3M™ Novec 1230™

Model NFG & NFD Fire Suppression Systems

Installation Instructions
Owner's Manual

This manual is an integral part of the system approval and the suppression system must be installed and maintained in accordance with all listed requirements.

U.S. Coast Guard approved
162.029/248/0

FM approved
3040508

Read and comply with these instructions, warnings and limitations before installing.

Suitable for use on:

NFG 25-200 Models:	20°F (-7°C) to 130°F (54°C)
NFD 225-825Models:	20°F (-7°C) to 130°F (54°C)
NFD 850-1800 Models:	32°F (0°C) to 130°F (54°C)

Always maintain this owner's manual
nearby for operator reference.

Owner's Manual PN: 123-330, Revision B
Printed in the USA

WARNING

CONCENTRATED AGENT AND BY-PRODUCT OF APPLICATION TO FIRE ARE TOXIC. AVOID BREATHING OF FUMES OR PROLONGED EXPOSURE. ACCIDENTAL DISCHARGE DURING HANDLING OR INSTALLATION MAY CAUSE SERIOUS INJURY. BEFORE ATTEMPTING TO INSTALL THIS DEVICE, READ AND COMPLY WITH INSTRUCTIONS, WARNINGS, AND LIMITATIONS CONTAINED IN THIS MANUAL. DO NOT LIFT, CARRY OR HANDLE BY SENSOR VALVE / DETECTOR. THE SENSOR / VALVE DETECTOR IS VISUALLY DESCRIBED IN FIGURE 8 OF THIS MANUAL. DO NOT DROP. KEEP AWAY FROM HEAT. KEEP AWAY FROM CHILDREN.
A MATERIAL SAFETY DATA SHEET (MSDS) IS INCLUDED IN THIS MANUAL.

WARNING

PRIOR TO PERFORMING MAINTENANCE WITHIN THE PROTECTED COMPARTMENT, ALWAYS INSTALL THE SAFETY PIN INTO THE SUPPRESSION SYSTEM TRIGGER ASSEMBLY TO AVOID ACCIDENTAL DISCHARGE. UPON COMPLETION OF MAINTENANCE, REMOVE THE SAFETY PIN FROM TRIGGER ASSEMBLY, AND STORE THE SAFETY PIN IN THE HOLE OF THE RELEASE BRACKET BEHIND THE ACTUATOR LEVER AS A BACK-STOP IN FARTHEST HOLE FROM CABLE/HOOK ASSEMBLY.

Installation Manuals currently available in English, German, Italian, and Spanish. Other languages available from your local distributor.

Installation Handbücher momentan verfügbar auf Englisch, Deutsch, Italiener, und Spanisch. Andere Sprachen, die verfügbar sind von Ihrem örtlichen Verteiler.

Manuales de la instalación actualmente disponible en inglés, alemán, italiano, y español. Otros idiomas disponibles de su distribuidor local.

Manuali di installazione attualmente disponibile in inglese, tedesco, italiano e spagnolo. Le altre lingue disponibili dal suo distributore locale

Index

Application

Novec 1230™ (1,1,1,2,2,4,5,5,5-NONAFLUORO-4-(Trifluoromethyl)-3- Pentanone), the extinguishing agent used in all Sea-Fire "NFG" and "NFD" series fire suppression systems, is a suitable EPA accepted alternate replacement for Halon. Novec is an electrically nonconductive and residue free extinguishing agent that requires no cleanup. Novec 1230™ is also referred to as FK-5-1-2 (dodecaflouro-2-methylpentan-3-one), a fluoroketone,

These features and the versatility of design make the "NFG" and "NFD" series fire suppression system models ideal for a broad range of applications. These applications would include marine, commercial and industrial use where electrical or flammable liquids are the likely source of fire.

Sea-Fire "NFG" and "NFD" series have passed a rigid testing program and carry Factory Mutual (FM Global) and United States Coast Guard (USCG) approvals for fire suppression applications in marine pleasure craft, un-inspected vessels, and Subchapter "T" inspected vessels, subject to the approval of the local Officer in Charge, Marine Inspection (OCMI). This would include many applications such as **unoccupied** engine and generator rooms, electrical compartments, paint and flammable storage lockers.

Limitations

Sea-Fire "NFG" and "NFD" model series Novec automatic fire suppression systems are designed and tested to extinguish Class B (flammable liquid) fires in enclosed compartments only.

The protected space (enclosure) limitations are:
Minimum Height: 2 Feet (.6 m) **Maximum Height**: 14 FT (4.3m) **Maximum Width**: 32 FT (9.75m)

Any openings (doors or hatches) will allow discharging agent to escape and will seriously affect the ability of agent to extinguish the fire.

