, the net force seals the piston against the primary valve seal. When the pressure above the piston is relieved by any means, there is only cylinder pressure acting against the piston seal and the piston slides to its fully open position, allowing for agent discharge.

The valve is equipped with a pressure gauge to monitor cylinder pressure and a quarter turn ball valve that interfaces with the Firetrace Detection Tubing. The ball valve must be kept closed at all times when the cylinder is not in service.

The 941009 and 942009 unit assemblies are equipped with a medium ILP valve (302119) containing two 1/2in NPT discharge ports.

The 941009-PS and 942009-PS unit assemblies are equipped with a medium ILP valve (302119-PS) containing two 1/2 in NPT discharge ports and Pressure Switch.

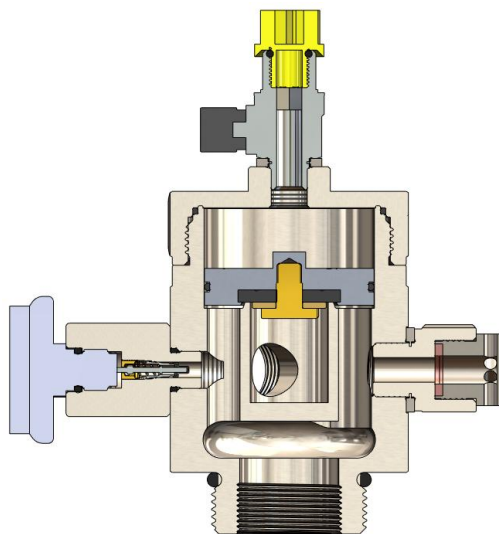
Each valve is also equipped with (2) discharge outlet ports. Each outlet port is provided with a safety plug that must be installed in the discharge outlet whenever a system is not in service. These plugs are safety devices designed to prevent uncontrolled discharge of the system in the event that the valve is accidentally actuated.

WARNING

The safety plugs must be installed in the valve discharge outlets at all times, except when connected into the units discharge piping or hoses. Failure to follow these instructions could result in property damage, personal injury, or death.

NOTE: All Firetrace Class D Dry Powder ILP Units utilize a straight siphon tube.

NOTE: All Firetrace Class D Dry Powder ILP Units are to be installed only in a vertical (valve on top) position.



Medium ILP Valve (302119)

Figure 3 – Cylinder Valves

3.4.1 Firetrace Detection/Actuation Tubing

The Firetrace Detection Tubing (FDT) is a UL recognized component per UL standard 521. The Firetrace Detection/Actuation Tubing is used as a combination linear heat detector and unit activation device to cause actuation of the dry powder unit. The tubing is installed throughout the hazard volume, with one end connected to the top of the cylinder valve. The tubing is pressurized with nitrogen to 195 psig while maintaining the ball valve in the “OFF” position.

The detection tubing is heat sensitive, and in a fire situation, is designed to rupture at any point along its length upon direct flame impingement or at any point along the tube when the temperature reaches 383°F (195°C). The rupture of the tubing releases the nitrogen pressure causing the dry powder cylinder valve to actuate, resulting in complete discharge of the dry powder agent through the discharge network and ultimately from the discharge nozzles throughout the protected area.

Hydrostatic Burst Pressure	Minimum Burst Pressure	1100 psi [75 bar]
	Typical Burst Pressure	1300 psi [88 bar]
Electrical Properties	Volume Resistivity	1014 (per DIN 53481)
	Dielectric Strength	40k V/mm (per DIN 53481)

Table 5 - Firetrace Detection Tubing Properties

Firetrace Detection Tubing Part Number	Description
204025	Firetrace Detection Tubing, 4/6 mm, 25 ft [7.6 m]
204050	Firetrace Detection Tubing, 4/6 mm, 50 ft [15.2 m]
204100	Firetrace Detection Tubing, 4/6 mm, 100 ft [30.4 m]
204328	Firetrace Detection Tubing, 4/6 mm, 328 ft [100 m]

Table 6 – Firetrace Detection Tube Part Numbers

3.5 Firetrace Detection Tubing Fittings

The fittings specified in this DIOM manual are the only accepted fittings to be used on the FDT.

ITEM	P/N	DESCRIPTION
NP	200152	Rubber Grommet
NP	200153	Plastic Grommet
NP	200172	Mounting Tab
NP	200182	Magnetic Mounting Clips
1	200157	Tube Tee (4/6)
2	200158	Tube Union (4/6)
NP	200159	Tube to Threads Elbow (4/6)
3	200168	Tube to End of Line Adapter (4/6)
NP	200169	Tube Tee to In Line Adapter (4/6)
4	200177	Tube Tee to Threads (4/6)
5	200178	Tube Elbow (4/6)
6	200179	Tube to Threads Union (4/6)
7	200203	Tube Plug (4/6)
NP	310303	End of Line Adapter Plug with O-Ring
NP	201170	Tube to End of Line Adapter Elbow (4/6)
NP	200185	Tube Fitting End Cap G1/8
NP	200195	End of Line Adapter
NP	200162	Tubing Bulkhead Assembly
NP – PARTS NOT PICTURED		

Table 7 – Tube Fittings

3.6 Pressure Gauge (400028)

The Firetrace Class D pressure gauge is used as part of the cylinder valve pressure gauge, manual release pressure gauge or End of Line mounted pressure gauge. This pressure gauge is supplied with an O-ring installed and has a M10x1 thread to allow for installation where a Schrader core is present. This enables the pressure gauge to be field serviceable in all the above applications (cylinder valve, manual release, and End of Line mounted locations).



Figure 4 – Class D Pressure Gauge

3.6.1 Manual Release (600064)

An optional Manual Release can be used with every system. This device consists of a yellow pull tab and a red plunger. Located on this device is a port for pressurizing the tubing and monitoring tubing pressure via the included Pressure Gauge. The manual release is used to manually release the nitrogen pressure in the tubing, causing the system to actuate. The actuation results in a complete discharge of the unit assembly.

The tube fitting on the body of the manual release allows for easy installation onto the system detection line network. The pull tab on the plunger prevents accidental activation of the manual release. The port on the body of the manual release is used to pressurize the tubing and allows for installation of a pressure gauge to monitor system pressure, refer to Figure 5 – Manual Release.

CAUTION: Do not remove the pull tab until ready to actuate system discharge

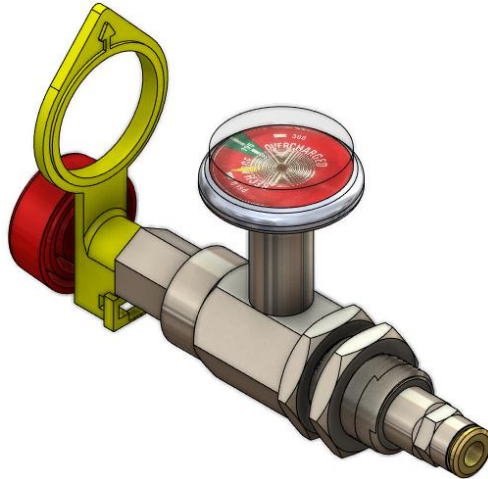


Figure 5 – Manual Release

3.6.2 Manual Release Rebuild Kit (600076)

A rebuild kit is available that contains a replacement burst disc, pull tab and anti-tamper seal along with guidelines of how to reassemble the device.

3.7 Discharge Network

NOTE: All piping must be thoroughly cleaned to remove burrs and swabbed with a degreasing solvent to remove all traces of cutting oils and chips.

3.7.1 Pipe, Fittings, and Pipe Supports

All piping must be installed in accordance with good commercial practices and applicable national standards.

3.7.1.1 Pipe Requirements

Recommended piping to be used for Firetrace ILP Units is copper. Piping shall be in accordance with the local authority having jurisdiction.

The 10lb (941009, 941009-PS) and 20lb (942009, 942009-PS) can use either copper discharge piping or the Firetrace supplied flexible discharge ½ in. hoses.

3.7.1.2 Pipe Fittings and Pipe Joining

Piping, fittings, and pipe supports shall be in accordance with the latest edition of NFPA 17 available from National Fire Protection Association. Temperature and pressure ratings of the fittings must not be exceeded. The method of joining all pipe must be in accordance with the latest requirements listed in NFPA 17.

3.7.1.3 Pipe Supports

Piping shall be securely supported by listed and/or approved hangers. Pipe supports must be installed with allowance for expansion and contraction and must be rated to support the dead weight of the piping and the thrust forces of the Class D Dry Powder discharge.

3.7.2 Flexible Hoses and Fittings

Flexible hoses and flexible hose fittings are available as an optional part for the system discharge network, for both 10lb and 20lb system sizes. Flexible hoses and flexible hose fittings shall be in accordance with the latest edition of NFPA 17 or the local authority having jurisdiction. Temperature and pressure rating of the flexible hoses and flexible hose fittings shall not be exceeded.

3.7.2.1 Flexible Hoses

The flexible hoses are constructed with synthetic, high tensile textile cord reinforcement. Both ends are fitted with swivel adapters for easy installation. The flexible hoses have a maximum operating pressure of 300 psig [20.7 bar] and a minimum bend radius of 4 in [10.2 cm]. The 941009 and 942009 unit assemblies use 1/2 in flexible hoses. Refer to Figure 6 – Flexible 1/2 inch Hoses, and Table 8 - Flexible Hose Part Numbers for 941009 / 942009 Unit Assembly for additional information. The flexible hoses have a maximum operating pressure of 300 psig [20.7 bar] and a minimum bend radius of 4 in [10.2 cm]. Refer to Figure 6 – Flexible 1/2 inch Hoses.

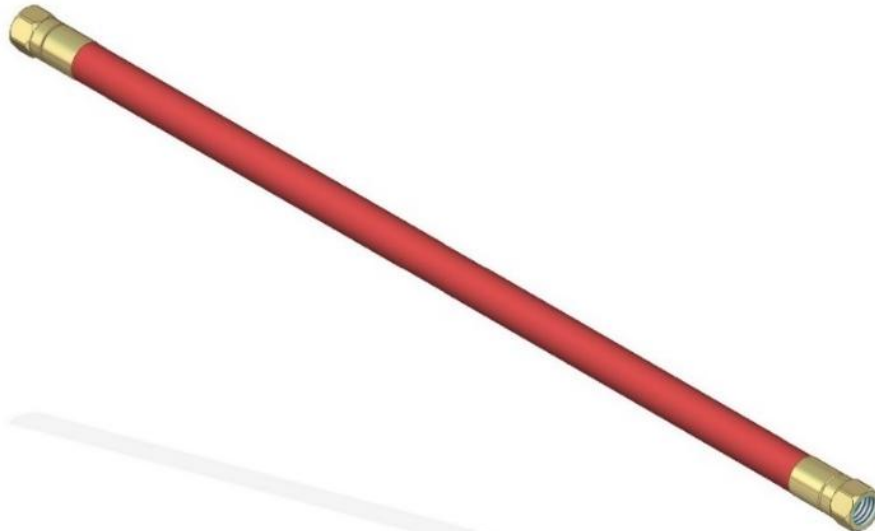


Figure 6 – Flexible 1/2 inch Hoses

Flexible Hose Part Number	Description
201820	1/2 in Flexible Hose, 2 ft [0.6 m]
201821	1/2 in Flexible Hose, 4 ft [1.2 m]
201822	1/2 in Flexible Hose, 6 ft [1.8 m]
201823	1/2 in Flexible Hose, 8 ft [2.4 m]
201824	1/2 in Flexible Hose, 10 ft [3.0 m]

Table 8 – Flexible Hose Part Numbers for 941009/942009 Unit Assembly

3.7.2.2 Flexible Hose Fittings

The flexible hose fittings are constructed of zinc plated steel. The flexible hose fittings allow for easy installation between the Firetrace Class D ILP Units, the flexible hoses, and the system nozzles. The flexible hose fittings have a minimum burst rating of 3000 psig [206.8 bar]. Refer to Table 9 for additional information.



Figure 7 – Flexible Hose Fittings

Flexible Hose Fitting Part Number	Description
850022	Fitting, 1/2 in Hose to Valve Union
850023	Fitting, 1/2 in Hose Union
850024	Fitting, 1/2 in Hose Elbow
850025	Fitting, 1/2 in Hose Tee
850026	Fitting, 1/2 in Hose to Nozzle Union Bulkhead
850027	Fitting, 1/2 in Hose to Nozzle Elbow Bulkhead

Table 9 – Flexible Hose Fitting Part Numbers for 941009/942009 Unit Assembly

3.7.3 Nozzles (501002, 501003)

Discharge nozzles are made of 304 stainless Steel with 1/2 in. NPT female threads. Nozzles are available in two types for use with Firetrace ILP Class D Dry Powder Units. The CNC Cutting Area nozzle, and Collection Drum nozzle. See Figure 8 – Nozzles. The 942009 unit assemblies use both the CNC Cutting Area nozzle, and Collection Drum nozzle, Figure 8 – Nozzles. The 941009 and 942009 unit assemblies can be designed using a single (only for collection drum), 2 or 4 nozzles. The coverage for each nozzle must not exceed its maximum length and area of coverage. Refer to Section 4 for nozzle coverage information.

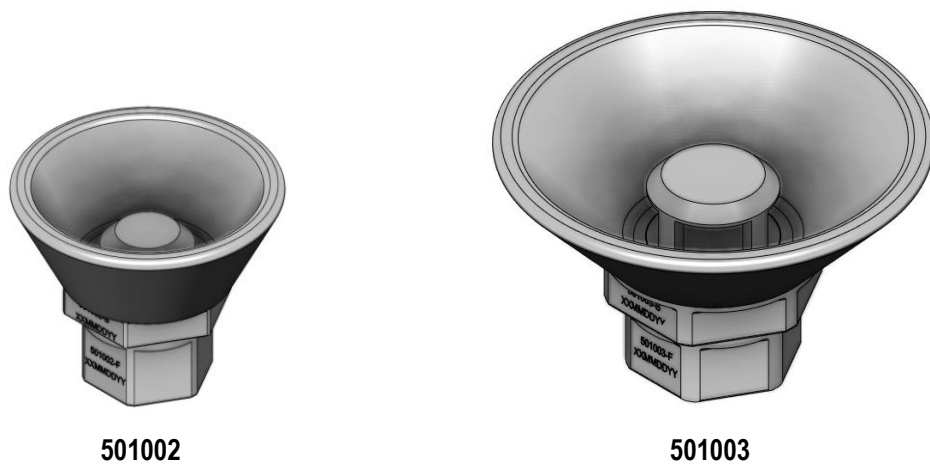


Figure 8 – Nozzles

Nozzle Part Number	Connection Size	Protected CNC Space	Unit Assembly
501002	1/2 in NPT	Cutting Area / Bin	941009 / 942009
501003	1/2 in NPT	Collection Drum & Bin	942009

Table 10 – Nozzle Part Numbers

3.7.4 Nozzle Blow-off Caps (501011)

Nozzle Blow-off Caps are made of a synthetic rubber copolymer. The Nozzle Blow-off Cap is available for Nozzle PN 501002 and for use with Firetrace ILP Class D Dry Powder Units. The Blow-off Cap is designed to prevent the entrance of moisture, environmental contaminants, or other foreign materials into piping. The blow-off cap shall provide an unobstructed opening upon system operation. See Figure 8 – Nozzles Blow-off Cap. Refer to Section 5 for blow-off cap installation.



Figure 9 – Nozzle Blow-off Cap

Blow-off Cap Part Number	Nozzle Part Number	Unit Assembly
501011	501002	941009 / 942009

Table 11 – Nozzle Blow-off Cap Part Numbers

3.8 Pressure Switch

CAUTION

Never use the pressure switch as a handle to transport the unit. Doing so can result in pressure leakage, damage to the pressure switch, and/or system discharge.

CAUTION

Pressure Switches are NOT Serviceable while System is Pressurized

3.8.1 Valve Mounted Pressure Switch (941009-PS, 942009-PS)

The valve mounted pressure switch is an optional part of the unit assembly. It is factory installed into the pressure switch port of the cylinder valve. The valve mounted pressure switch is used to monitor unit pressure, unit actuation, or it can be used to energize or de-energize electrically operated equipment. If the unit to which the pressure switch is attached to loses pressure and reaches a pressure of 70 ± 10 psig [4.8 ± 0.7 bar] or below, the switch contacts will operate. Refer to Figure 10 – Valve Mounted Pressure Switch, Table 12 – Valve Mounted Pressure Switch Part Number, and Figure 11 –Pressure Switch Wiring Schematic.

The pressure switch is single pole, double throw (SPDT) and can be wired in either normally open (NO), normally closed (NC) configurations, where the normal condition is at atmospheric pressure. Pressure switch comes equipped with three #18 AWG dry contacts. Please refer to Table 13 - Pressure Switch Properties for additional information. When the unit is pressurized, the contacts switch over.

When the pressure switch is used on a standard supervisory input circuit, there will be no distinction between a wiring fault and device actuation. The pressure switch shall be installed onto a circuit suitable for unit supervision in accordance with NFPA 70 National Electric Code and NFPA 72 National Fire Alarm and Signaling Code.

This device is only to be utilized when accepted by the authority having jurisdiction. All other uses of this switch should be approved by the authority having jurisdiction.

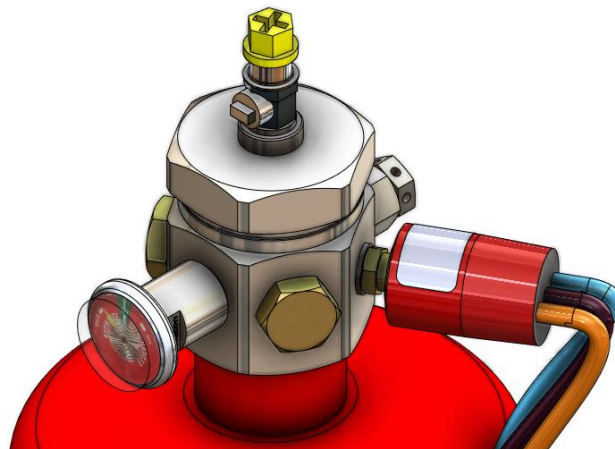


Figure 10 – Valve Mounted Pressure Switch

NOTE: All detection devices and auxiliary alarm and control devices must be electrically compatible with each other. They must be approved by the authority having jurisdiction.

NOTE: Firetrace recommends that all units be equipped with a pressure switch and connected into a notification or shutdown device, in the event of a discharge.

Pressure Switch Part Number	Description
400005	Valve Mounted Pressure Switch

Table 12 – Valve Mounted Pressure Switch Part Number

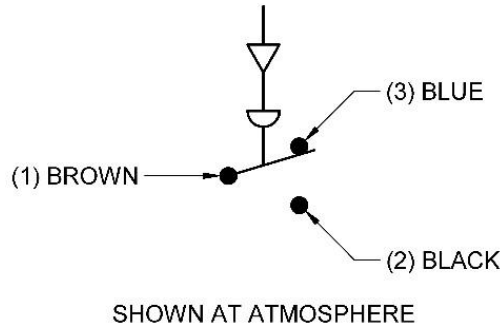


Figure 11 –Pressure Switch Wiring Schematic

Electrical Rating		Temperature Range
28 VDC – 15 A		-20 °F to 150 °F [-28.9 °C to 65.6 °C]
NO (1 and 3): 120 VAC – 10 A 240 VAC – 5 A	NC (1 and 2): 120 VAC – 25 A 240 VAC – 5 A	

Table 13 – Pressure Switch Properties

3.8.2 End of Line Pressure Switch

The end of line pressure switch (400004) is available as an optional part for the system detection network. The thread on the end of the pressure switch allows for easy installation into the threads of the end of line adapter. The provided washer (400003) included in this assembly, ensures that the pressure switch will fully depress the Schrader core installed within the end of line adapter. The provided O-ring ensures that there will be an adequate seal between the pressure switch and the end of line adapter.

The end of line pressure switch is used to monitor system pressure, system discharge, or it can be used to energize or de-energize electrically operated equipment. If the detection network to which the pressure switch is attached to loses pressure and reaches a pressure of 70 ± 10 psig [4.8 ± 0.7 bar] or below, the switch contacts will operate. Refer to Figure 11 –Pressure Switch Wiring Schematic and Figure 12 – End of Line Pressure Switch.

The pressure switch is single pole, double throw (SPDT) and can be wired in either the normally open (NO), normally closed (NC) configurations, where the normal condition is at atmospheric pressure. When the unit is pressurized, the contacts switch over.

When the pressure switch is used on a standard supervisory input circuit, there will be no distinction between a wiring fault and device actuation. The pressure switch shall be installed onto a circuit suitable for unit supervision in accordance with NFPA 70 National Electric Code and NFPA 72 National Fire Alarm and Signaling Code.

This device is only to be utilized when accepted by the authority having jurisdiction. All other uses of this switch should be approved by the authority having jurisdiction.

NOTE: All detection devices and auxiliary alarm and control devices must be electrically compatible with each other. They must be approved by the authority having jurisdiction.

NOTE: Firetrace recommends that all units be equipped with a pressure switch and connected into a notification or shutdown device, in the event of a discharge.



EOL Pressure Switch Assembly (400004)

Figure 12 – End of Line Pressure Switch

Pressure Switch Assembly Part Number	Pressure Switch Component Part Number	Description
400004	400002	O-Ring M10x1
	400003	Pressure Switch Washer
	400005	Pressure Switch (70PSI Falling)

Table 14 – End of Line Pressure Switch Part Number

3.8.3 Pressure Switch Assembly (400441)

The pressure switch assembly is available as an optional part for the system detection network. The fitting on the exterior of the pressure switch assembly enclosure allows for the detection tubing to be easily installed into the assembly.

The pressure switch assembly is used to monitor system pressure, system discharge, or it can be used to energize or de-energize electrically operated equipment. If the detection network to which the pressure switch is attached to loses pressure and reaches a pressure of 70 ± 10 psig [4.8 ± 0.7 bar] or below, the switch contacts will operate. Refer to Figure 13 – Pressure Switch Assembly, Figure 11 – Pressure Switch Wiring Schematic and Table 13 – Pressure Switch Properties.

The pressure switch is single pole, double throw (SPDT) and can be wired in either normally open (NO), normally closed (NC) configurations, where the normal condition is at atmospheric pressure. When the unit is pressurized, the contacts switch over.

The pressure switch assembly (400441) contains the same pressure switch as the valve mounted option.

When the pressure switch is used on a standard supervisory input circuit, there will be no distinction between a wiring fault and device actuation. The pressure switch shall be installed onto a circuit suitable for unit supervision in accordance with NFPA 70 National Electric Code and NFPA 72 National Fire Alarm and Signaling Code.

This device is only to be utilized when accepted by the authority having jurisdiction. All other uses of this switch should be approved by the authority having jurisdiction.

NOTE: All detection devices and auxiliary alarm and control devices must be electrically compatible with each other. They must be approved by the authority having jurisdiction.

NOTE: Firetrace recommends that all units be equipped with a pressure switch and connected into a notification or shutdown device, in the event of a discharge.



Figure 13 – Pressure Switch Assembly

Pressure Switch Part Number	Description
400441	Pressure Switch Assembly

Table 15 – Pressure Switch Assembly Part Number

3.8.4 Dual Pressure Switch Module

The Dual Pressure Switch Module gives the ability to monitor the health of the Firetrace fire suppression system and deliver a shutdown / notification signal in the event of a system discharge due to fire in a single package solution. The pressure switch module also contains an integrated end-of-line adapter to help simplify the installation process. A signal bypass key switch is also included for ease of servicing.

The Dual Pressure Switch Module is offered in two main variants. Each variant includes two pressure switches utilizing either a supervisory and activation pressure switch or two activation pressure switches. The “Standard” variant only contains a combination of these two pressure switches and no signal bypass or end-of-line adapter. The second variant adds the bypass key switch and integrated end-of-line to provide additional functionality and ease of install.

Please refer to Table 16 – Variant Specifications for an overview of the different variants highlighting part numbers, fire suppression system pressures they are used with, and the pressure switch types used. These module kits include the following:

- Dual Pressure Switch Module
- Cable Harness (P/N 203210)
- Nameplate (align with the mounting orientation of the module)



Standard Module (No Bypass or Gauge)



Module w/ Bypass & Gauge

Figure 14 – Dual Pressure Switch Modules

NOTE: All detection devices and auxiliary alarm and control devices must be electrically compatible with each other. They must be approved by the authority having jurisdiction.

NOTE: Firetrace recommends that all units be equipped with a pressure switch and connected into a notification or shutdown device, in the event of a discharge.

Kit Part No.		Module Part No.	System Pressure	Pressure Switch 1	Set Point	Pressure Switch 2	Set Point
Standard	603400	601400	195psi	Activation	70psi	Supervisory	150psi
	603420	601420	Any	Activation	70psi	Activation	70psi
With Bypass	603305	601305	195psi	Activation	70psi	Supervisory	150psi
	603325	601325	Any	Activation	70psi	Activation	70psi

Table 16 – Variant Specifications

The cable harness (P/N 203210) needs to be properly secured to the box when installed. Ensure the female connector on the harness is pushed all the way in before tightening the connector body to the male connector on the box. Tighten to finger tight. Figure 15 below details the pin locations on the harness. Table 17 indicates the relationship between each pin and wire and the pressure switch associated with them. Cable shielding can be utilized by connecting directly to the shielding in the cable, if needed.

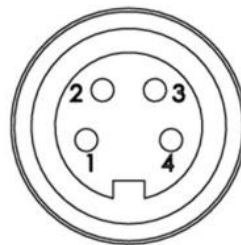


Figure 15 – Harness Pinout Diagram

Pin	Wire Color	Pressure Switch
1	White	Supervisory / Activation (PS2)
2	Brown	Supervisory / Activation (PS2)
3	Green	Activation (PS1)
4	Yellow	Activation (PS1)
Shield	Green/Yellow	N/A

Table 17 – Pinout Details

For more details on service, maintenance, mounting, and switch configurations for the dual pressure switch module (With and Without Bypass), please refer to the Installation Manual (DIOM P/N: 800095) on our website: www.firetrace.com > Instruction Manuals > Instruction Manuals for System Accessories > Manual for Dual Pressure Switch Module

3.9 Alarm Module – Battery Operated (600096)

The Firetrace supplied alarm module is powered by a 9V cell (supplied) and requires a closed circuit to activate the alarm function. Firetrace recommends using the pressure switch to supply an open circuit whilst the system is armed and ready for use. Upon detection of a fire, the pressure switch will change state during discharge to a closed circuit – which will cause the alarm module to sound.



Figure 16 – Alarm Module – Battery Operated

3.10 Electric Solenoid Assembly (400312, 400324)

The electric solenoid assembly is available as an optional part for the system detection network. The fitting attached to the electric solenoid allows for the detection tubing to be easily installed into the electric solenoid assembly.

The electric solenoid assembly is used to release pressure from the detection tubing, resulting in actuation of the Firetrace Class D ILP Unit. Refer to Figure 17 – Electric Solenoid Assembly, Table 18 – Electric Solenoid Assembly Part Number, Figure 18 – Electric Solenoid Assembly Wiring Schematic, and Table 19 – Electric Solenoid Assembly Properties for additional information.

The electric solenoid is normally closed and requires electrical energy to remain open. The electric solenoid assembly is available in 12 VDC, 24 VDC, 120 VAC, and 240 VAC configurations.

The electric solenoid assembly shall be installed in accordance with NFPA 70 National Electric Code and NFPA 72 National Fire Alarm and Signaling Code.

This device is only to be utilized when accepted by the authority having jurisdiction. All other uses of this electric solenoid assembly should be approved by the authority having jurisdiction.

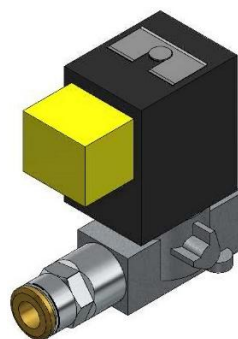


Figure 17 – Electric Solenoid Assembly

NOTE: All detection devices and auxiliary alarm and control devices must be electrically compatible with each other. They must be approved by the authority having jurisdiction.

NOTE: Detection networks equipped with an electric solenoid assembly require the use of a solenoid connector cable.

Electric Solenoid Assembly Part Number	Description
400312	12 VDC Electric Solenoid Assembly
400324	24 VDC Electric Solenoid Assembly
600088	Solenoid Valve Wiring Harness
200107	Solenoid to Ball Valve Adapter

Table 18 – Electric Solenoid Assembly Part Number

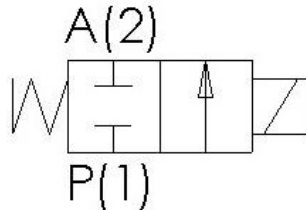


Figure 18 – Electric Solenoid Assembly Wiring Schematic

Maximum Allowable Pressure	725 psig [50 bar]
Opening Time	10 ms
Closing Time	10 ms
Fluid Temperature	32 °F to 266 °F [0 °C to 130 °C]

Table 19 – Electric Solenoid Assembly Properties

4 SYSTEM DESIGN AND LIMITATIONS

4.1 General

The Firetrace series of Class D Dry Powder Self-Contained Automatic Indirect Units' design limits were established and tested by Firetrace. The Units are designed for protecting CNC equipment processing combustible metals.

These units were subjected to numerous performance tests in order to verify their suitability and to establish design limitations for:

- Hazard Area
- Operating Temperature Range
- Detection Tubing Placement
- Nozzle Area Coverage and Heights
- Nozzle Placement
- Maximum Length/Size of Piping and Number of Fittings

The pre-designed automatic unit concept minimizes the amount of engineering required when evaluating a design for a specific application. So long as the discharge piping and nozzles are installed within the limits prescribed in this Manual, no calculations are required for pressure drop, flow rates, or discharge time. When the additional limitations of hazard volume, area coverage, maximum height, design concentration, agent quantity, detector arrangement, etc., are also met, the unit installation can be understood to comply with the design requirements, NFPA-17 and UL/ULC standards. Therefore, no discharge tests or concentration measurements should be required.

4.2 Specifications

4.2.1 Storage and Operating Temperature Range

The Firetrace Class D Dry Powder Units and equipment are designed to be stored and operated at the ambient temperature range of 0°F to +130°F (-17.8°C to +54.4°C).

4.2.2 System Operating Pressure

The normal operating pressure for the unit is 195 psig at 70°F (13.5 bar at 21°C).

The Firetrace Dry Powder Units are designed for an operating temperature range of 0°F to +130°F. Table 20 shows the cylinder gauge pressure-temperature relationship based on a charging pressure of 195 psig at 70°F.

Cylinder Pressure			
Temperature		Pressure	
°F	°C	psig	kPa
0	-17.8	169	1165
10	-12.2	173	1193
20	-6.7	177	1220
30	-1.1	180	1241
40	4.4	184	1267
50	10.0	188	1296
60	15.5	191	1317
70	21.1	195	1344
80	26.7	199	1372
90	32.2	202	1393
100	37.8	206	1420
110	43.3	210	1448
120	48.9	213	1469

Table 20 – Cylinder Pressure-Temperature Relationship

4.3 Design Procedure

The following procedures should be used to design a Firetrace Dry Powder Self-Contained Automatic Indirect Fire Suppression Unit. In addition, the applicable requirements specified in NFPA-17 should be followed.

- Conduct a survey and analysis of the hazard to be protected.
- Determine the height, length, and width of the enclosure. Calculate the **area**, focusing on where the metal chips are likely to accumulate. For enclosures with angled surfaces in the protected space, the area should be calculated using a top-down projection method. All of these parameters must be within the dimensional limits specified in this Manual. (See Section 4.4.1)
- Determine the anticipated minimum and maximum ambient temperatures expected within the enclosure to be protected. (See Section 4.2.1)
- Determine the integrity of the enclosure and if any openings must be closed at the time of agent discharge. (See Section 4.4.2)
- Determine the amount of Class D Dry Powder needed for the protected area. (See Section 4.5)
- Determine the cylinder size required based on the projected amount (weight) of metal turnings, hazard area limitations and enclosure size. **Remember, as cautioned in Section 3.1 of this Manual, no more than (2) suppressions units can be used to protect one (1) hazard. Please see 4.5 for agent limitations.**
- Determine the location of the Class D Dry Powder cylinder.
- Determine the location and quantity of nozzles required, based on the size and configuration of the enclosure. For **Please see Section 4.6 for measuring Nozzle height in CNC cutting area and collection drum.**

- i. Determine the routing and quantity of discharge pipe required. The discharge pipe and fitting limitations must not be exceeded. (See Section 4.6)
- j. Determine the arrangement and placement of the Firetrace detection tubing. (See Section 4.7)
- k. Determine any auxiliary equipment requirements, such as a pressure switch(s) to sound alarms, shut-down ventilation, shut-off electrical power, etc.

4.4 Hazard Enclosure Limitations

4.4.1 Enclosure Size

The maximum dimensions and area coverage for each size unit are shown in Table 21 – Enclosure Size and Nozzle Limitations. The protected enclosure can be any size, shape, or volume, provided that the dimensions do not exceed the limitations shown in Table 21.

CNC Area	Model	Class D Dry Powder	Total Area Coverage Per Unit	Number of Cylinders	Discharge Ports Used (DP)	Nozzles Per DP	Total Number of Nozzles Per Unit	Max. Area Coverage Per Nozzle	Maximum Height	Minimum Height
Cutting Area	941009	10 lb (4.54 Kg)	4 ft ² (0.37 m ²)	1	2	1	2	2 ft ² (0.19 m ²)	32 in (81.3 cm)	29 in (73.7cm)
						2	4			
	942009	20 lb (9.07 Kg)	8 ft ² (0.74 m ²)	1	2	2	4	4 ft ² (0.37 m ²)	34 in (86.4 cm)	29 in (73.7cm)
2						4	4 ft ² (0.37 m ²)			
Collection Drum	942009	20 lb (9.07 Kg)	2.76 ft ² (Ø 22.5 in)	1	1	1	1	2.76 ft ² (Ø 22.5 in)	8 in (20.3 cm)	6 in (15.2 cm)
					2	1	2			

See Figure 19 - 22 for typical examples of configurations that meet the maximum area coverage limitations.

Table 21 – Enclosure Size and Nozzle Limitations



This unit is designed as an Automatic unit. Only up to two (2) 20 lb systems can be combined for simultaneous actuation to protect one (1) hazard. The suppression units cannot be combined with different size systems to protect a larger size hazard since the configuration/performance has not been validated for simultaneous actuation of (3) or more units and therefore not recommended. Otherwise, only one (1) unit can be used to protect one (1) hazard.