Sea-Fire "NFG" and "NFD" suppression systems are designed to induce a minimum atmospheric concentration of 5.85 percent within the protected compartment. This is equivalent to a 30% safety factor on a 4.5% Minimum Extinguishing Concentration (MEC). In addition to gasoline and diesel fuel, other flammable liquids with MEC values equal to or below 4.5% for Novec 1230™ may be protected by Sea-Fire "NFG" and "NFD" systems.

The specification tables in this manual list the minimum and maximum approved compartment volume (size) allowable for each model (per NFPA 2001, UL 2166, FM 5600*). Volume can be determined by multiplying the compartment's **length x width x height which equals the volume in cubic feet or meters (LxWxH=V).**

*NFPA 2001: Standard on Clean Agent Fire Extinguishing Systems; UL 2166: Halocarbon Clean Agent Extinguishing System Units; FM 5600: Approval Standard for Clean Agent Extinguishing Systems

Models described in this manual are stock available in 25 Cubic Feet (0.7 Cubic meters) intervals. Systems are available in 1 Cubic Feet (0.03 Cubic meters) intervals if desired. Exact calculations and/or measurements of the protected space should be accomplished if ordering these models. The Specification Table shows the area of protection range available for ordering within each basic model. For simplicity, throughout this manual, only the stock sizes will be noted.

NFG and NFD systems are designed for only one cylinder (single nozzle) to protect the entire space. Using two cylinders to achieve combined coverage is not acceptable.

CAUTION: NEVER INSTALL A UNIT WITH A VOLUME RATING LESS THEN THE GROSS VOLUME OF THE COMPARTMENT TO BE PROTECTED. DO NOT DEDUCT FOR ENGINES, REMOVABLE TANKS OR OTHER EQUIPMENT.

Exception: If the boat manufacturer has placed a permanently affixed label in the engine compartment specifying the gross volume less the volume of permanently installed tankage, then this volume may be used to determine the proper size suppression system. Check the specification table for proper application before making installation.

Sea-Fire Marine offers all models compliant to applicable European Directives. Systems will be shipped as requested. For orders requested compliant to CE directives, a Declaration of Conformance (DOC) shall be included.

System Operations

Sea-Fire units described in this manual are automatically actuated by a temperature sensitive UL listed glass bulb tested in accordance with UL 199. These bulbs are manufactured and tested to be activated at a minimum temperature of approximately 175°F (79°C) when immersed in a liquid bath or approximately 220°F (104°C) when tested using an air bath. The actual activation temperature of the bulb in a fire scenario is influenced by numerous factors including air velocity, rate of temperature rise, air flow, location, etc. The discharge temperature ranges (approximate) are shown in the specification table, pages 20 – 21, and on the label attached to each unit.
These systems have been tested to United States Coast Guard (USCG), UL 2166 and FM 5600 requirements for Automatic Extinguisher Unit Automatic Operation Fire Tests.

* UL 199: Standard for Safety of Automatic Sprinklers for Fire Protection Service.

Discharge Temperature Ranges (approximate):
NFG 25 – 75: 200 - 250°F (93 - 121 °C)
NFG 100 – 200: 175 - 225°F (79 – 107°C) NFD 225 – 1800: 175 - 225°F (79 - 107°C)

CAUTION: IN CASE OF SUPPRESSION SYSTEM DISCHARGE, DO NOT RUSH TO OPEN THE PROTECTED COMPARTMENT. THE PROTECTED SPACE MUST BE KEPT CLOSED FOR AT LEAST 15 MINUTES TO ALLOW THE FIRE TO BE EXTINGUISHED AND SURFACES COOLED SUFFICIENTLY TO PREVENT REFLASH. STOP BLOWERS AND SECURE HATCHES. HAVE A PORTABLE EXTINGUISHER AVAILABLE AND USE CARE WHEN OPENING COMPARTMENT.

Avoid breathing fire related fumes or vapor.

Note: It is important to retain the designed vapor concentration within the compartment to insure complete fire outage. Upon discharge, engines(s) and all powered ventilation (blowers) must be shut down.

Supervisory Pressure Switch

Sea-Fire "NFG" and "NFD" series suppression systems are equipped with a factory installed pressure switch which is intended for cylinder pressure monitoring and supervision and may also be used to control other electrical functions (engine shutdown, air exchange equipment etc.).

When using the pressure switch as an electrical disconnect for any equipment shutdown function, a means of overriding (bypassing, shunting) the pressure switch must be provided in order to return the affected equipment to an operational mode after suppression system discharge has occurred. The pressure switch is a single pole single throw (SPST) type that is normally closed (NC) with the system in the charged condition. Discharge or loss of system pressure will release the contacts to an open state thereby cutting off any electrical current flow.
Never use pressure switch for electrical loads over rated capacity.

Switch Specifications 4.0 AMPS at 12 VDC, 2.0 AMPS at 28 VDC
For applications requiring larger load capacities, contact the factory.