4.4.2 Ventilation Shut-Down and Unclosable Openings

When the unit is discharged into an enclosure, normal gaps and openings under doorways must not impact system performance. Doors and normal vents that are required in the enclosure are recommended to be closed prior to, or at the time of unit discharge. Doors and closures, including ventilation, which are held open while operating are recommended to have devices installed to close at the start or prior to unit discharge. All doors are recommended to be closed and ventilation fans shut down prior to discharge to avoid diffusion of powder in unwanted areas.

4.5 Required Amounts of Agent per Square foot

4.5.1 CNC Cutting Areas

For CNC Cutting Areas, 2.5lb of Class D Dry Powder are required to protect 1 sq. ft. (0.09 m²) surface area, up to 16 sq. ft. Please refer to Table 22 - Firetrace Class D System Coverage Capacity in Cutting Areas, and Table 21 – Enclosure Size and Nozzle Limitations for the maximum area able to be protected by each system. Nozzles shall be positioned inside CNC Workspace where metal chips may accumulate.

Extinguishing Capacity Single 10lb Firetrace Class D		Fire Ratings		
Hazard	Area		Quantity of Metal	
	ft ²	m ²	lb	kg
Magnesium Chips	4	0.37	20	9.07
Titanium Chips				
Fine Swarf / Bird's Nest			6	2.72

Extinguishing Capacity Two 20lb Firetrace Class D		Fire Ratings		
Hazard	Area		Quantity of Metal	
	ft ²	m ²	lb	kg
Magnesium Chips	16	1.49	40	18.14
Titanium Chips				
Fine Swarf / Bird's Nest			12	5.44

Table 22 – Firetrace Class D System Coverage Capacity for Cutting Areas

4.5.2 CNC Collection Drums & Bins

A single 20lb Class D Dry Powder system will protect a 55-gal Drum with a 2.76 sq. ft. (0.26 m²) cross-section area. Roughly, 7lb of Class D agent are required per 1 sq. ft. for a Collection Drum. Areas where more than 20lbs of metal chips are collected, an additional Class D agent is required.

4.6 Nozzle and Discharge Pipe Requirements

4.6.1 Discharge Nozzle Limitations

Two nozzle sizes are available for use with the Firetrace ILP Units. The Collection Drum Dry Powder Nozzle (P/N 501003) is only used with 20lb units. The CNC Cutting Area Dry Powder Nozzle (P/N 501002) is used with the 10lb., and 20lb units and can be designed using 2, or 4 nozzles to suit the hazard configuration, while the 20lb unit is the only system designed using 1 nozzle. Secure the Nozzle to bulkhead fitting by tightening it using the smaller hex on the nozzle fitting. Cutting Area Nozzle (P/N 501002) May be used for collection bins. However, hazard areas where more than 20lbs of metal chips are collected, 7lb of Class D agent are required per 1 sq. ft. Nozzles shall be positioned inside CNC Workspace where metal chips may accumulate.

Refer to Table 21 for maximum enclosure heights for nozzle installation. Each nozzle is to be installed at the top of the hazard enclosure facing down in a pendant position and centered in the area to be protected by that particular nozzle.

Each cylinder valve is equipped with 2 discharge ports (DP). Whether 1 or 2 discharge ports are used depends on the size and shape of the enclosure and the number of nozzles required to cover the specific hazard.

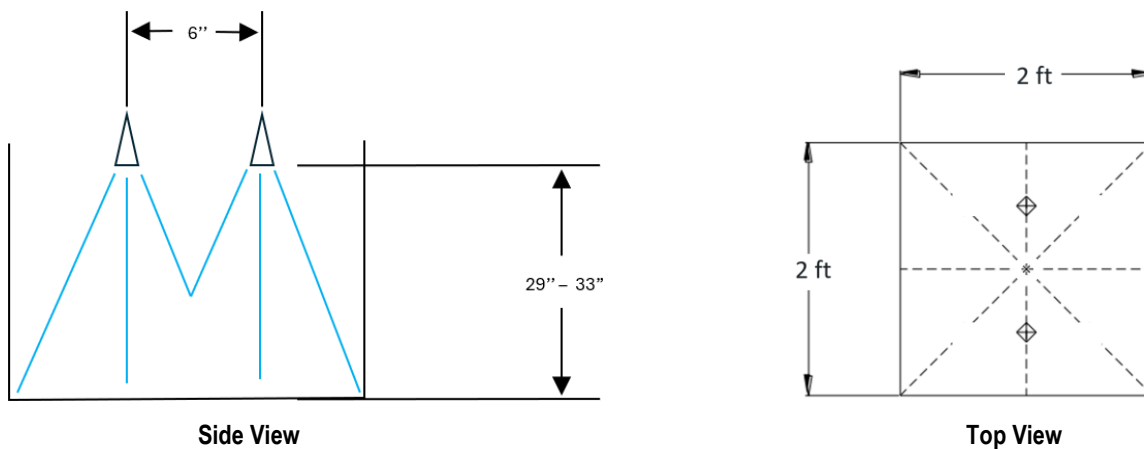
See Figures 19 - 23 for typical examples of configurations that meet the maximum area coverage limitations.

! CAUTION

When fastening the Nozzle to the bulkhead fitting, tighten it using the smaller hex on the nozzle fitting. Do not fasten to bulkhead from the hex on shroud piece, as this may damage the nozzle assembly threads.

4.6.2 Nozzle Area Coverage

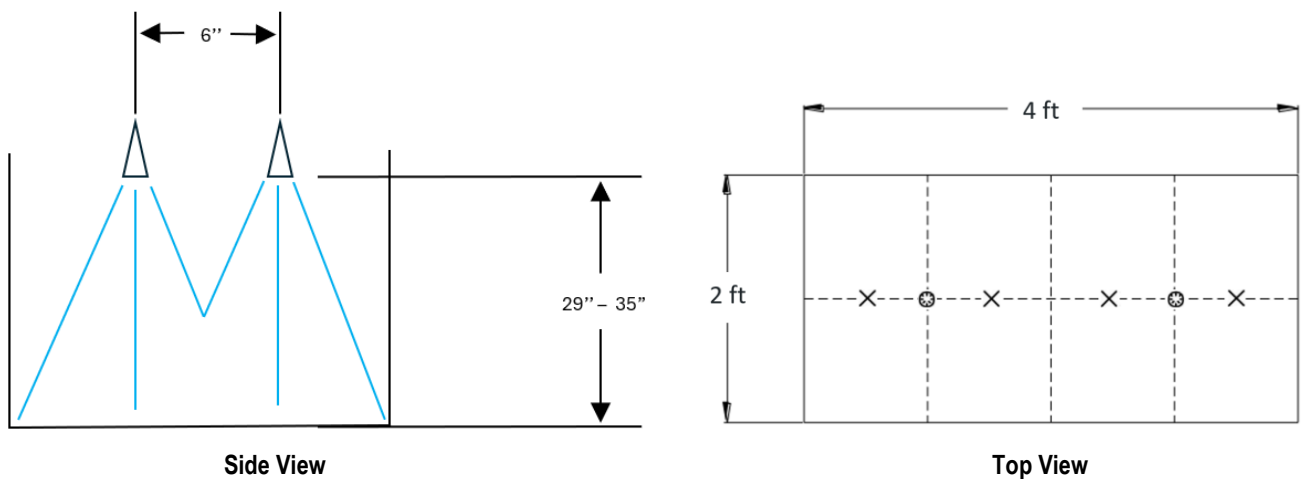
Nozzle configuration must adhere to placement limitations per Suppression Unit(s) outlined in Table 21 – Enclosure Size and Nozzle Limitations, to ensure complete and effective suppression for the hazard area. At the designated heights, the Class D System will effectively cover the following areas: $2.76ft^2$, $4ft^2$, $8ft^2$, & $16ft^2$. Proper positioning and spacing of nozzles is critical to achieve adequate suppression and maintain compliance of system design requirements. Refer to Figures 18 - 21 displays some typical examples of configurations that meet these limitations.



◆ = 2 Nozzles

Figure 19 – Typical Example of a $4ft^2$ Enclosure Configuration With Single 10lb Unit

NOTE: Distance between pairs of Nozzles must be 24in. apart for a 4ft. length



x = 4 Nozzles

Figure 20 – Typical Example of a $8ft^2$ Enclosure Configuration With Single 20lb Unit

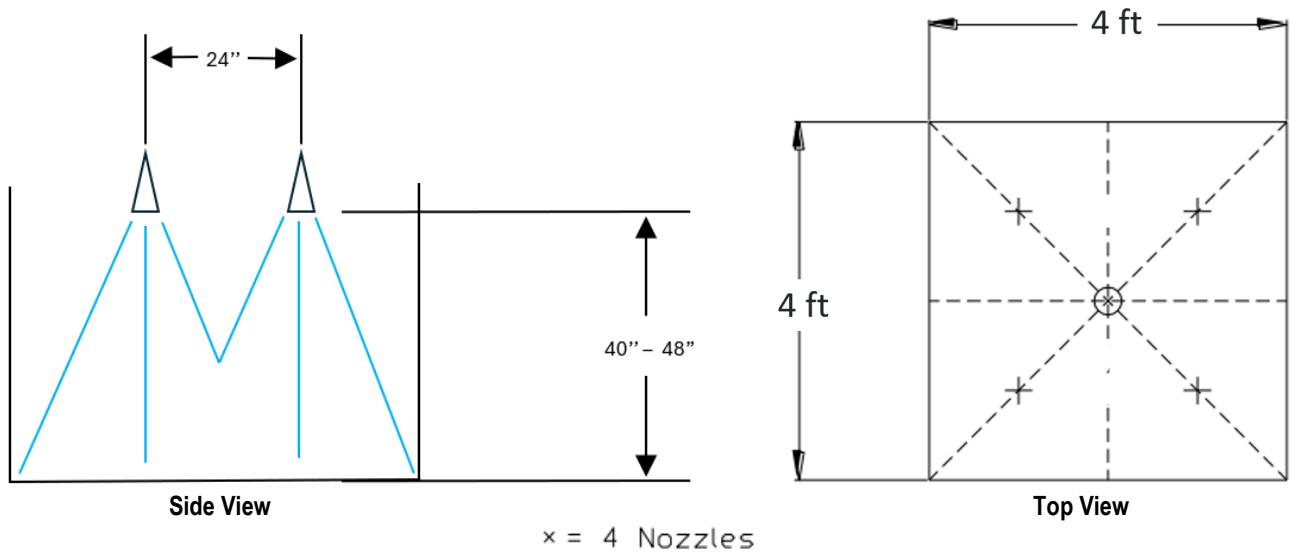


Figure 21 – Typical Example of a 16ft² Enclosure Configuration With Dual 20lb Units

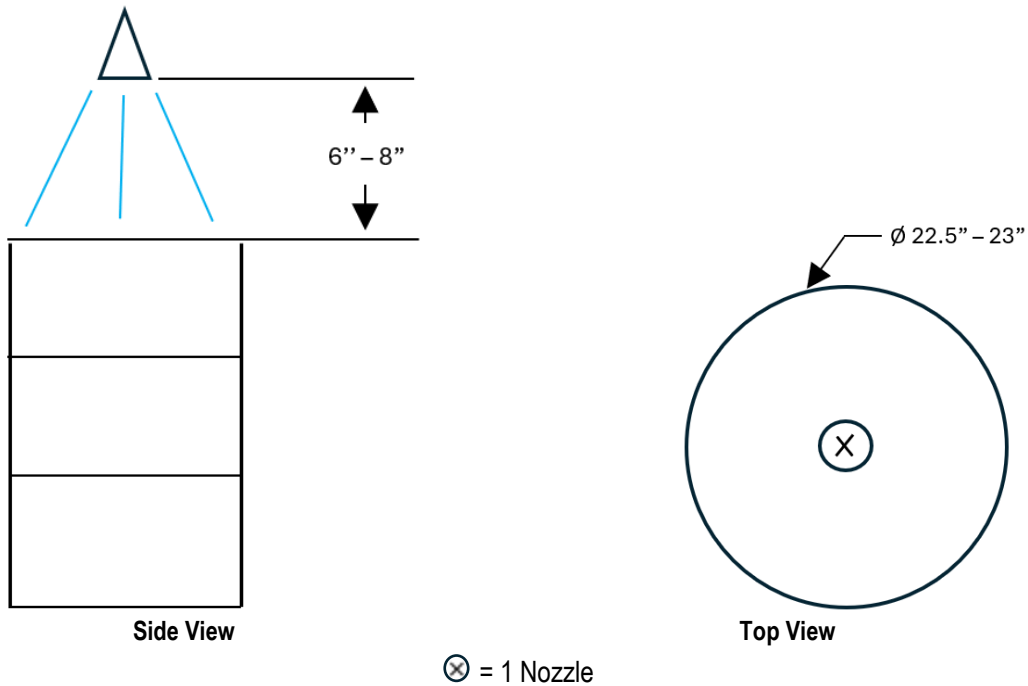


Figure 22 – Typical Example of a 2.76ft² 55-gal Drum Configuration With Single 20lb Unit

4.6.3 General Nozzle Area Coverage Limitations (Straight Fitting)

The following parameters apply when using straight bulkhead fitting and serve as limitations for system design inside an enclosed space. Nozzles shall be positioned inside CNC Workspace where metal chips may accumulate. The Minimum Height is determined by the lowest mounting position that prevents the spread of metal chips upon discharge. The Maximum Height is set to ensure adequate area coverage and maintain the required minimum Class D Dry Powder agent layer thickness for effective fire suppression.

Minimum Height	12 in
Maximum Height	48 in
Height	Total Coverage Per Nozzle
12 in	ø12 in
16 in	ø13 in
24 in	ø20 in
26 in	ø21 in
29 in	ø22.5 in
35 in	ø24 in
48 in	ø33in

Table 23 – General Limitations with Straight Bulkhead Fitting

NOTE: Secure the Nozzle to bulkhead fitting by tightening it using the smaller hex on the nozzle fitting.

4.6.4 General Nozzle Area Coverage Limitations (45° Elbow Fitting)

The following parameters apply when using a 45° elbow bulkhead fitting and serve as limitations for system design inside an enclosed space. Nozzles shall be positioned inside CNC Workspace where metal chips may accumulate. The Minimum Height is determined by the lowest mounting position that prevents the spread of metal chips upon discharge. The Maximum Height is set to ensure adequate area coverage and maintain the required minimum Class D Dry Powder agent layer thickness for effective fire suppression. Please refer to Table 21 for total coverage area per system size.

Model	Class D Dry Powder	Discharge Ports Used (DP)	Nozzles Per DP	Total Number of Nozzles Per Unit	Height	Total Coverage Area
941009	10 lb (4.54 Kg)	2	1	2	9 in	1.35 <i>ft</i> ²
					12 in	1.44 <i>ft</i> ²
					24 in	3.47 <i>ft</i> ²
					36 in	3.99 <i>ft</i> ²
942009	20 lb (9.07 Kg)	2	1	2	9 in	2.7 <i>ft</i> ²
					12 in	2.88 <i>ft</i> ²
					24 in	6.94 <i>ft</i> ²
					36 in	7.98 <i>ft</i> ²

Table 24 – General Limitations with 45° Elbow Bulkhead Fitting

The parameters provided in the table below are specified for coverage area limitation inside an enclosed space when using a 45° elbow bulkhead fitting on a 10lb system. These parameters shall be followed to maintain system effectiveness inside the enclosed space. Limitations in Table 23 define the effective discharge range of the system based on mounting height and nozzle configuration.

Minimum Height	9 in			
Maximum Height	36 in			
Height	Unprotected Space "A"	Coverage Width "B"	Coverage Length "C"	Total Coverage Per Nozzle
9 in	2 in	13 in	15 in	1.35 ft^2
12 in	3 in	13 in	16 in	1.44 ft^2
24 in	6 in	20 in	25 in	3.47 ft^2
36 in	6 in	23 in	25 in	3.99 ft^2

Table 25 – Nozzle Area Coverage for 10lb Unit

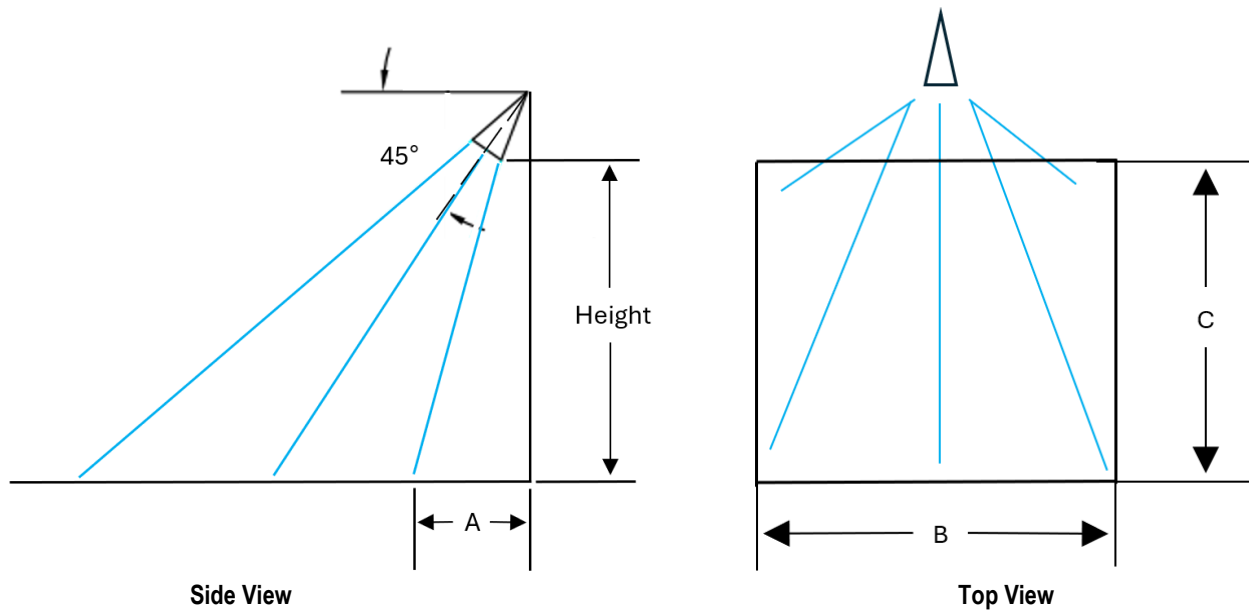


Figure 23 – Nozzle Coverage using a 45° elbow fitting

4.6.5 Discharge Piping and Fitting Specifications

All Firetrace ILP Units shall use copper tubing for the Dry Powder distribution system. The following tubing and fittings shall be used.

Unit Assembly	Material	Outer Diameter	Wall Thickness
941009	soft annealed copper (AS B-280*, for air conditioning and refrigeration service)	1/2 in	.032 in
942009		1/2 in	.032 in

*The use of AS B-280 soft annealed copper, as specified in this manual, complies with ASME B 31.1.

Table 26 – Discharge Piping Specifications

NOTE: For other options consult NFPA 17 Edition Section 4.6

Material	Connection Type	Minimum Pressure Rating**
Brass	Flareless Bite*	1000 psig
*Use Parker Intru-Lok, Camozzi, or equivalent (1500 PSI in all sizes thru 1/2").		
**Minimum pressure rating for use with Firetrace Class D ILP Units		

Table 27 – Discharge Fitting Specifications

4.6.6 Maximum Discharge Piping and Fitting Limitations

The maximum piping and fitting limitations are shown in Table 23.

CNC	Unit Size	Discharge Ports Used (DP)	Nozzles Per DP	Total Number of Nozzles Per Unit	Max. Length of Piping Per DP	Max. No. of Elbows Per DP	Max. No. of Tees Per DP
Cutting Area	10 & 20 lb	2	1	2	10 Ft (3.05 m)	2	0
			2	4	14 Ft (4.27 m)	3	1
Collection Drum	20 lb	1	1	1	10 Ft (3.05 m)	0	0
		2	1	2			

Table 28 – Maximum Piping and Fitting Limitations

4.6.7 Piping Bends

Wherever possible, pipe bends should be used in lieu of 90° pipe elbows. It is recommended that a pipe bender be used when forming the 90° bends. The following minimum bend radii should be used when forming the pipe bends in order to minimize the chance of flattening the pipe.

Pipe Outer Diameter (OD)	Minimum Bend Radius* to Pipe Centerline	Equivalent Length** for 90° Bend***
1/2 in	1-1/2 in	2-3/8 in
<p>* The minimum bend radii were derived from Parker Industrial Tube Fittings Catalogue 4300, dated March 1991.</p> <p>** The equivalent length is to be subtracted from the maximum length of piping as stated under Table 28 – Discharge Piping Limitations.</p> <p>***90° pipe bends are not required to be subtracted from the maximum number of elbows stated under Table 29 –Pipe Bend Radius and Equivalent Length.</p>		

Table 29 –Pipe Bend Radius and Equivalent Length

4.7 Firetrace Detection/Actuation Tubing

The location of the Firetrace detection tubing is critical to the response time in the event of a fire. The Firetrace detection tubing should be installed throughout the enclosure and routed in close proximity to all potential fire sources. The Firetrace detection tubing should not be placed horizontally adjacent to a potential fire source.

The detection/actuation tubing is heat sensitive and in a fire situation is designed to rupture at any point along the tube upon direct flame impingement or at a temperature above 383°F (195°C). The maximum length of tubing that can be used for any ILP unit is 120 feet (36.58 m). Refer to Section 5.4 for installation instructions.

NOTE: It is recommended that the tubing not be placed horizontally adjacent to potential fire sources as this may significantly delay response time.

Description	Limitation	
Maximum length	120 ft	36.58 m
Maximum height between layers	3.28 ft	1 m
Maximum distance between passes	21.12 in	53.8 cm
Maximum distance from wall	10.56 in	26.82 cm
Minimum bend radius	6 in	15.24 cm

Table 30 – Firetrace Detection Tubing Limitations

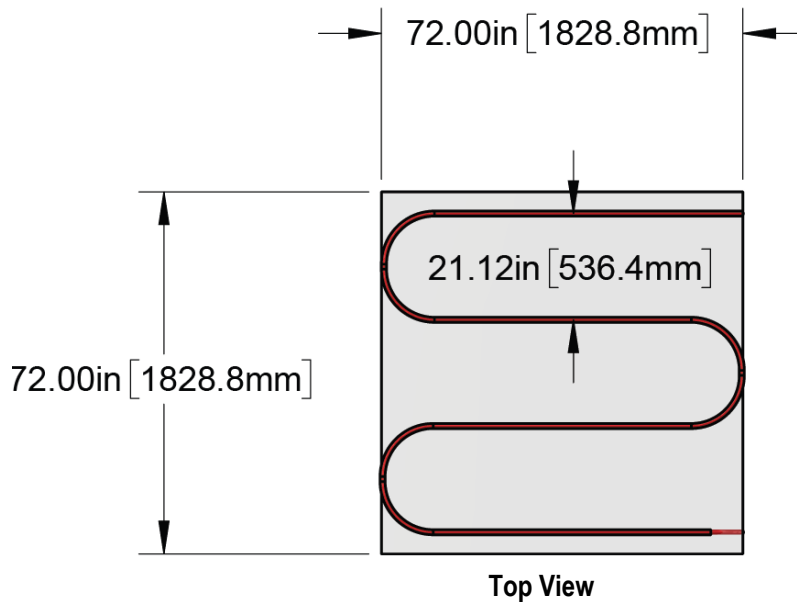


Figure 24 – Tubing Configuration Guideline (Top View)

5 INSTALLATION INSTRUCTIONS

This section provides installation instructions covering components and limitations described in Section 3 and Section 4 of this Manual.

All components should be installed to facilitate proper inspection, testing, recharging, and any other required service or maintenance as may be necessary. Equipment must not be subjected to severe weather conditions or mechanical, chemical, or other damage which could render the equipment inoperative. The equipment must be installed in accordance with instructions in this Manual and the NFPA Standard 17.

WARNING

Dry Powder cylinder/valve assemblies must be handled, installed and service in accordance with the instruction contained in this Manual and on the cylinder nameplate. Failure to follow these instructions could result in property damage, severe injury, or death.

WARNING

Pressurized (charged) cylinders are extremely hazardous and if not handled properly are capable of causing property damage, bodily injury, or death. Always wear safety glasses and make sure the discharge plugs are properly in place before unit installation, servicing, or other general handling.

5.1 Dry Powder Cylinder/Valve and Bracket Assemblies

The Dry Powder cylinders should be located as close as possible to the protected enclosure. The cylinder must be mounted outside the protected enclosure. The assemblies shall be located in a readily accessible location to allow for ease of inspection, service, and maintenance. The cylinders shall be located in an environment protected from the weather and where the temperature range is between 0°F to +130°F (-17.8°C to +54.4°C).

The cylinder and bracket must be mounted in the vertical plane with the cylinder valve facing up and oriented so that the pressure gauge is facing out and away from the mounting wall to facilitate visual inspection.

Mount the cylinder where it will not be subjected to accidental damage or movement. Suitable protection must be installed where necessary to prevent damage or movement.

WARNING

Make sure that the ball valve, located on the top of the cylinder valve, is maintained in the “OFF” position and the discharge port safety plugs are kept in place until the system is secured in place and ready for connection of the discharge piping. Failure to follow these instructions will result in actuation and discharge of the cylinder contents.

1. Securely mount the cylinder bracket to structural support using 2 or more mounting holes.
2. Position the cylinder in the bracket with the pressure gauge facing out. Secure the cylinder in place using the bracket straps or band clamps.

5.2 Discharge Piping and Nozzles

1. Locate the nozzle(s) following the guidelines and limitations described in Section 4.6.2.
2. Determine the routing of the discharge pipe and whether one (1) or two (2) discharge ports will be used following the guidelines and limitations described in Section 4.6.5 & 4.5.6. If two (2) discharge ports are used, verify that the pipe length from each discharge port does not exceed a 10% imbalance.
3. Determine where metal chips may accumulate inside CNC Workspace.
4. Remove one or two safety plugs from the valve discharge ports as required. Attach male connection fittings (Firetrace P/N 310300 or P/N 310301 as applicable) into each discharge port.
5. Install the discharge pipe and fittings between the cylinder and nozzle(s). Secure the pipe with the appropriate size pipe clamps as required.

For a more comprehensive list of Discharge Pipe Fittings, refer to **Appendix A**.

5.3 Nozzle Blow-off Caps

The Class D Nozzle Blow-off Cap shall be installed on nozzle assembly as illustrated in Figure 25 - Blow-off Cap Placement. The lanyard loop hole shall be attached to the nozzle fitting as shown in the figure below in red then securely place cap over larger diameter of nozzle shroud. Refer to Figure 25 – Final Configuration for complete installation. Install the Nozzle Assembly to bulkhead by fastening the nozzle fitting hex shown in green as illustrated in Figure 25 - Blow-off Cap Placement.

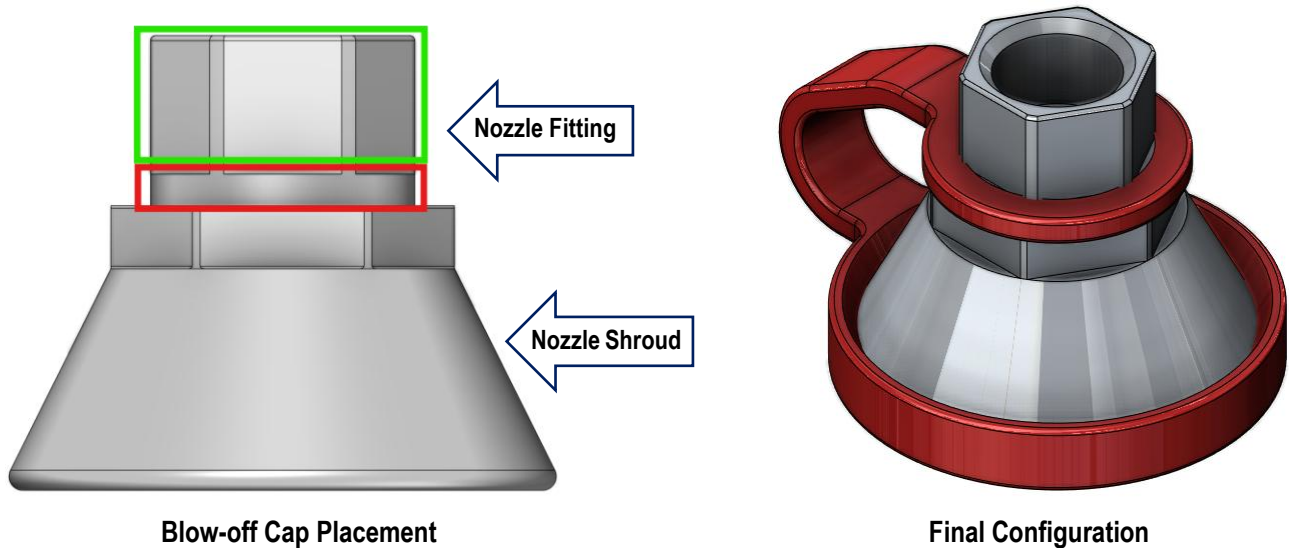


Figure 25 – Blow-off Cap Installation

5.4 Discharge Line Tees

Changes in direction of flow cause separation of expellant gas and dry powder. To provide proper distribution of dry powder upon splitting the stream special attention must be given to the method in which an approach is made to a tee after a change in direction. Certain acceptable methods are shown in Figure 26.

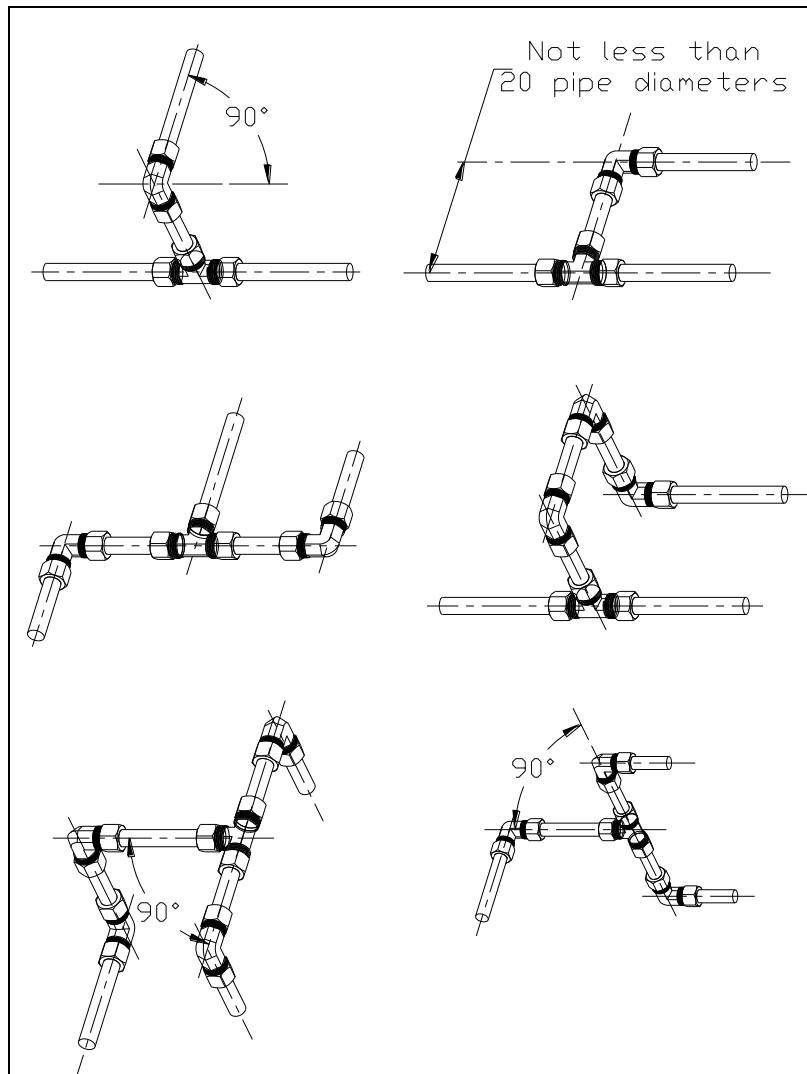


Figure 26 – Illustrations of Acceptable Means of Piping Into a Tee in a Dry Powder System

5.5 Firetrace Detection/Actuation Tubing

Location and spacing of the tubing is critical to the response time in the event of a fire. The tubing should be placed above the hazard areas being protected. The Typical Tubing Placement diagram, located in Appendix B, provides general guidelines for placement of the detection tubing along with the maximum spacing and height limitations. Depending on the configuration of specific hazards, the guidelines shown in the Typical Tubing Placement diagram may, or may not, be applicable. The maximum height that is allowed between layers is 3.28 feet (1 m), the maximum distance between passes is 21.12 inches (53.34 cm), and the maximum distance allowed from any wall to the tubing is 10.56 inches (26.82 cm). Refer to the Typical Tubing Placement diagram in Appendix B for further clarification.



Do not kink, bend, or crush Firetrace tubing in order to prevent leakage which could result in accidental unit discharge.

**Do not install tubing in a hazardous environment where the maximum ambient temperature exceeds 176°F (80°C)
Maximum length of detection tubing shall not exceed 120 Feet (36.58 m).**

1. Secure the detection tubing using Mounting Tabs at 1.5 Ft (0.46 m) intervals.
2. Use the appropriate rubber/plastic grommets when the detection tubing is routed through sharp holes in order to prevent damage to the tubing.

5.6 Detection Tubing Fittings and Accessories

5.6.1 Slip-On Fittings

All high-pressure slip-on fittings must be secured in the following manner:

1. Cut the tube end, ensuring the cut is square, clean, and free from burrs. Check that no debris is left in the tube.
2. Thoroughly clean the tubing to a distance of at least 2 in. (5.08 cm) above the cut end, removing all dirt, grease, or grime. This will ensure a good seal inside the fitting.
3. Slide the tubing into the opening until it butts up against the inner wall. Pull lightly on the tubing and the brass outer ring should move outward slightly.

For a more comprehensive list of Slip-On Fittings, refer to Appendix A.

5.6.2 End of Line Accessories

All of the following accessories will connect to an End of Line Adapter. The End of Line Adapter can be installed by following the appropriate procedures in Section 5.5.1 or Section 5.5.2.

5.6.2.1 Dry Powder 195 psig Pressure Gauge (P/N 400028):

The Dry Powder 195 psig Pressure Gauge must be installed with its included o-ring. Thread the pressure gauge into the End of Line Adapter so that the gauge indicates the tubing pressure.

5.6.2.2 Pressure Switch for End of Line Adapter (P/N 400004):

The Pressure Switch for the End of Line Adapter must be installed with its included o-ring and washer. Insert the washer into the End of Line Adapter, and then thread the Pressure Switch in until an audible “click” can be heard. The Pressure Switch is now active.