System Status Indicator Light Operation

All Sea-Fire pre-engineered fire suppression systems approved for marine applications are packaged with an indicator light and faceplate. USCG approval requires that the indicator light (unless replaced by another Sea-Fire device: i.e.: display panel) must be installed for system supervision and operator awareness. When properly installed, activation of electrical power to the system will illuminate the light indicating normal charge condition. System discharge or loss of pressure will immediately turn off the indicator light. In the event that the indicator light is not lit when power is applied, check for the following conditions:

1. Check pressure indicator gauge for proper range.
2. Check fuse and indicator light and replace if defective (lamp replacements available from factory).
3. Check for loose electrical connections.
4. Remove and weigh system cylinder as described in **System Maintenance Section** of the manual.

Pressure Relief Assembly (Burst Disk)

All models are protected from over pressure of system. NFG Models 25 – 200 and NFD 225 – 825 are protected by the design of the glass bulb temperature / pressure relationship. Sea-Fire Marine maintains a Department of Transportation (DOT) Special Permit, DOT-SP-11598 for these models.

NFD Models 850 – 1800 have a definite purpose Pressure Relief Device (designed and manufactured per CGA S.1-1) installed on the manifold. Do not remove or perform any maintenance on this device. Removing or loosening this device will cause the contents under pressure to escape.

Interaction with Engines, Generators and Powered Ventilation (Blowers)

Sea-Fire offers optional engine interrupt systems which will automatically shut down engines, generators and powered ventilation upon discharge of the fire suppression system. They are available with 4, 6 or 8 control circuits and operate between 9 – 32 volts DC. Shutdown may be accomplished by interruption of the electrical circuit between the ignition switch and the engine coils.

It is the responsibility of the system designer/installer to comply with the following instructions on Diesel and Gasoline Engines/Generators.

Diesel Engines or Generators, Powered Ventilation (Blowers)

USCG, and American Boat and Yacht Council (ABYC) – Standard A-4, Fire Fighting Equipment (Section A-4.7.3.3) both require the following:

> The system shall be designed and installed so that the engine(s), generator(s), and blower(s) located in the protected space shut down automatically and after discharge the minimum required design concentration (5.85 percent Novec 1230) must remain.

Gasoline Engines or Generators

<u>It is optional to automatically shut down gasoline engines and generators, but it is highly recommended.</u> In the case of engine compartment fire, you must still manually shut down engine(s) or generator(s) before manual discharge, or immediately after automatic discharge of the fire suppression system.

Relationship to Portable Fire Extinguishers

<u>Reminder:</u> Sea-Fire pre-engineered systems shall be considered as supplementary to the number of portable fire extinguishers required on-board and are designed and intended for enclosed unoccupied compartment installations that are not subject to direct weather or water.

Manual Discharge Capability

US Coast Guard approval requires the installation of manual discharge capability on all systems installed in compartments of 1,000 cubic feet and larger. Sea-Fire offers manual discharge cables for this purpose. Models with manual cable connections are designated as “M” following the system size. “M” designates manual/automatic. “A” alone designates automatic only.

Installation

Read entire instruction manual and cylinder nameplate prior to installation.

These installation instructions are intended to cover most normal installations. Additional technical or application information can be obtained by contacting:

Sea-Fire Marine - USA
Baltimore, Maryland
Tel: (410) 687-5500
Website: www.Sea-Fire.com

or

Sea-Fire Europe, LTD
Hampshire
United Kingdom
Tel: +44(0)2392679666
Website: www.Sea-Fire.co.uk

Only one system (cylinder) may be used to protect a compartment. If more than one suppression system is used to achieve the required amount of agent concentration, there is no guarantee that several suppression systems will actuate simultaneously as each suppression system operates independently. Several suppression systems may be used only if each independent suppression system is capable of protecting the entire volume of the compartment.

CAUTION:

1. **DO NOT INSTALL IN AN AREA DESIGNATED FOR OCCUPANCY.**
2. **ACCIDENTAL DISCHARGE MAY CAUSE SERIOUS INJURY.**
3. **HANDLE THE CYLINDER WITH EXTREME CARE.**
4. **WEAR EYE PROTECTION.**
5. **DO NOT LIFT OR CARRY CYLINDER BY THE MANIFOLD OR ACTUATOR COMPONENTS.**
6. **DO NOT ATTEMPT TO LOOSEN OR REMOVE ANY SUPPRESSION SYSTEM COMPONENTS.**

I. Cylinder Installation:

Step 1 Carefully remove cylinder from carton and visually check for damage in shipment.

Step 2 To ensure that the cylinder is operational, both the weight and pressure indicator must conform with the cylinder specification as shown on the nameplate. Weigh cylinder (less bracket) on an accurate calibrated scale before installing. Record date and weight on tag provided for this purpose.

Step 3 Do's and Don'ts

Do place Unit:	Don't place unit:
a. As high as possible, no more than 3 feet below the ceiling, on compartment bulkhead for mounting.	a. Near a fresh air or ventilation duct supply opening.
b. With detector head near the area in which a fire is most likely to occur. This would be on the fuel line side of the engine, near the carburetor, or fuel pump.	b. Near access door.
c. At the centerline of the bulkhead wall (left to right).	c. To underside or inside of access door or panel.
d. Against forward bulkhead.	d. Extremely close to the turbocharger or exhaust system.
e. Vertical or horizontal as described per model.	e. Where an accumulation of standing water could block sensor or cause corrosion.
f. Between the engines when two engines are to be protected.	f. On underside of cover or compartment hatch that could be thrown clear due to possible explosion.
g. Avoid immediate obstructions to the discharge orifices.	g. On a ceiling.
	h. Too close to a room corner or large obstruction.

Step 4 Loosen mounting bracket cylinder holding straps (Figure 1) and remove cylinder from racket. Although the sensor valve / detector is protected, care should be exercised to avoid striking the sensor valve / detector.

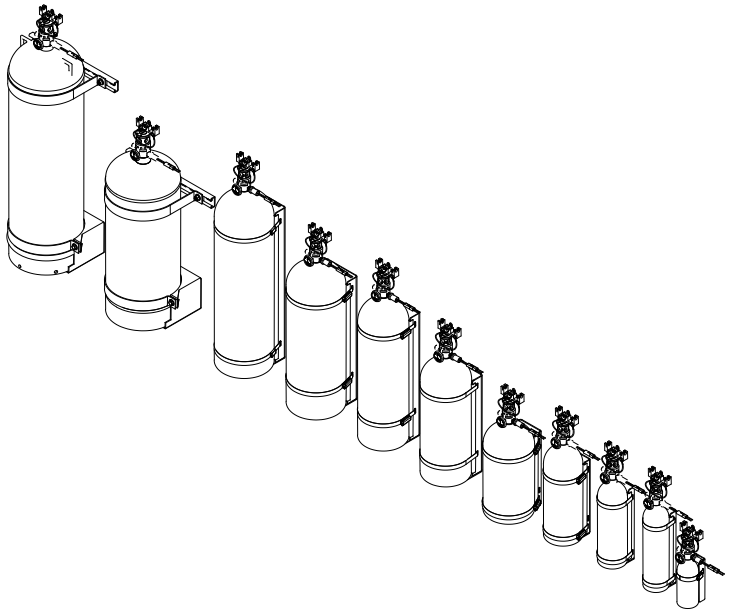


Figure 1

Wall Mounting

Models NFG 25 - 200 and NFD 225 – NFD 825 may be installed Vertical or horizontal with the following angular / off-set limitations. Vertical installation is recommended for optimum performance. Off-set is defined as the distance below level line from end of the bracket. The discharge orifice spray pattern must be oriented away from the wall and towards the room. See Figure 2.

Models NFG 25 - 100

- Vertical installation.
- Horizontal with a minimum 8 degree angle or 1" (25.4mm) offset below level.

Models NFG 101 - 200

- Vertical installation.
- Horizontal with a minimum 5 degree angle or 1/2" (12.7mm) offset below level.

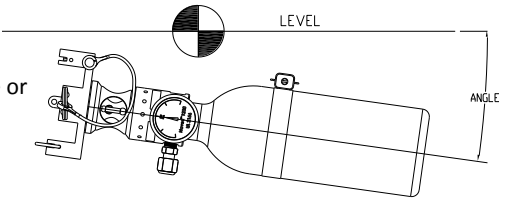


Figure 2

MODELS NFD 225 THRU 825

- Vertical installation.
- Horizontal with a minimum 2.5 degree angle or 1/2" (12.7mm) offset below level.

MODELS NFD 850 – 1800

- Vertical Installation Only

WARNING: WHEN INSTALLING CYLINDER IN HORIZONTAL POSITION, THE ACTUATOR (TOP OF CYLINDER) MUST NEVER BE LOWER THAN THE BOTTOM OF THE CYLINDER OR PROPER DISCHARGE OF AGENT WILL NOT OCCUR (SEE FIGURE 2 ABOVE).

Step 5 Locate bracket in desired position (Vertical-sensor Valve / Detector Head Up, or Horizontal, Figure 2). Ensure bulkhead or mounting surface is solid enough to hold the weight of the unit. Fasteners are not included. Use medium strength (Grade 5, Property Class 8.8) or better grade material. Use minimum 5/16" (M8) diameter [recommend 3/8" (M10) diameter] fasteners for all but 130-249 bracket assemblies. 130-249 minimum hardware size is ¼" (M6) diameter. All mounting holes must be utilized. See table below for qty and hole size in respective bracket. Using the bracket as a template, mark and drill holes in bulkhead and install bracket ensuring that all fasteners are thoroughly tight.