5.6.2.3 End of Line Adapter Plug (P/N 310303):

The End of Line Adapter Plug must be installed with its included o-ring. Thread the plug into the End of Line Adapter.

NOTE: End of Line Adapters are not designed to provide a lasting seal without the use of one of the following items:

NOTE: Without installation of the included washer, the Pressure Switch will not be active.

5.6.3 FDT Charging using Nitrogen Charge Kit (P/N 600213)

The FDT Nitrogen charge kit contains:

- Regulator (910550)
- 2x nitrogen cylinders (600214 quantity of two cylinders included in this part number)
- Nitrogen charge adapter to fit into EOL fitting (910600)

- Hard case with foam inserts

The FDT network must have an EOL fitting such as EOL (200168), a pressure switch module with EOL gauge fitting or a manual release (600077) that can be used for charging the FDT network.

Using the nitrogen charge kit, to pressurize the FDT network follow the steps outlined here:

- Ensure the FDT network is complete (all terminations present – a closed loop)
- Prepare the EOL for installing the charging adapter (910600) by removing the component installed in the EOL position
- Ensure the ball valve is closed on the nitrogen regulator (910550)
- Install a nitrogen cylinder (600214) to the regulator (910550)
- Install the nitrogen charge adapter (910600) into the EOL fitting of the FDT network, ensuring the O-ring is in position, and the adapter fully engages with the Schrader core inside the EOL fitting
- Connect the regulator outlet (910550) quick disconnect into the installed charge adapter (910600) fitting
- Open the ball valve on the regulator (910550) to start the flow of nitrogen into the FDT network

Charging of the FDT network should only take a few seconds at the most. When the valve is first opened on the regulator, there will be an audible flow of nitrogen briefly – if you can hear nitrogen discharging from the FDT network at any point, close the regulator ball valve and check the FDT network for leaks or missing terminations.

Once the FDT network is charged, remove the regulator by pulling the quick disconnect fitting away from the regulator, releasing the charge adapter fitting.

Remove the nitrogen charge adapter fitting, the Schrader core will engage and keep the FDT network pressurized – there will be an audible pop as the O-ring seal of the nitrogen charge adapter is removed from the EOL fitting.

Perform a leak check of the FDT network once pressurized.

Install the fitting previously removed from the EOL fitting in order to seal the termination. EOL fittings should not be left with no fittings installed, as the Schrader core is not designed to be a permanent seal on its own.

Locate the pressure gauge on the FDT network and monitor the pressure for a minimum of 20 minutes, if no pressure drop is noted, proceed with the commissioning of the system.

If a decrease in pressure is noted, repeat the FDT leakage check using a leak indicator solution.

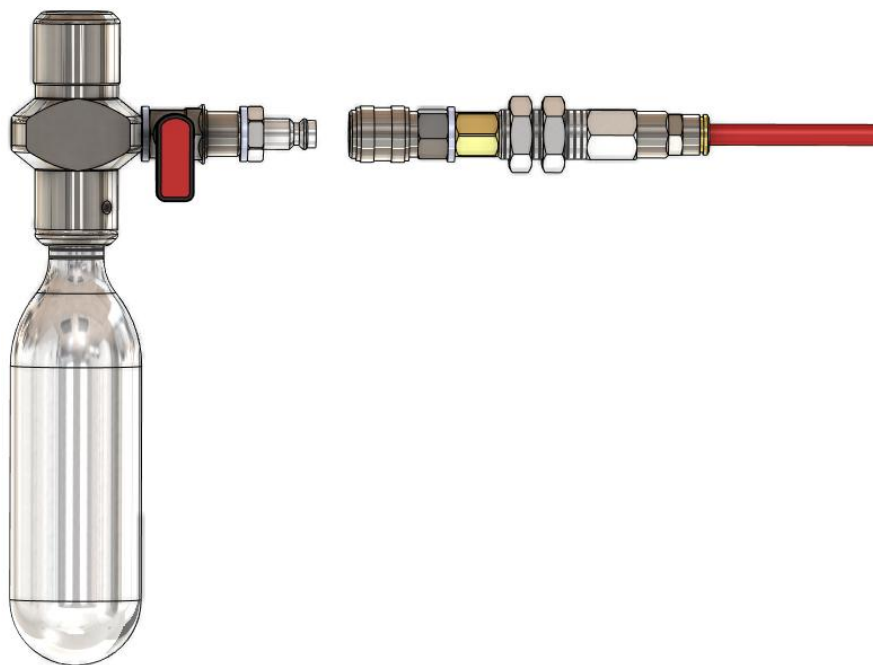


Figure 27 – Firetrace Nitrogen Charge Kit 600213

5.7 System Activation

1. Install the detection tubing, fittings, and accessories according the procedures specified in Section 5.4 and Section 5.5.
2. With the system ball valve still closed, connect the detection tubing to the system using the appropriate procedure in Section 5.5.1 or Section 5.5.2.
3. Attach the filling adapter (P/N 600023 or 600028) to the End of Line Adapter. Refer to Section 5.5.3.
4. A regulator and calibrated pressure gauge shall be used to pressurize the detection tubing with dry nitrogen through the filling adapter to 195 psig (13.5 bar). It is recommended to have a portable dry nitrogen cylinder or Firetrace Nitrogen Fill Kit for on-site use.
5. Remove the filling adapter and thread the pressure gauge & O-ring (Firetrace P/N 400013) into its place to verify that the tubing is pressurized to at least 195 psig at 70°F (13.5 bar at 21°C) (pressure may have to be adjusted for temperatures higher or lower than 70°F). Refer to Section 5.5.3 for further instructions.
6. With the gauge still attached to the filling adapter, test for leakage:
 - Apply soapy water solution to the cylinder valve connection, end of line adapter connection, and the pressure gauge connection. Observe for bubble leaks.
 - Wait 30 minutes, then observe the pressure gauge. Any decrease in pressure is an indication of a leak.
 - In the event of a leak go back to Section 5.5 and check the installation of all fittings and accessories.
7. If an optional pressure switch is to be installed in the EOL adapter, remove the pressure gauge and install the pressure switch according to the procedures in Section 5.5.3. Check pressure switch connection for bubble leaks using soapy water solution.
8. After confirming that there is no leakage within the detector tubing, **SLOWLY** rotate the ball valve lever counterclockwise to the “ON” position.



CAUTION

If the ball valve lever is opened abruptly, activation of the cylinder valve may occur, causing the unit to discharge.

9. Tamper proof the unit by removing the ball valve lever face and securing the lever in the “ON” position with a zip tie. Refer to the Tamper Proof Instruction in Appendix B.
10. If the optional Pressure Switch is installed on the valve or on the E.O.L., ensure that the proper electrical connections are made to annunciate unit discharge, shut down ventilation, etc., as may be required by the end user or the AHJ. (All electrical connections are to be in accordance to NFPA 70 National Electric Code)
11. The unit is now fully armed and ready for use.

6 SERVICE AND MAINTENANCE INSTRUCTIONS

WARNING

1. Dry Powder cylinder/valve assemblies must be handled, installed, inspected and serviced only by qualified and trained personnel in accordance with the instructions contained in this Manual, the cylinder nameplate, NFPA-17, and any other regulations and codes that may apply.
2. Before performing maintenance or refilling procedures refer to the material safety data sheets in Appendix C.

WARNING

Pressurized (charged) cylinders are extremely hazardous and if not handled properly are capable of causing bodily injury, death or property damage. Always wear safety glasses and make sure the discharge plugs are properly in place before unit installation, servicing, or other general handling.

ATTENTION

Any maintenance requiring depressurization, filling, or pressurization should only be performed at an Authorized Firetrace Service Location. Service at any other location will void the FM Approval and UL/ULC Listing. Please contact Firetrace directly for a list of Authorized Firetrace Service Locations.

6.1 General

A regular program of systematic maintenance must be established for continuous, proper operation of all Dry Powder units, and to avoid violating the warranty. A periodic maintenance schedule must be followed and an inspection log maintained for ready reference. As a minimum, the log must record: (1) inspection interval, (2) inspection procedure performed, (3) maintenance performed, if any, as a result of inspection, and (4) name of inspector performing task.

For any deficiencies that are found, appropriate corrective actions shall be taken immediately.

6.2 Recharge Agents

6.2.1 Dry Powder

Only Class D Dry Powder provided by Firetrace may be used in any Firetrace Dry Powder Self-Contained Automatic Indirect Fire Suppression Unit.

6.2.2 Argon Helium 90:10

Argon Helium 90:10 mixture is used to pressurize Class D Dry Powder Self-Contained Automatic Indirect Fire Suppression Unit. This 90:10 mixture is used for leak testing the system after assembly. Industrial Grade dry Argon that meets or exceeds MIL SPEC A18455C may be used to pressurize Class D Dry Powder System. Ensure it is regulated to 195 psig at 70 °F [13.5 bar at 21 °C]. Please refer to Table 20 for cylinder gauge pressure-temperature relationship based on a charging pressure of 195 psig at 70°F.

6.3 Periodic Service and Maintenance Procedures

6.3.1 Monthly Inspection

Inspection by the owner or end user should verify the following:

1. The Suppression Unit is in its proper location.
2. The Manual Actuators are unobstructed.
3. The Tamper Indicator is intact.
4. The Maintenance Tag or Certificate is in place.
5. The Suppression Unit shows no physical damage or condition that might prevent operation.
 - a. This includes inspecting the detection tubing in the hazard area for abrasion, distortion, cuts, or dirt accumulation.
6. The Pressure Gauge is in the operable range.
7. The Nozzle Blowoff Caps are intact and undamaged.
8. Neither the Protected Equipment nor the Hazard has been replaced, modified, or relocated.
9. If the pressure switch is installed:
 - i. Check pressure switch connection for bubble leaks using soapy water solution.
 - ii. Ensure the proper electrical connections are made. (All electrical connections are to be in accordance with NFPA 70 National Electric Code and NFPA 72 National Fire Alarm and Signaling Code.)

6.3.2 Semiannual Inspection

Semiannual Inspection is to be performed only by a Certified Firetrace Distributor. Inspection should include a repetition of the monthly inspection.

1. Check to see that the hazard has not changed.
2. Before Inspecting System close the ball valve, by turning the ball valve lever clockwise to the "OFF" position.
3. Inspect detection/actuation tubing, Manual releases, discharge piping, nozzles, signals, and all other auxiliary equipment.
4. Verify the discharge piping/hoses are not obstructed.
 - Remove the nozzle(s) and inspect for obstructions. Reinstall the nozzles.

6.3.3 Six Year Inspection

Examination of the Dry Powder shall be conducted at an Authorized Firetrace Service Location at least once every 6 years. The powder will be examined for caking and may require replacement.

Dry Powder cylinders continuously in service without discharging shall be given a complete external visual inspection in place, every 6 years or more frequently if required.

All hoses shall be tested or replaced every 6 years. The testing procedure is as follows:

1. The hose is removed from any attachment.
2. The hose assembly is then placed in a protective enclosure designed to permit visual observation of the test.
3. The hose must be completely filled with water before testing.
4. Pressure then is applied at a rate-of-pressure rise to reach the test pressure within 1 minute. The test pressure is then maintained for 1 full minute. Observations are then made to note any distortion or leakage.
5. After observing the hose for leakage, movement of couplings, and distortion, the pressure is released.

6.3.4 Firetrace Detection Tubing Maintenance

Firetrace detection tubing maintenance is to be performed by an authorized Firetrace distributor. Maintenance should include a complete external visual inspection of the tubing during every monthly inspection. The tubing shall show no

signs of physical damage or degradation, including but not limited to abrasion, distortion, cuts, dirt accumulation. For any deficiencies that are found, appropriate corrective actions shall be taken immediately.

In addition to a monthly visual inspection, a semi-annual inspection is to be performed to evaluate the tubing for damage and pliability. If any concerns are noted, replacement of the Firetrace detection tubing would be recommended.

If all routine maintenance is followed and inspection of the tubing determines the tubing to be in good condition and does not show signs of damage or degradation, the tubing can remain in service.

6.3.5 Hydrostatic Testing

WARNING

DO NOT assume that ILP cylinders have been completely discharged or are empty after a suspected or verified discharge event. Any remaining pressure in the system could be still considered extremely hazardous and if not handled properly can cause property damage, bodily injury, or death. Never handle the systems by the pressure switches, electric solenoids, or pressure gauges. Always wear safety glasses and make sure the discharge port safety plug(s) and cap(s) are properly in place before system installation, servicing, or other general handling.

- The Dry Powder Cylinder shall be subject to a hydrostatic pressure test at intervals not exceeding 10 years.
- Carefully depressurize the system following the procedures in Section 7.1. Discard the Dry Powder.

Firetrace Dry Powder Suppression units with DOT cylinders are built to DOT-4B specifications and therefore fall under DOT CFR Title 49.

DOT-4B Firetrace Dry Powder containers requiring retest must be hydrostatically tested in accordance with DOT CFR Title 49, General requirements for requalification of specification cylinders section & Requirements for requalification of specification cylinders section. This periodic retest must be performed by an authorized retester having a current identification number issued by the Associated Administrator for Hazardous Material Safety of DOT, and must include an internal and external examination in accordance with CGA pamphlet C-6, C-6.1, C-6.2, or C-6.3, as applicable. The test procedures are described in CGA pamphlet C-1. Because volumetric expansion of the container must be measured, only the water jacket volumetric expansion method or the direct expansion methods are acceptable.

Rebuild and recharge the system, referring to Section 7.2 and Section 7.3.

7 SYSTEM DISSASSEMBLY, ASSEMBLY, AND CHARGING

WARNING

Pressurized (charged) cylinders are extremely hazardous and if not handled properly are capable of causing bodily injury, property damage, or death. Always wear safety glasses and make sure the discharge plugs are properly in place before unit installation, servicing, or other general handling.

ATTENTION

Any maintenance requiring depressurization, filling, or pressurization should only be performed at an Authorized Firetrace Service Location. Service at any other location will void the FM Approval and UL/ULC Listing. Please contact Firetrace directly for a list of Authorized Firetrace Service Locations.

7.1 Depressurizing the Unit

1. Turn the ball valve lever to the “off” position (perpendicular to the valve).
2. Depressurize the detection/actuation tubing by depressing the Schrader valve inside of the End of Line Adapter.
3. Remove the detection/actuation tubing from the top of the ball valve.
4. Remove the discharge piping from the discharge ports.
5. Install discharge plugs into both discharge ports.
6. Slowly, slightly open the ball valve so only a small amount of nitrogen can be heard leaving the unit.



Opening the ball valve too far, or too fast, will unseat the piston and bring Dry Powder into the valve assembly.

7. Once the pressure gauge has reached 0 psig, slowly open the ball valve completely
8. Carefully remove the discharge plugs from the valve to ensure system depressurization.

7.2 Valve Rebuild

For valve rebuilding instructions, please refer to Tech Bulletin 009 located in Appendix B. Tech Bulletin 009, along with all other bulletins, is also available in our Distributor Portal.

7.3 System Recharge

1. Fill the cylinder with the appropriate amount of dry powder. Refer to Table 1 for the correct amounts for each system.
2. Clean the threads of the cylinder with a small brush or dry cloth.
3. Thread the siphon tube into the valve. See Appendix A for the part numbers appropriate for each system.
4. Thread the valve and siphon tube assembly onto the cylinder. Ensure a tight fit so that the valve is seated completely on top of the cylinder collar.
5. Install the detection/actuation tubing. Refer to Section 5.4.
6. Using Charge Kit PN 600213, pressurize the detection/actuation tubing and the cylinder through the End of Line Adapter or Manual Release. Refer to Section 5.6.

APPENDIX A

**System Parts List
Discharge Line Parts List
Detection Line Parts List**

System Parts List

10, & 20 LB.