Step 6 Carefully attach cylinder to bracket. Sensor valve / detector head should point towards engine or center of the compartment. Nameplate and gauge should be visible. Tighten bracket straps so that the cylinder body is firmly and securely held in place by its bracket (worm drive clamps must be torqued to 75-85 in-lbs., (6-7 ft.-lbs.). Ensure 180° discharge orifices do not face the wall.

Depending on the model, the bracket strap will be different:

Types

Screw drive coil, Phillips / hex drive. ---------- NFG 25 – 200 and NFD 201 - 825

Two piece bracket / saddle assembly. --------- NFD models 825 - 1800.

Brackets		
Model	Assembly	Mounting Holes (Qty x Dia)
NFD 225 - 300	130-251	4 x .39" (9.9 mm)
NFD 325 - 400	130-252	
NFD 425 - 525	130-253	
NFD 550 - 675	130-254	
NFD 700 - 825	130-777	
NFD 850 - 1800	130-009	13 x 7/16" (10.7 mm)

Brackets		
Model	Assembly	Mounting Holes (Qty x Dia
NFG 25	130-249	2 x .29" (7.2 mm)
NFG 50 - 75	130-775	4 x .39" (9.9 mm)
NFG 100	130-805	
NFG 125 - 200	130-250	

II. Cable Assembly Installation

CAUTION: TO AVOID KINKING OF CABLE, DO NOT PUSH CABLE TO RETRACT THE CORE.

Model SMAC-#XX (PN: 136-#XX) is required.

CAUTION: TO PREVENT ACCIDENTAL DISCHARGE DURING CABLE INSTALLATION, VERIFY THAT THE MANUAL DISCHARGE LEVER SAFETY PIN IS PROPERLY INSTALLED (SEE FIGURE 6A – PAGE 14).

Step 1 Select the proper location for remote pull station.

a. Manual discharge release pull stations should never be installed in the protected compartment.

b. Locate discharge pull handle at the helm station with full view and easy access by the operator.

c. The area selected must be structurally secure and provide at least twelve (12) inches (305 mm) of clearance at the rear of the panel to facilitate cable hardware.

Step 2 Installing cable along routing between cable ends-

a. Do not install cable in area where the possibility of physical abuse is likely. Where practical, follow the same cable path as installed by boat manufacturer (if a replacement cable).

b. Route the cable to allow it to lie in its most natural state. The cumulative bend in the cable run must never exceed 720 degrees. This is equivalent to eight (8) right (90°) angles. Use extreme care when bending cable to avoid kinking. Never form a bend with a radius of less than five (5) inches (127 mm). Selection of the correct size Sea-Fire cable length will reduce excess cable coil.

c. Position the cable in its routing, but do not secure at this time. Steps 3A thru 3F must be completed prior to securing cable in its final location.

- Do not connect cable to the cylinder at this time

Step 3 Mounting cable faceplate and release (T) handle.

Confirm faceplate supplied with cable and/or cylinder assembly. The faceplate heading should be "MANUAL/AUTOMATIC" (Figure 3).

Manual/Automatic systems use faceplate 124-026

Figure 3

a. Using the manual discharge faceplate (Figure 3, Figure 4) as a template, mark and drill a 13/32inch (10.4 mm) hole.

b. Remove the protective backing from the faceplate. While aligning the holes, place even pressure upon the faceplate. To insure a good bond, the temperature should be in excess of 50°F (10°C).

c. Following the diagram in Figure 4, install the jam nut and lock washer on the cable end – outer. Screw the jam nut to the end of the threads. Insert the cable end through the panel and faceplate hole. Pull the cable end – inner (threaded shaft) out to its fullest travel. Install ferrule by screwing onto the cable end – outer until it bottoms out. Use pliers on the back side – holding the cable end – outer while turning the ferrule. Use pliers with rubber tips or other non-scratching grip. Do not over tighten.

d. With cable end – inner (threaded shaft) out to its fullest travel, place rubber O-ring over threads on shaft. Hold the cable end-inner from rotating using the safety pin in cross hole (see Figure 4 – Page 11) or by using needle nose pliers. Install the T- Handle on the cable end – inner, screwing it on until it bottoms out. Do not over tighten.

e. Pull on the cylinder (S-hook) end of the cable to retract the handle into the ferrule. It may be necessary to slightly push on the T-handle to seat the O-ring. Align the cross holes in the T-

Handle and ferrule and insert the safety pin through both items so that the end of the safety pin shows out the far side. Leave the safety pin inserted through the T-handle/Ferrule, but do not install the red safety tie at this time.

f. Turn the T-handle/Ferrule so that the word **FIRE** is vertical or oriented as needed.

g. This action will result in the entire cable rotating along its length. Ensure that the cable is allowed to rotate and remain in a natural state.

h. Tighten the jam nut behind the instrument panel to lock in the position and orientation of the T-handle/Ferrule.

Step 4 Securing cable in place

a. Secure the cable along its length.

i. Nylon cable ties should be used for cable securing. Fasten and support the cable on straight runs only. Do not secure at locations where cable bends.

ii. At the cylinder/actuator S-Hook end:

a. The cable should have a minimum straight length of 6 inches (15 cm) before making any bends. The cable should be secured on a straight run before making a bend.

b. The cable should be secured within 6 inches to 18 inches (15 cm – 46 cm) of the cylinder. Some flexibility will be needed to move the cable for servicing the cylinder.

CAUTION: FAILURE TO FOLLOW THESE INSTRUCTIONS MAY PLACE UNDUE PRESSURE ON THE HAIRPIN COTTER PIN, CAUSING IT TO MALFUNCTION

iii. Do not install cables with other wiring. Do not use tie wire around the cables.

b. Temporarily remove safety pin and test cable operation. **Never push cable.** Pull from cylinder (S hook) end, then pull T handle and repeat. Cable must move freely without friction or binding. Reinstall safety pin and confirm that release handle is now locked in place.

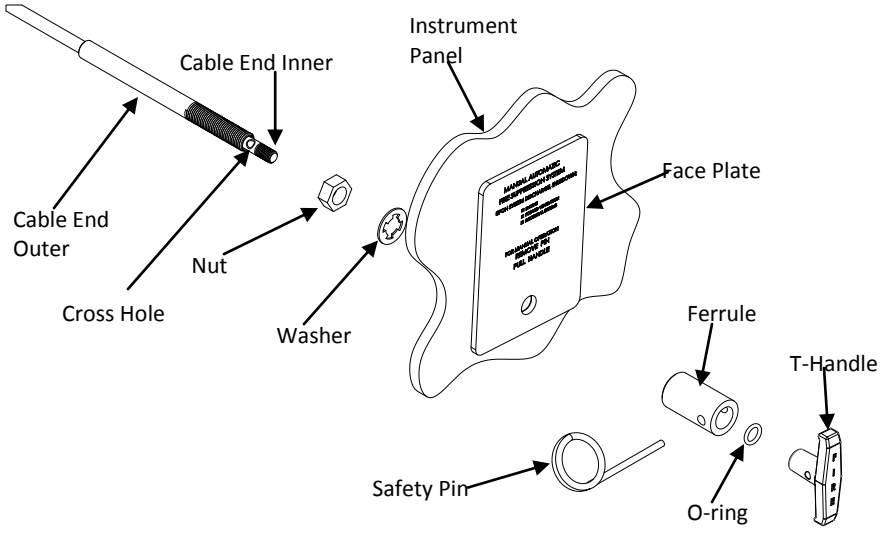


Figure 4

CAUTION: ACCIDENTAL DISCHARGE DURING HANDLING OR INSTALLATION MAY CAUSE SERIOUS INJURY. DO NOT REMOVE FACTORY INSTALLED SAFETY (PULL) PIN FROM CYLINDER SENSOR VALVE / DETECTOR UNTIL INSTALLATION IS COMPLETED AND CHECKED.

Step 5 Installation Verification and Test Requirement.

Specification / Regulation

- U.S.C.G – Navigation and Vessel Inspection (NVIC 6-72, Section V, Page 71) requires a maximum of 40 lbs. of force required at T handle (pull station) to activate system discharge.
- NFPA 12A - Operating devices. Para. 1-8.3.7 maximum of 40 lbs. of force required at T handle (pull station) to activate system discharge.
- Sea-Fire - minimum of 10 lbs. of force required at the S hook (extinguisher) to activate system discharge.

Test Procedure

CAUTION: DO NOT PUSH (FIRE) T-Handle while installing cable assembly to avoid kinking the cable core. Pull S-Hook at opposite end to retract the T-Handle.

After the initial routing of cable assembly is completed:

a. Attach a scale (PN: 128-212 Cable Test Fixture) to the S-hook (cylinder end) in place of the cylinder Release assembly.
b. Attach a scale (PN: 128-092 Digital Scale) to the T-handle (pull station) end of the cable assembly. A handle hook, PN: 128-115 is available to facilitate attaching the scale. (Scales available from Sea-Fire or others may be used)
c. Pull on the T-handle scale, monitoring the displayed force, until 10 lbs (4.5Kg) is shown on the S-hook (cylinder end) scale.
d. Ensure that the required force at the T-handle (pull station) does not exceed 40 lbs. (18.2 Kg) to achieve 10 lbs. (4.5 Kg).
    i. If less than 40 lbs. (at the pull station) of force achieves the 10 lbs. (at cylinder), complete the cable assembly installation per Step 6.
    ii. If greater than 40 lbs. of force was exerted to achieved 10 lbs., the cable routing should be inspected and likely changed. Repeat inspection.
e. Remove both scales. Pull on the S-Hook at the cylinder to retract the cable.
f. Reinstall safety pin and confirm that release handle is now locked in place.
g. Attach the tamper resistant round plastic tie to the safety pin by passing tie through the safety pin ring and around the cable assembly. Insert the end of the tie into cable end and pull up snug. The tie provides a means of deterring accidental discharge and determining if manual actuation has occurred.