AUTOMATIC INDIRECT
CLASS D DRY POWDER SUPPRESSION UNIT

MODELS

941009 - 10 LB. CLASS D DRY POWDER ILP

942009 - 20 LB. CLASS D DRY POWDER ILP

ITEM	PART NO.	DESCRIPTION	SYSTEM
1	300119	Medium Dry Chemical ILP Valve	10, 20 LB.
2	300221	Collar O-Ring Medium ILP	10, 20 LB.
3	600003	Siphon Tube 1"x12"	10 LB.
3	600009	Siphon Tube 1"x19.5"	20 LB.
4	101200	Large Cylinder	10 LB.
4	120020	Extra Large Cylinder	20 LB.
5	310301	Medium Discharge Port Plug	10, 20 LB.
6	600033	Bonded Seal	All Systems
7	111206	Large Bracket	10 LB.
7	111020	Extra Large Bracket	20 LB.
8	400002	O-Ring, M1x10	All Systems
9	200103	Yellow Ball Valve Transport Cap	All Systems
10	600116	Nameplate: ILP Dry Chem	All Systems
11	400005	Pressure Switch	All Systems (OPTIONAL)
NP	111402	ASM, Large Heavy Duty Bracket	10 LB. (OPTIONAL)
NP	111400	ASM, Extra Large Heavy Duty Bracket	20 LB. (OPTIONAL)
NP	800100	Warranty/Registration Card	All Systems
NP	600081	Pressure Switch Port Plug	All Systems
* OPTIONAL PARTS NP NOT PICTURED			

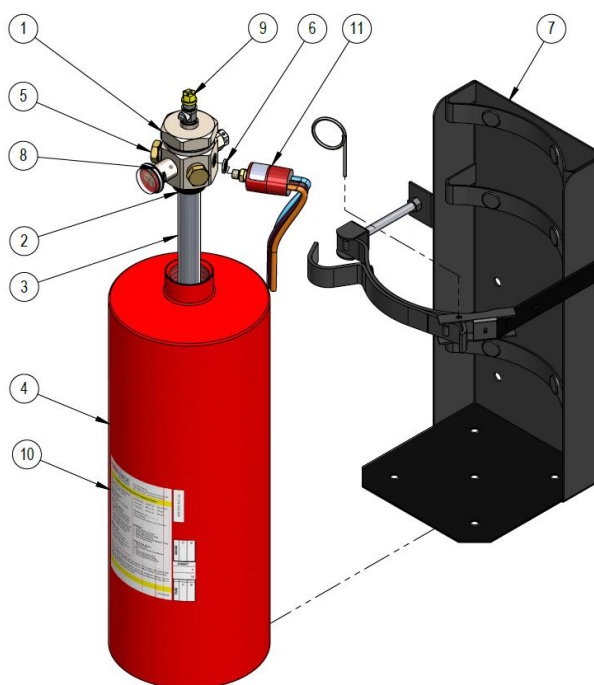


Table 31 – Class D ILP System Assembly

Firetrace Class D Dry Powder ILP Automatic Suppression Unit Assemblies

Part Number	Description
941009	Large Class D Dry Powder ILP Suppression Unit (10 lb)
942009	Extra Large Class D Dry Powder ILP Suppression Unit (20 lb)

Table 32 – Firetrace Class D Dry Powder ILP Units

Part Number	Description
941009-PS	Large Class D Dry Powder ILP Suppression Unit with Pressure Switch (10 lb)
942009-PS	Extra Large Class D Dry Powder ILP Suppression Unit with Pressure Switch (20 lb)

Table 33 – Firetrace Class D Dry Powder ILP Units w/ Valve Mounted Pressure Switch

Cylinder Brackets

Part Number	Description
111206	Cylinder Bracket, DOT and CE, Large (10-12lb or 5kg), Generic
111020	Cylinder Bracket, DOT, Extra Large (20-35lb), Generic

Table 34 – Cylinder Brackets

Accessory Brackets

Part Number	Description
120305	Accessory Bracket
111022	Bracket Support

Table 35 – Accessory Brackets

Discharge Network

Part Number	Description
202820	1/2 in Flexible Hose, 1 ft
201820	1/2 in Flexible Hose, 2 ft
201821	1/2 in Flexible Hose, 4 ft
201822	1/2 in Flexible Hose, 6 ft
201823	1/2 in Flexible Hose, 8 ft
201824	1/2 in Flexible Hose, 10 ft

Table 36 – Medium/Large ILP Discharge Network Flexible Hoses

Part Number	Description
850022	Fitting, 1/2 in Hose to Valve Union
850023	Fitting, 1/2 in Hose Union
850024	Fitting, 1/2 in Hose Elbow
850025	Fitting, 1/2 in Hose Tee
850026	Fitting, 1/2 in Hose to Nozzle Union Bulkhead
850027	Fitting, 1/2 in Hose to Nozzle Elbow Bulkhead

Table 37 – Medium/Large ILP Discharge Network Flexible Hose Fittings

Part Number	Description
501002	1/2 NPT, Cutting Area Nozzle, 2" Shroud
501003	1/2 NPT, Drum Nozzle, 3" Shroud
501011	2" Nozzle Blow-off Cap, Cutting Area Nozzle

Table 38 – Nozzles

Detection Network

Part Number	Description
204025	Firetrace Detection Tubing, 4/6 mm, 25 ft [7.6 m]
204050	Firetrace Detection Tubing, 4/6 mm, 50 ft [15.2 m]
204100	Firetrace Detection Tubing, 4/6 mm, 100 ft [30.4 m]
204328	Firetrace Detection Tubing, 4/6 mm, 328 ft [100 m]
200163	Meal Coil Tubing Protector, 4mm/6mm, 20ft [6 m]
200300-25	Plastic Tubing Protector, 4mm/6mm, 25ft [7.6 m]

Table 39 – Firetrace Detection Tubing

Part Number	Description
200157	Fitting, Tube Tee, 4/6 mm
200158	Fitting, Tube Union, 4/6 mm
200159	Fitting, Tube to Threads Elbow, 4/6 mm
200177	Fitting, Tube Tee to Threads, 4/6 mm
200178	Fitting, Tube Elbow, 4/6 mm
200179	Fitting, Tube to Threads Union, 4/6 mm
200203	Fitting, Tube Plug, 4/6 mm
200169	In Line Adapter w/ Tube Tee, 4/6 mm

Table 40 – Tube Fittings

Part Number	Description
200168	End of Line Adapter w/ Tube Union, 4/6 mm
400028	Pressure Gauge w/ O-Ring, 195 psig
310303	End of Line Adapter Plug
400004	End of Line Pressure Switch
600064	Manual Release w/ 195 psig Gauge and Tube Union, 4/6 mm

Table 41 – End of Line Accessories

Miscellaneous

Part Number	Description
200150	Rubber Grommets for Detection Tubing (Qty. 2)
200151	Plastic Grommets for Detection Tubing (Qty. 2)
200171	Mounting tabs for Detection Tubing, 4/6 mm (Qty. 12)
201006	Magnetic Mounting Clips for Detection Tubing, 4/6 mm (Qty. 6)
201133	Heavy Duty Mounting Clips for Detection Tubing (Qty. 6)
600213	Detection Tubing Charge Kit
600210	Tube Cutter
201132	Tamperproof Device, "ON" position
201137	Tamperproof Device, "OFF" position
201138	Tamperproof Device, "ON" position with Lock out Tag out
201139	Tamperproof Device, "OFF" position with Lock out Tag out
120305	Accessory Mounting Brackets

Table 42 – Installation Accessories

Part Number	Description
400005	Valve Mounted Pressure Switch
400441	Pressure Switch Assembly Box
601300	Dual Pressure Switch Module
400312	12 VDC Electric Solenoid Assembly
400324	24 VDC Electric Solenoid Assembly
400316	120 VAC Electric Solenoid Assembly
400327	240 VAC Electric Solenoid Assembly
600096	Black Audible Alarm, Battery Operated (requires pressure switch)

Table 43 – Auxiliary Accessories

Part Number	Description
600213	Tools, Detection Tube Nitrogen Charge Kit
600214	Tools, Replacement Cylinder for Nitrogen Charge Kit
910550	Nitrogen Regulator, 210psi
910600	Nitrogen Charge Adapter, EOL
900007	Tools, Charging Adapter, Use Your Own Nitrogen
300246	Tools, ILP Valve Rebuild Kit, Small DOT Valves
300248	Tools, ILP Valve Rebuild Kit, Medium DOT Valves

Table 44 – Installation Tools

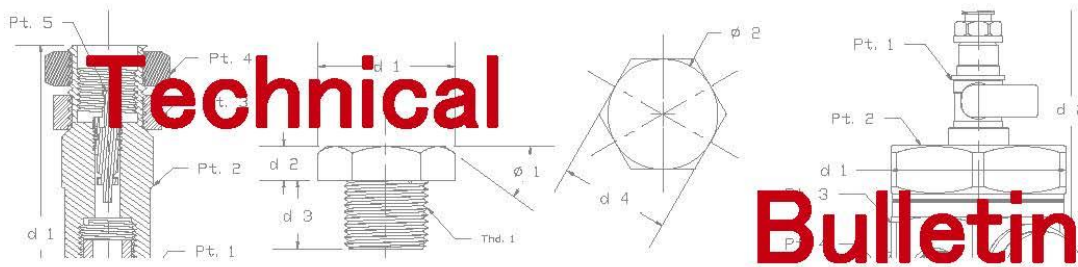
Part Number	Description
201137	Tamperproof Valve Lockout Clip, Disarmed - Red
201132	Tamperproof Valve Locking Clip, Armed - Green
201138	Tamperproof Device, "ON" position with Lock out Tag out
201139	Tamperproof Device, "OFF" position with Lock out Tag out
200164	Ball Valve for ILP and DLP Valves
900164	Ball Valve Lever Replacement
200303	Transport Cap, Yellow
310300	Safety Plug for Small (1/4") ILP Valve
310301	Safety Plug for Medium/Large (1/2") ILP Valve
600033	Washer, Bonded Seal, 1/8"

Table 45 – Valve Accessories

APPENDIX B

- **Technical Bulletin 030**
- **Technical Bulletin 009**
 - Dry Chemical Valve
 - Rebuild Procedures
- **Firetrace Detection Tubing Compatibility**
 - Additional Dry Chemical Maintenance Recommendations
- **Typical Tubing Placement**
- **Tamp Proof Options**

Technical Bulletin 030



TB030

Additional Dry Chemical Maintenance Recommendations

Each of the respective ABC Dry Chemical System Manuals contains the specific requirements for periodic system maintenance. These requirements refer to, and are required by, NFPA 17: Standard for Dry Chemical Extinguishing Systems and UL 1254: Standard for Pre-Engineered Dry Chemical Extinguishing System Units. In addition to these requirements, the following is **recommended**:

Prior to installation and semi-annually

1. The Fire Suppression System Indication Module functionality should be tested.
2. The Fire Suppression System Assembly should be disconnected from the detection and discharge networks and the powder agitated.

To accomplish these, the subsequent steps should be followed:

1. Deactivate the system by closing the System Ball Valve.
2. Partially depressurize the detection network by removing the auxiliary gauge found on the End of Line Adapter and slowly depressing the schrader valve until the service light on the Indication Module is activated.
3. Completely depressurize the detection network by fully depressing the schrader valve until no pressure remains. The activation light and alarm on the Indication Module should now be activated.
4. Remove the Fire Suppression System Assembly from the detection and discharge networks.
5. Place the Discharge Port Plugs into the Discharge Ports.
6. Carefully invert the assembly and gently knock the bottom and sides of the cylinder with a rubber mallet 5-10 times.
7. Verify that the cylinder pressure is within the operable range.
8. Place the System Assembly back into the System Bracket and reinstall the detection and discharge networks.
9. Repressurize the detection network.
10. Reactivate the system by opening the System Ball Valve.

This additional maintenance should be logged along with the previously required maintenance items.

FIRETRACE
AUTOMATIC FIRE SUPPRESSION SYSTEMS

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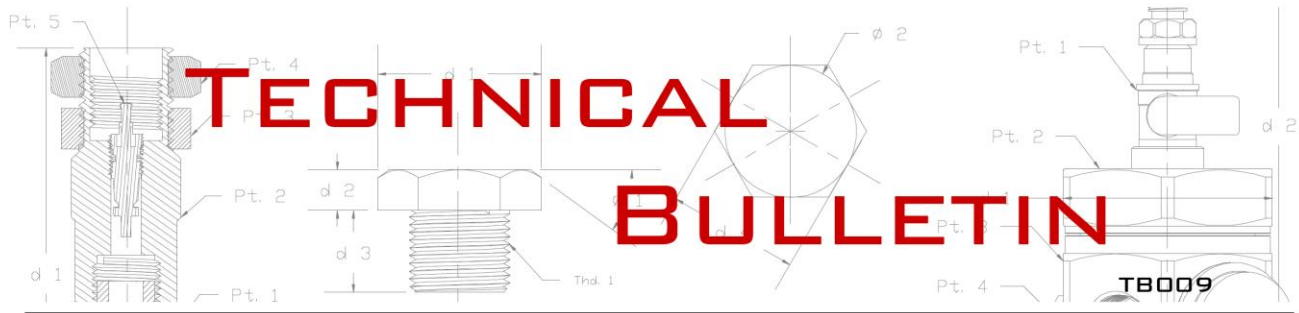
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TB030

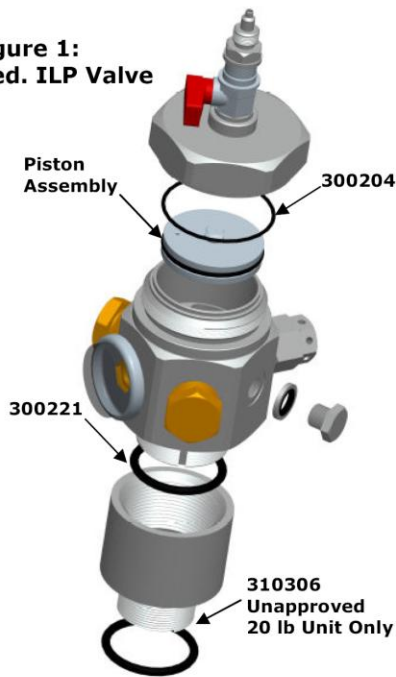
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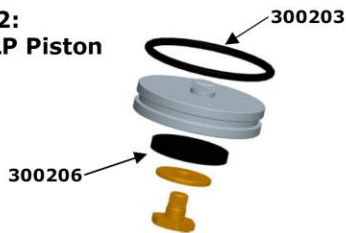
Technical Bulletin 009



**Figure 1:
Med. ILP Valve**



**Figure 2:
Med. ILP Piston**



Dry Chemical Rebuild Procedure:

I. Medium UL/FM Approved ILP Valve

- 1) Verify that the unit is not pressurized by looking at the pressure gauge and then very slowly opening the ball valve.
- 2) Remove the valve from the cylinder and siphon tube.
- 3) Unthread the top of the valve from the valve base, remove and discard the O-Ring from inside.
- 4) Remove the piston assembly from the valve body.
 - a) Carefully remove and discard O-Ring from around the piston assembly.
 - b) Unscrew the small bolt from the bottom of the piston assembly.
 - c) Remove the washer.
 - d) Carefully remove and discard the Seat Seal from the bottom of the piston assembly.
- 5) Carefully remove and discard the Collar O-Ring from the bottom threads of the valve.

Note: An Unapproved 20lb system will also require the removal of the collar adapter (P/N 310306) in order to remove the collar O-Ring.

- 6) Thoroughly clean all valve surfaces and collar adapter if applicable. Verify the small hole in the Piston is clear of Dry Chemical.
 - 7) Reassemble the valve following these steps. Lightly lubricate each O-Ring with Parker O Lube before installing.
 - a) Carefully place P/N 300221 around the neck of the valve threads.
- Note: For an unapproved 20lb system, carefully place P/N 310306 around the neck of the Collar Adapter threads, then fasten the Collar Adapter (P/N 600052) to the valve.
- b) Carefully place P/N 300206 into the bottom of the piston assembly and install the washer and the bolt. NOTE: Do not lubricate the Seat Seal (P/N 300206).
 - c) Carefully place P/N 300203 into the slotted region of the piston assembly.
 - d) Carefully place the piston assembly back into the valve with the bolt facing down into the valve.
 - e) Carefully place P/N 300204 into the valve top then fasten the valve cap to the valve body.

Approved 5, 10, & 20 lb. Dry Chemical Rebuild Kit P/N: 300248		
Part Number	Quantity	Description
300204	1	Cap O-ring Med. ILP FM/UL
300203	1	Piston O-ring Med. ILP FM/UL
300206	1	Seat Seal Med. ILP FM/UL
300221	1	Collar O-ring Med. ILP FM/UL

Unapproved 20 lb. Dry Chemical Rebuild Kit P/N: 300250		
Part Number	Quantity	Description
300204	1	Cap O-ring Med. ILP FM/UL
300203	1	Piston O-ring Med. ILP FM/UL
300206	1	Seat Seal Med. ILP FM/UL
300221	1	Collar O-ring Med. ILP FM/UL
310306	1	O-ring, 20 LB Dry Chem

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TB009

11/27/2007

Firetrace Detection Tubing Compatibility

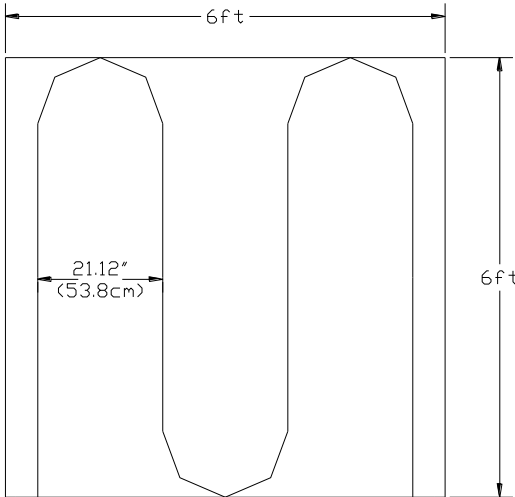
Results of chemical testing of Firetrace Detection Tubing undertaken by Oxford University.

<u>Solvent</u>	<u>Vapor</u>	<u>Liquid</u>
Ether	No Action	Loss of black type/slightly harder
THF	No Action	Loss of black type/slightly harder
Toluene	No Action	Slightly harder
Ethyl Acetate	No Action	No action
N-methylmorpholine	No Action	Loss of color
Petrol	No Action	No action
Acetone	No Action	No action
Methanol	No Action	No action
Dichloromethane	No Action	No action
Triethylamine	No Action	Loss of black type
Chloroform	No Action	No action
Pyridine	No Action	Slight loss of color
Acetyl Chloride	No Action	Slight attack
Sodium Hydroxide	No Action	No action
Dimethylformamide	No Action	Slight attack
Acetonitrile	No Action	Loss of black type
Butyl Ethyl Ether	No Action	Loss of shine on surface
Carbon Tetrachloride	No Action	Loss of black type
Benzene	No Action	No action
Benzyl Bromide	No Action	Pitted the plastic
T-butanol	No Action	No action
Trifluoroacetic Acid	Plastic Attacked	Soup
Formic Acid	No Action	Soup
Dimethyl Sulphoxide	No Action	Hardened Plastic
Acetic Anhydride	No Action	No action
Diglyme	No Action	No action
Trimethylsilyl Chloride	No Action	No action
Styrene	No Action	Hardened Plastic
Methyl Acrylate	No Action	Hardened Plastic
Diisopropylamine	No Action	Hardened Plastic
Nitric Acid (70%)	Eaten Away	Soup
Hydrochloric Acid (35%)	Eaten Away	Soup
Acetic Acid/Hydrogen Bromide	Eaten Away	Soup
Thionyl Chloride	Eaten Away	Not quite soup
Phosgene in Toluene	No Action	Slightly harder plastic
Ammonia (35% Aqueous)	No Action	No action
Hydrogen Peroxide	No Action	Plastic softened

*All chemicals were in contact with the tubing for five days (vapor and liquid)

Typical Tubing Placement

TUBING PLACED AT
3.28ft (1m) HIGH
INTERVALS



MAXIMUM AREA TUBING LAYOUT

Overhead View

Figure 28 – Tubing Placement Example



Figure 29 – Tubing Placement in CNC Cutting Area Example

Tamper Proof Instruction

- Tamper Proof Instructions
- Firetrace Detection Tube Compatibility

Tamper Proof (Disarmed) Instruction (P/N 201137)

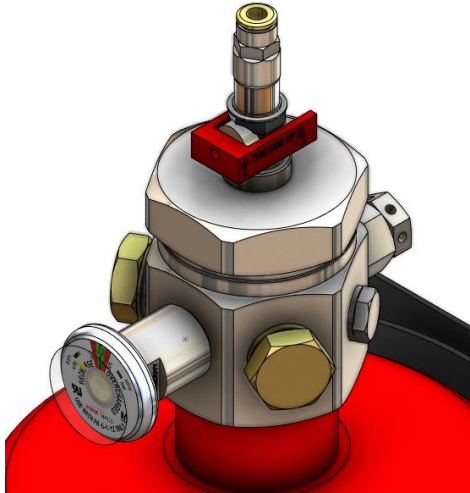


Figure 30 – Tamper Proof (Disarmed) Assembly

1. Verify that the ball lever is in the “OFF” position
2. Remove the lever
3. Install the sleeve (as pictured above)
4. Apply the plastic tie wrap and record the serial number stamped on the wrap.

Tamper Proof (Armed) Instruction (P/N 201132)

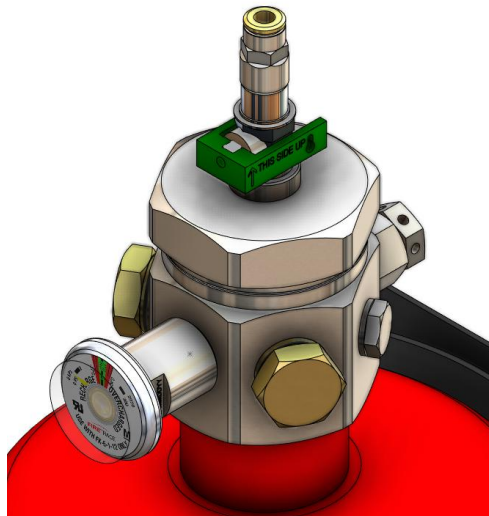


Figure 31 – Tamper Proof (Armed) Assembly

1. Verify that the ball lever is in the “ON” position
2. Remove the lever
3. Install the sleeve (as pictured above)
4. Apply the plastic tie wrap and record the serial number stamped on the wrap.

APPENDIX C

- SAFETY DATA SHEETS
- Class D Dry Powder
- Argon/Helium – 90:10

Class D Dry Powder SDS



Quality is Behind the Diamond®

SAFETY DATA SHEET

Section 1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: Super D Dry Powder Extinguisher
Other Identifiers: Class D Powder, Sodium Chloride
Product Code(s): CH 545, CH 557
Model Codes(s) on Extinguishers: 570, 680
Recommended Use: Fire extinguishant for metal fires
Not for human or animal drug use.

Manufacturer: AMEREX CORPORATION
Internet Address: www.amerex-fire.com
Address: 7595 Gadsden Highway, P.O. Box 81
Trussville, AL 35173-0081
Company Telephone: (205) 655-3271
E-mail Address: info@amerex-fire.com
Emergency Contacts: Chemtrec 1(800) 424-9300 or
(703) 527-3887
Revised: August 9, 2023; Revision B

Section 2. HAZARDS IDENTIFICATION

GHS – Classification

Hazard Class	Category	Signal Word
Aerosols	Category 3	Warning
Acute Toxicity	Category 5	Warning
Skin Corrosion/Irritation	Category 2	Warning
Serious eye damage/eye irritation	Category 2A	Warning
Acute Toxicity, Inhalation	Category 5	Warning

GHS – Label Symbol(s):



If Pressurized: Gas Under Pressure



GHS – Signal Word(s):

Warning

Other Hazards Not Resulting in Classification: Mica may contain small quantities of quartz (crystalline silica). Prolonged exposure to respirable crystalline silica dust at concentrations exceeding the occupational exposure limits may increase the risk of developing a disabling lung disease known as silicosis. IARC found limited evidence for pulmonary carcinogenicity of crystalline silica in humans. In the case of normal use of this product, exposure to silica should be nil.

The attapulgite clay used in this product has a fiber length of less than 5 µm; therefore, the clay is not considered to be carcinogenic to animals or humans.

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SUPER – D

SDS Part Number 27555

GHS – Hazard Phrases

GHS Hazard	GHS Code(s)	Code Phrase(s)
Physical	H229	*Pressurized container; may burst if heated.
Health	H303	May be harmful if swallowed.
	315	Causes skin irritation.
	319	Causes serious eye irritation.
	335	May cause respiratory irritation.
Environmental	None	
Precautionary:		
General	P101	If medical advice is needed, have product container or label at hand
Prevention	P210	*Keep away from heat, hot surface, sparks, open flames, and other ignition sources.
	251	*Do not pierce or burn, even after use.
	261	Avoid breathing dust.
	264	Wash hands and face thoroughly after handling.
	280	Wear protective gloves/protective clothing/eye protection/face protection.
Response	P319	Get medical help if you feel unwell.
	321	Specific treatment (see Section 4. First Aid Measures).
	340	Remove person to fresh air and keep comfortable for breathing.
	362	Take off contaminated clothing.
	301+317	IF SWALLOWED: Get medical help.
	302+352	IF ON SKIN: wash with plenty of water
	304+317	IF INHALED: Get medical help.
	305+351+338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do – continue rinsing.
	332+317	If skin irritation occurs: Get medical help.
	362+364	Take off contaminated clothing and wash it before reuse.
Storage	403+233	Store in a well-ventilated place. Keep container tightly closed.
	410+403	*Protect from sunlight. Store in well-ventilated place.
Disposal	P501	Dispose of contents through a licensed disposal company. Contaminated container should be disposed as unused product.

*- Fire extinguishers are designed to be used to extinguish fires.

Section 3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	EC No.	REACH Reg. No.	CAS-No.	Weight %
Sodium chloride evaporated flour grade	231-598-3	Not Available	7647-14-5	75-90
Attapulgate clay	601-805-5	Not Available	12174-11-7	3-6
Mica-potassium aluminum silicate	310-127-6	Not Available	12001-26-2	3-5
Zeolite, synthetic amorphous precipitated silica	215-283-8	Not Available	1318-02-1	1.5-3
Silica, amorphous, fumed	601-216-3	Not Available	112945-52-5	<2
Magnesium stearate octadecanoic acid, Mg salt	209-150-3	Not Available	557-04-0	<1

Emergency overview:

Light purple, fine solid powder, odorless.

Adverse health effects and symptoms:

May be an irritant to the respiratory system; irritant to the skin and eyes. Symptoms may include coughing, shortness of breath, and irritation of the lungs, eyes, and skin. Ingestion, although unlikely, may cause gastric distress.

Section 4. FIRST AID MEASURES

Eye Exposure:	Causes irritation. Irrigate eyes with water and repeat until pain free. Seek medical attention if irritation persists, or if vision changes occur.
Skin Exposure:	Causes skin irritation. In case of contact, rinse with plenty of water. Seek medical attention if irritation persists.
Inhalation:	May cause irritation, along with coughing. If respiratory irritation or distress occurs remove victim to fresh air. Seek medical attention if irritation persists.
Ingestion:	Overdose symptoms may include nausea, vomiting, diarrhea, and abdominal cramps may result from excessive salt consumption. Profuse water loss can cause unusually high blood sodium levels ('hyponatremia') with symptoms such as dizziness, low blood pressure, and reduced urine production. Serious cases may result in swelling (edema), heightened blood pressure, increased heart rate, breathing trouble, convulsions, coma, and death. If victim is conscious and alert, give plenty of water to drink and do not induce vomiting. Seek immediate medical attention if overdose symptoms appear. Do not leave victim unattended. To prevent aspiration of swallowed product, lay victim on side with head lower than waist.
Medical conditions possibly aggravated by exposure:	Kidney conditions, hypertension.

Section 5. FIRE-FIGHTING MEASURES

Flammable Properties:	Not flammable
Flash Point:	Not determined
Suitable Extinguishing Media:	Extinguishing measures suitable to local circumstances and the surrounding environment
Hazardous Combustion Products:	Toxic fumes of hydrochloric acid, sodium oxide, silicone oxide.
<u>Explosion Data:</u>	
Sensitivity to Mechanical Impact:	Not sensitive
Sensitivity to Static Discharge:	Not sensitive
Unusual fire/explosion hazards:	None known.
Protective Equipment and Precautions for Firefighters:	As in any fire, wear self-contained breathing apparatus pressure-demand. NIOSH (approved or equivalent) and full protective gear.

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SUPER – D

SDS Part Number 27555

Section 6. ACCIDENTAL RELEASE MEASURES

Personal Precautions:	Avoid contact with skin, eyes, and clothing.
Personal Protective Equipment:	Minimum - safety glasses, gloves, and a dust respirator.
Emergency Procedures:	NA
Methods for Containment:	Prevent further leakage or spillage if safe to do so.
Methods for Clean Up:	Avoid dust formation. Clean up released material using vacuum or wet sweep and shovel to minimize generation of dust. Bag and transfer to properly labeled containers. Ventilate area and wash spill site after material pickup is complete.
Environmental Precautions:	Prevent material from entering waterways.
Other:	If product is contaminated, use PPE and containment appropriate to the nature of the most toxic chemical/material in the mixture.

Section 7. HANDLING AND STORAGE

Personal Precautions:	Use appropriate PPE when handling or maintaining equipment, and wash thoroughly after handling (see Section 8).
Conditions for Safe Storage:	Keep product in original container or extinguisher. Contents may be under pressure – inspect extinguisher consistent with product labeling to ensure container integrity.
Incompatible Products:	Strong oxidizers. Reactive with metals, acids.
Hazardous Decomposition Products:	Toxic fumes of hydrochloric acid, sodium oxide, silicone oxide.
Hazardous Polymerization:	Will not occur.

Section 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Chemical Name	OSHA PEL	ACGIH TLV	DFG MAK *	EU BLV
Sodium chloride	PNOC** Total dust, 15 mg/m ³ Respirable fraction, 5 mg/m ³	PNOC Total dust, 10 mg/m ³ Respirable fraction, 3 mg/m ³	PNOC Total dust, 4 mg/m ³ Respirable fraction, 1.5 mg/m ³	NA
Attapulgite Clay	PNOC** Total dust, 15 mg/m ³ Respirable fraction, 5 mg/m ³	PNOC Total dust, 10 mg/m ³ Respirable fraction, 3 mg/m ³	PNOC Total dust, 4 mg/m ³ Respirable fraction, 1.5 mg/m ³	NA
Mica	PNOC Total dust, 15 mg/m ³ Respirable fraction, 5 mg/m ³	PNOC Total dust, 10 mg/m ³ Respirable fraction, 3 mg/m ³	PNOC Total dust, 4 mg/m ³ Respirable fraction, 1.5 mg/m ³	NA
Zeolite	80 mg/m ³ % SiO ₂	10 mg/m ³	4 mg/m ³	NA
Silica	PNOC Total dust, 15 mg/m ³ Respirable fraction, 5 mg/m ³	PNOC Total dust, 10 mg/m ³ Respirable fraction, 3 mg/m ³	PNOC Total dust, 4 mg/m ³ Respirable fraction, 1.5 mg/m ³	NA
Magnesium stearate octadecanoic acid, Mg salt	PNOC** Total dust, 15 mg/m ³ Respirable fraction, 5 mg/m ³	PNOC Total dust, 10 mg/m ³ Respirable fraction, 3 mg/m ³	PNOC Total dust, 4 mg/m ³ Respirable fraction, 1.5 mg/m ³	NA

*German regulatory limits **PNOC = Particulates not otherwise classified (ACGIH) also known as Particulates not otherwise regulated (OSHA) *** NR = Not Regulated. All values are 8 hour time weighted average concentrations.

Engineering Controls:

Showers
Eyewash stations
Ventilation systems

Personal Protective Equipment – PPE Code E:

The need for respiratory protection is not probable during short-term exposure. PPE use during production process must be independently evaluated.



Eye/Face Protection:

Wear tightly fitting safety goggles. Contact lens may absorb and concentrate irritants; if this problem occurs, a workplace policy should be determined.

Skin and Body Protection:

Wear protective coveralls, rubber boots, PVC gloves. Use barrier cream and skin cleaning cream if concentrations are high enough to cause mild irritation.

Respiratory Protection:

If exposure limits are exceeded or irritation is experienced, NIOSH approved respiratory protection should be worn. Use P100 respirators for limited exposure, use air-purifying respirator (APR) with high efficiency particulate air (HEPA) filters for prolonged exposure. Positive-pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current safety and health requirements. The need for respiratory protection is not likely for short-term use in well-ventilated areas.

Hygiene Measures:

Good personal hygiene practice is essential, such as avoiding food, tobacco products, or other hand-to-mouth contact when handling. Wash thoroughly after handling.

Section 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Fine crystals, off-white
Molecular Weight:	NACL: 58.44 g/mol; Zeolite: 162 g/mol
Odor:	None
Odor Threshold:	No information available (NIA)
Decomposition Temperature °C:	NIA
Freezing Point °C:	NIA
Initial Boiling Point °C:	NACL: 100 at 750mm Hg; Zeolite: NIA
Physical State:	Crystalline Powder
pH:	NACL: Approximately 6.7 – 7.3 for a 10% solution; Zeolite: 1.2 – 1.3
Flash Point °C:	NACL: 1413; Zeolite: NIA
Autoignition Temperature °C:	NIA
Boiling Point/Range °C:	NACL: 100 at 750mm Hg; Zeolite: NIA
Melting Point/Range °C:	NACL: 801; Zeolite: > 500
Flammable:	Not Flammable
Flammability Limits in Air °C:	Upper: None; Lower: None
Explosive Properties:	None
Oxidizing Properties:	None
Volatile Component (%vol)	NIA
Evaporation Rate:	NIA
Vapor Density:	Not Applicable
Vapor Pressure:	NACL: 1 mm Hg at 865 °C; Zeolite: NIA
Specific gravity:	NACL: Approximately 2.17 at 25 °C; Zeolite: 2.3 – 2.7
Solubility:	Miscible
Partition Coefficient:	NIA
Viscosity:	Not Applicable

NOTE: NACL-Sodium Chloride; NIA – No Information available

Section 10. STABILITY AND REACTIVITY

Stability:	Stable under recommended storage and handling conditions.
Reactivity:	Generally unreactive.
Incompatibles:	Strong oxidizers.
Conditions to Avoid:	Storage or handling near incompatibles.
Hazardous Decomposition Products:	Heat of fire may release toxic fumes of hydrochloric acid, sodium oxide, silicone oxide.
Possibility of Hazardous Reactions:	None
Hazardous Polymerization	Does not occur.

Section 11. TOXICOLOGICAL INFORMATION

Likely Routes of Exposure:	Inhalation, skin and eye contact. Ingestion
Immediate:	Symptoms:
Inhalation:	Irritation, coughing.
Eyes:	Irritation.
Skin:	Irritation.
Ingestion:	May cause irritation of gastrointestinal tract.
Delayed:	Symptoms may be delayed
Chronic Toxicity:	Acute Toxicity: Slightly toxic.
Short-term Exposure:	None known.
Long-term Exposure:	As with all dusts, pneumoconiosis, or "dusty lung" disease, may result from chronic exposure.

Acute Toxicity Values - Health

Chemical Name	LD50		LC50 (Inhalation)
	Oral	Dermal	
Sodium chloride	3000 mg/kg (rat); (TDL human 12357 mg/kg/23d)	10000 mg/kg (rabbit)	None
Attapulgite clay	None	None	None
Mica	None	None	None
Zeolite	None	None	None
Silica	None	None	None
Magnesium stearate octadecanoic acid, Mg salt	None	None	None

Reproductive Toxicity:	This product's ingredients are not known to have reproductive or teratogenic effects.
Target Organs and Effects (TOST):	Respiratory system (mild irritant). This product is an irritant to epithelial tissue, (eyes, mucous membranes, skin) and may aggravate dermatitis. No information was found indicating the product causes sensitization. May be a kidney toxicant at high doses. May cause pulmonary edema and respiratory arrest at very high doses.