CAUTION: DO NOT USE NYLON CABLE TIES IN PLACE OF THE TAMPER RESISTANT TIE FOR SAFETY PIN.

Note: Limit the quantity, and tightness of tie downs to avoid restriction.

Note: A maximum of 720° in turns, and no less than five (5) inches (127 mm) of radius per turn should be utilized.

Step 6 Connecting cable assembly to cylinder (Figure 6).

Note: The cable may be installed from either direction using the existing Bi-Directional hardware installed on the system.

a. Confirm that the cylinder is mounted in its bracket, the cable pull handle end is installed and the cable is correctly routed to the cylinder.
b. Insert the "S" hook [Fig 5-A] into the actuator lever from the front side (over top of the 2 mounting screws in the Release Bracket [Fig 6-B]. After the "S" hook is connected to the lever, align the groove in the cable end-outer [Fig 5-B] with the slot in the Release Bracket assembly [Fig 6-C].
c. Insert the Hairpin Cotter Pin provided with the cable into the release bracket, over top of the cable end [Fig 6-D].
    - There may be a slight bend (bump) in the cable between where it is attached to the actuator lever and where the cable end - outer is clipped into the Release Bracket. This is normal.
    - <u>There should not be tension in the cable pulling on the lever</u>. Tension on the lever can cause the cylinder to discharge when the safety pin is removed.
d. With Step c successfully complete, use care to remove the factory installed safety pin from the actuator assembly [Fig 6-E].
e. Store the safety pin in the hole of the Release Bracket behind the actuator lever as a back-stop in farthest hole from cable/hook assembly [Fig 6-F].
f. Ensure the safety pin is completely installed through the bracket.

WARNING – DO NOT INSTALL THE SAFETY PIN BETWEEN THE LEVER AND THE CABLE. THIS WILL PREVENT THE CABLE FROM ACTUATING THE SYSTEM.

g. The fire suppression system extinguisher is now fully operational.

CAUTION – ALWAYS INSTALL SAFETY PIN IN CYLINDER ACTUATOR LEVER [FIG 6-A] WHEN PERFORMING SERVICE OR MAINTENANCE ON SYSTEM. BE SURE TO REMOVE SAFETY PIN FROM ACTUATOR LEVER UPON COMPLETION OF SERVICING.

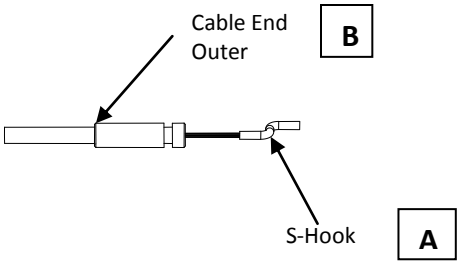
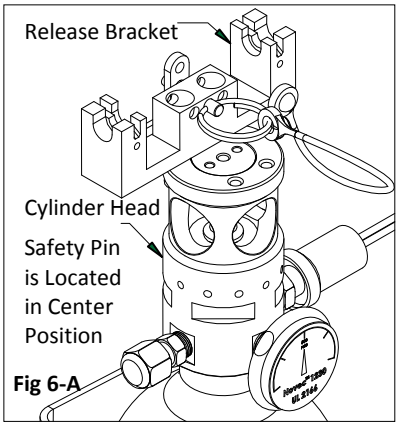
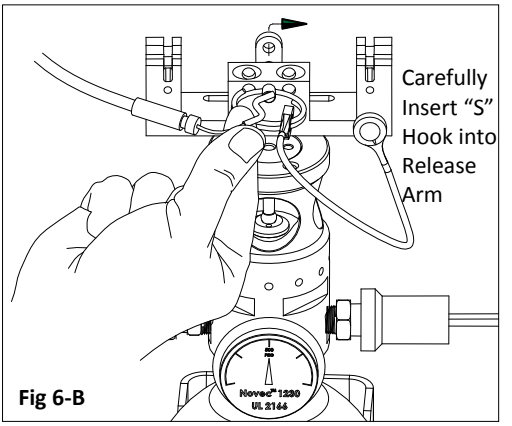
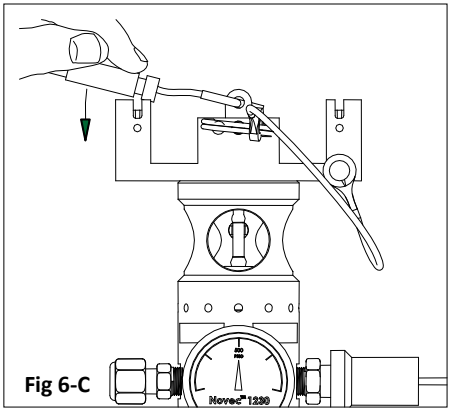
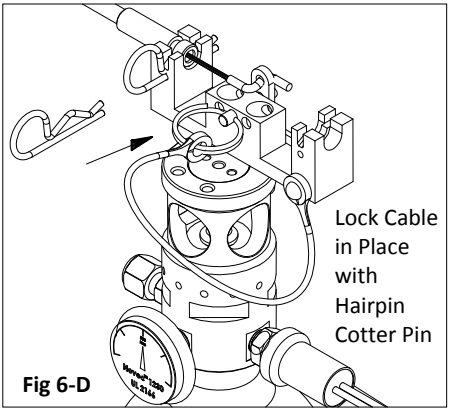