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Other Toxicity Categories

Chemical Name	Germ Cell Mutagenicity	Carcinogenicity	Reproductive	TOST Single Exp	TOST Repeated Exp	Aspiration
Sodium chloride	None	None	None	None	None	None
Attapulgite clay	None	None	None	None	Kidney	None
Mica						
Zeolite	None	None	None	None	None	None
Silica	None	None	None	None	None	None
Magnesium stearate octadecanoic acid, Mg salt	None	None	None	None	None	None

Section 12. ECOLOGICAL INFORMATION

Ecotoxicity:	Can be toxic in high concentrations.
Persistence/Degradability:	Degrades rapidly to chloride ion in wet environments, but the chloride ion is very persistent.
Probability of rapid biodegradation:	Est: 0.731(Rapid)
Anaerobic biodegradation probability:	Est: 0.836 (Rapid)
Bioaccumulation potential:	Low.
Bioconcentration factor:	3.16 L/kg
Bioaccumulation Potential:	Low. CT50 (days): LogP<3
Mobility in soil:	Log Koc: Est: 0.400
Log Koa:	Not applicable
Log Kaw:	Not applicable
Atmospheric oxidation half-life:	20.6 days
Level III Fugacity Model:	No information
<u>Other Adverse Ecological Effects:</u>	No other known effects at this time

Aquatic Toxicity Values – Environment

Chemical Name	Acute (LC50)	Chronic (LC50)
Sodium chloride	9,498 (96h)-Rainbow Trout	Cat IV; 1300 mg/l (rainbow trout), 670 mg/l (water flea)
Attapulgite clay	N/A	N/A
Mica	N/A	N/A
Zeolite		
Silica	N/A	N/A
Magnesium stearate octadecanoic acid, Mg salt	N/A	N/A

Aquatic Toxicity Values – Calculated Estimates

Chemical Name	Acute (LC50)	EC50
Sodium chloride	597 mg/l Fish 96hr 296 mg/l Daphnia 48 hr	597 mg/l Gr Algae 96hr
Attapulgite clay	N/A	N/A
Mica	N/A	N/A
Zeolite		
Silica	N/A	N/A
Magnesium stearate octadecanoic acid, Mg salt	N/A	N/A

Section 13. DISPOSAL CONSIDERATIONS

Safe Handling	Keep formation of airborne dust to a minimum. Avoid breathing dust. Avoid contact with eyes, skin and clothing. Use only with adequate ventilation. Use appropriate PPE when handling, and wash thoroughly after handling (see Section 8).
Waste Disposal Considerations	Dispose in accordance with federal, state, and local regulations.
Contaminated Packaging	Dispose in accordance with federal, state, and local regulations.

NOTES:

This product is not a RCRA characteristically hazardous or listed hazardous waste. Dispose of according to state or local laws, which may be more restrictive than federal laws or regulations. Used product may be altered or contaminated, creating different disposal considerations.

Section 14. TRANSPORT INFORMATION

UN Number:	NA
UN Proper Shipping Name:	NA
Transport Hazard Class:	NA
Packing Group:	NA
Marine Pollutant?:	NA

See current applicable transport regulation (Dot - Ground, IATA - Air, IMDG - Maritime) prior to shipping.

The transportation information above covers the Super D Dry Powder extinguisher agent as shipped in bulk containers and not when contained in fire extinguishers or fire extinguisher systems. If shipped in a stored pressure-type fire extinguisher, and pressurized with a non-flammable, non-toxic inert expellant gas, the fire extinguisher is considered a hazardous material by the US Department of Transportation and Transport Canada. The proper shipping name shall be FIRE EXTINGUISHER and the UN designation is UN 1044. The DOT hazard class/division is LIMITED QUANTITY when pressurized to less than 241 psig and when shipped via highway or rail. UN Class 2.2. Non-Flammable Gas, when shipping via air. Packing Group – N/A

Section 15. REGULATORY INFORMATION

International Inventory Status: Sodium chloride is on the following inventories:

Country(ies)	Agency	Status
United States of America	TSCA	Yes
Canada	DSL	Yes
Europe	EINECS/ELINCS	Yes
Australia	AICS	Yes
Japan	MITI	Yes
South Korea	KECL	Yes

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REACH Title VII Restrictions: No information available

Chemical Name	Dangerous Substances	Organic Solvents	Harmful Substances Whose Names Are to be Indicated on Label	Pollution Release and Transfer Registry (Class II)	Pollution Release and Transfer Registry (Class I)	Poison and Deleterious Substances Control Law
Sodium Chloride	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

Component	ISHA – Harmful Substances Prohibited for Manufacturing, Importing, Transferring, or Supplying	ISHA – Harmful Substances Requiring Permission	Toxic Chemical Classification Listing (TCCL) – Toxic Chemicals	Toxic Release Inventory (TRI) – Group I	Toxic Release Inventory (TRI) – Group II
Sodium chloride	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Attapulgitte clay	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Mica	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Zeolite	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Silica	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Magnesium stearate octadecanoic acid, Mg salt	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

European Risk and Safety phrases:

EU Classification: XN Irritant
 R Phrases: 20 Harmful by inhalation.
 36/37 Irritating to eyes, respiratory system.
 S Phrases: 22 Do not breath dust.
 24/25 Avoid contact with skin and eyes
 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
 36 Wear suitable protective clothing.

U.S. Federal Regulatory Information:

SARA 313:

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) - This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

None of the chemicals in this product are under SARA reporting requirements or have SARA threshold planning quantities (TPQs) or CERCLA reportable quantities (RQs), or are regulated under TSCA 8(d).

SARA 311/312 Hazard Categories:

Acute Health Hazard Yes
 Chronic Health Hazard No
 Fire Hazard No
 *Sudden Release of Pressure Hazard Yes
 Reactive Hazard No
 * - Only applicable if material is in a pressurized extinguisher.

Clean Water/Clean Air Acts:

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42) or Clean Air Act, Section 112 Hazardous Air Pollutants (HAPs) (see 40 CFR 61) and Section 112 of the Clean Air Act Amendments of 1990.

U.S. State Regulatory Information:

Chemicals in this product are covered under specific State regulations, as denoted below:

- Alaska** - Designated Toxic and Hazardous Substances: None
- California** – Permissible Exposure Limits for Chemical Contaminants: None
- Florida** – Substance List: Mica Dust
- Illinois** – Toxic Substance List: None
- Kansas** – Section 302/303 List: None
- Massachusetts** – Substance List: Mica Dust
- Minnesota** – List of Hazardous Substances: None
- Missouri** – Employer Information/Toxic Substance List: None
- New Jersey** – Right to Know Hazardous Substance List: None
- North Dakota** – List of Hazardous Chemicals, Reportable Quantities: None
- Pennsylvania** – Hazardous Substance List: None
- Rhode Island** – Hazardous Substance List: Mica Dust
- Texas** – Hazardous Substance List: No
- West Virginia** – Hazardous Substance List: None
- Wisconsin** – Toxic and Hazardous Substances: None

California Proposition 65: No component is listed on the California Proposition 65 list.

Other:

Canada – WHMIS Hazard Class No component listed.

Section 16. OTHER INFORMATION

This SDS conforms to requirements under U.S., U.K., Canadian, Australian, and EU regulations or standards, and conforms to the proposed 2003 ANSI Z400.1 format.

Issuing Date	17-June-2012
Revision Date	9-August-2023; Revision B
Revision Notes	None

The information herein is given in good faith but no warranty, expressed or implied, is made.

Propellant SDS



Safety Data Sheet

Argon Helium

Allied Gases & Welding Supplies, Inc.
945 E. Curry Rd.
Tempe, AZ 85281
(480) 894-6000
alliedgases.com

Section 1: Product and Company Identification

Allied Gases & Welding Supplies, Inc.
945 E. Curry Rd.
Tempe, AZ 85281
(480) 894-6000
alliedgases.com

Product Code: Argon Helium

Synonyms:

Recommended Use:

Usage Restrictions:

SDS Number: 9005

Section 2: Hazards Identification



Warning

Hazard Classification:
Gases Under Pressure

Hazard Statements:
Contains gas under pressure; may explode if heated

Precautionary Statements

Storage:
Protect from sunlight.
Store in well-ventilated place.

Section 3: Composition/Information on Ingredients

	CAS #	Concentration
Argon	7440-37-1	0-99%

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Helium	7440-59-7	0-99%
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	Chemical Substance	Chemical Family	Trade Names
Argon	ARGON, COMPRESSED	non-metallic	ARGON; UN 1006; AR
Helium	HELIUM	inorganic, gas	HELIUM GAS; HELIUM COMPRESSED; HELIUM-4; ATOMIC HELIUM; UN 1046; He

Section 4: First Aid Measures

	Skin Contact	Eye Contact	Ingestion	Inhalation	Note to Physicians
Argon	Not applicable route of exposure	Flush eyes with plenty of water.	Not applicable route of exposure	If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.	For inhalation, consider oxygen.
Helium	Wash exposed skin with soap and water.	Flush eyes with plenty of water.	If a large amount is swallowed, get medical attention.	If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.	For inhalation, consider oxygen.

Section 5: Fire Fighting Measures

	Suitable Extinguishing Media	Products of Combustion	Protection of Firefighters
Argon	Non-flammable gas	Not applicable	<ul style="list-style-type: none"> ▪ N/A ▪ N/A
Helium	Non-flammable. Use suitable extinguishing media for surrounding fire.	Non-flammable	<ul style="list-style-type: none"> ▪ Non-flammable ▪ Non-flammable

Section 6: Accidental Release Measures

	Personal Precautions	Environmental Precautions	Methods for Containment
Argon	Keep unnecessary people away, isolate hazard area and deny entry. Stay upwind and keep out of low areas.	None known.	Stop leak if possible without personal risk.
Helium	Keep unnecessary people away, isolate hazard area and deny entry. Stay upwind and keep out of low areas.	Avoid soil, waterways, drains and sewers	Stop leak if possible without personal risk.

	Methods for Cleanup	Other Information
Argon	Leaks may be detected by a soapy-water solution.	
Helium	Stop leak, evacuate area. Contact emergency personnel.	None

Section 7: Handling and Storage

	Handling	Storage
Argon	Store and handle in accordance with all current regulations and standards. Subject to storage regulations: U.S. OSHA 29 CFR 1910.101. Keep separated from incompatible substances.	Avoid using in confined spaces.
Helium	Store and handle in accordance with all current regulations and standards. Subject to storage regulations: U.S. OSHA 29 CFR 1910.101.	Keep separated from incompatible substances.

Section 8: Exposure Controls/Personal Protection

Exposure Guidelines

Exposure Guidelines	
Argon	ARGON, COMPRESSED: ARGON: ACGIH (simple asphyxiant)
Helium	HELIUM: ACGIH (simple asphyxiant)

Engineering Controls

Handle only in fully enclosed systems.

	Eye Protection	Skin Protection	Respiratory Protection
Argon	Eye protection not required, but recommended.	Protective clothing is not required.	N/A
Helium	Eye protection not required, but recommended.	Protective clothing is not required.	Non-flammable

General Hygiene considerations

- Avoid breathing vapor or mist
- Avoid contact with eyes and skin
- Wash thoroughly after handling and before eating or drinking

Section 9: Physical and Chemical Properties

	Physical State	Appearance	Color	Change in Appearance	Physical Form	Odor	Taste
Argon	Gas	Colorless	Colorless	N/A	Gas	Odorless	Tasteless
Helium	Gas	Colorless	Colorless	N/A	Gas	Odorless	Tasteless

	Flash Point	Flammability	Partition Coefficient	Autoignition Temperature	Upper Explosive Limits	Lower Explosive Limits
Argon	Not flammable			Nonflammable	Nonflammable	Nonflammable
Helium	Not flammable	Not available	Not available	Nonflammable	Nonflammable	Nonflammable

	Boiling Point	Freezing Point	Vapor Pressure	Vapor Density	Specific Gravity	Water Solubility	pH	Odor Threshold	Evaporation Rate	Viscosity
Argon	-303 F (-186 C)	-308 F (-189 C)	500 mmHg @ -190 C	1.38 (Air=1)	Not applicable	3.36% @ 20 C	Not applicable	Not available	Not applicable	0.0225 cP @ 25 C
Helium	-452 F (-269 C)	-458 F (-272 C) @ 26 atm	1719 mmHg @ -268 C	0.138 (Air=1)	Not applicable	0.94% @ 0 C	Not applicable	Not available	Not applicable	0.02012 cP @ 26.8 C

	Molecular Weight	Molecular Formula	Density	Weight per Gallon	Volatility by Volume	Volatility	Solvent Solubility
Argon	39.948	AR	1.784 g/L @ 0 C	Not available	100%	Not applicable	Soluble: Organic solvents
Helium	4.0026	He	0.1785 g/L @ 0 C	Not available	100%	Not applicable	Insoluble: Not available

Section 10: Stability and Reactivity

	Stability	Conditions to Avoid	Incompatible Materials
Argon	Stable at normal temperatures and pressure.	Stable at normal temperatures and pressure.	No data available.
Helium	Stable at normal temperatures and pressure.	Stable at normal temperatures and pressure.	No data available.

	Hazardous Decomposition Products	Possibility of Hazardous Reactions
Argon	No data available.	Will not polymerize.
Helium	Miscellaneous decomposition products	Will not polymerize.

Section 11: Toxicology Information

Acute Effects

	Oral LD50	Dermal LD50	Inhalation
Argon	Not established	Not established	Nausea, vomiting, difficulty breathing, irregular heartbeat, headache, dizziness, disorientation, mood swings, tingling sensation, loss of coordination, suffocation, convulsions, unconsciousness, coma
Helium	Not available	Not available	Nausea, vomiting, difficulty breathing, irregular heartbeat, headache, fatigue, dizziness, disorientation, emotional disturbances, tingling sensation, loss of coordination, suffocation, convulsions, unconsciousness, coma

	Eye Irritation	Skin Irritation	Sensitization
Argon	No information on significant adverse effects	No information on significant adverse effects	Difficulty breathing
Helium	Liquid: frostbite, blurred vision	Liquid: frostbite	Difficulty breathing

Chronic Effects

	Carcinogenicity	Mutagenicity	Reproductive Effects	Developmental Effects
Argon	Not established	Not established	Not established	No data
Helium	Not available	Not available	Not available	No data

Section 12: Ecological Information

Fate and Transport

	Eco toxicity	Persistence / Degradability	Bioaccumulation / Accumulation	Mobility in Environment
Argon	Fish toxicity: Not available Invertebrate toxicity: Not available Algal toxicity: Not available Phyto toxicity: Not available Other toxicity: Not available	Not available	Not available	Not available
Helium	Fish toxicity: Not available Invertebrate toxicity: Not available Algal toxicity: Not available Phyto toxicity: Not available Other toxicity: Not available	Not available	Not available	Not available

Section 13: Disposal Considerations

Argon	Dispose in accordance with all applicable regulations.
Helium	Dispose in accordance with all applicable regulations.

Section 14: Transportation Information

U.S. DOT 49 CFR 172.101

DOT Information For This Mixture

Shipping Name	Compressed gas, n.o.s.
UN Number	UN1956
Hazard Class	2.2
Hazard Information	Non-Flammable Gas

Individual Component Information

	Proper Shipping Name	ID Number	Hazard Class or Division	Packing Group	Labeling Requirements	Passenger Aircraft or Railcar Quantity Limitations	Cargo Aircraft Only Quantity Limitations	Additional Shipping Description

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	Proper Shipping Name	ID Number	Hazard Class or Division	Packing Group	Labeling Requirements	Passenger Aircraft or Railcar Quantity Limitations	Cargo Aircraft Only Quantity Limitations	Additional Shipping Description
Argon	Argon, compressed	UN1006	2.2	Not applicable	2.2	75 kg or L	150 kg	N/A
Helium	Helium, compressed	UN1046	2.2	Not applicable	2.2	75 kg or L	150 kg	N/A

Canadian Transportation of Dangerous Goods

	Shipping Name	UN Number	Class	Packing Group / Risk Group
Argon	Argon, compressed	UN1006	2.2	Not applicable
Helium	Helium, compressed	UN1046	2.2	Not applicable

Section 15: Regulatory Information

U.S. Regulations

	CERCLA Sections	SARA 355.30	SARA 355.40
Argon	Not regulated.	Not regulated.	Not regulated.
Helium	Not regulated.	Not regulated.	Not regulated.

SARA 370.21

	Acute	Chronic	Fire	Reactive	Sudden Release
Argon	Yes	No	No	No	Yes
Helium	Yes	No	No	No	Yes

SARA 372.65

Argon	Not regulated.
Helium	Not regulated.

OSHA Process Safety

Argon	Not regulated.
Helium	Not regulated.

State Regulations

	CA Proposition 65
Argon	Not regulated.
Helium	Not regulated.

Canadian Regulations

	WHMIS Classification
Argon	A
Helium	A

National Inventory Status

	US Inventory (TSCA)	TSCA 12b Export Notification	Canada Inventory (DSL/NDSL)
Argon	Listed on inventory.	Not listed.	Listed on inventory.
Helium	Listed on inventory.	Not listed.	Not determined.

Section 16: Other Information

	NFPA Rating
Argon	HEALTH=0 FIRE=0 REACTIVITY=0
Helium	HEALTH=0 FIRE=0 REACTIVITY=0

0 = minimal hazard, 1 = slight hazard, 2 = moderate hazard, 3 = severe hazard, 4 = extreme hazard