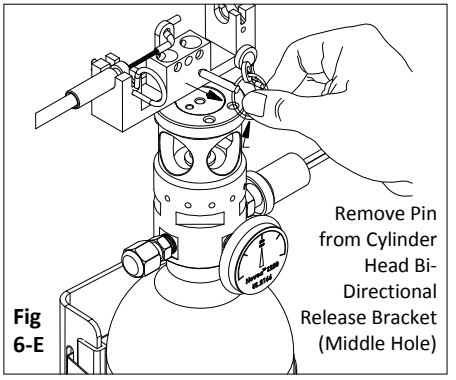
Figure 5 -- SMAC Cable S-Hook End

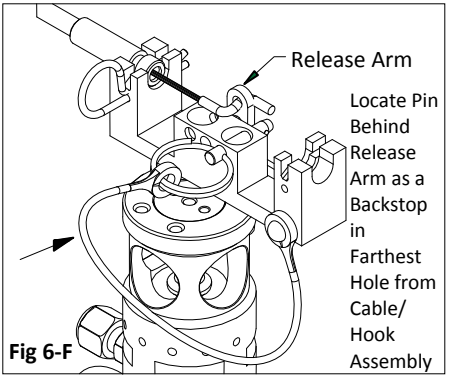












Bi Directional Release Bracket Cable Connection

Figure 6

III. System Status Indicator Light Installation

Select a location at the helm on or near the console that is in full view of the helmsman. The location selected must have access for electrical wiring. Remove the adhesive protective cover from back of indicator faceplate and attach. For proper adhesion, surface must be clean and dry and temperature must be above 50°F (10°C). Use the preformed faceplate hole as a template and carefully drill a 5/16 inch (8 mm) hole. Insert indicator light wire (see Figure 7).

CAUTION: PRIOR TO WIRING INDICATOR LIGHT, TURN OFF ELECTRICAL POWER BY SWITCHING OFF CIRCUIT BREAKER, REMOVING FUSE OR DISCONNECTING POSITIVE BATTERY TERMINAL. FAILURE TO DISCONNECT ELECTRICAL POWER WHILE MAKING ELECTRICAL CONNECTION CAN RESULT IN INJURY FROM FIRE OR ELECTRICAL BURNS.

The standard indicator light is rated for 12 VDC (contact factory for other voltages). Wire in accordance with the American Boat and Yacht Council (ABYC), Standard E-9, Direct Current Electrical System on Boats, copies of which may be obtained from ABYC, Edgewater, MD, USA, 21037, +1 (410) 956-1050.

Supplies, which are not included with your Sea-Fire system and should be at hand before the indicator light installation, are as follows:

1. Five (5) ampere in-line fuse and holder.
2. Sufficient length of insulated minimum 16 AWG stranded wire.
3. Crimp on wire connectors.
4. Crimp pliers, hand tools.

Attach one wire lead from the in-line fuse (C) to the ignition terminal on the started switch. Connect other lead from the in-line fuse to the indicator light (D). Connect remaining indicator lead (E) to one of the Sea-Fire cylinder pressure switch connector wires (F). Connect the remaining cylinder pressure switch lead (G) to common ground, which may be the negative battery buss at the control panel, or directly to the engine block (see Figure 7).

CAUTION: ELECTRICAL SYSTEMS VARY FROM VESSEL TO VESSEL AND THESE DIRECTIONS MAY NOT BE APPLICABLE FOR YOUR INSTALLATION. SHOULD YOU HAVE ANY DOUBTS OF SAFELY ACCOMPLISHING THIS INSTALLATION, CONTACT A QUALIFIED MARINE ELECTRICIAN OR SEA-FIRE MARINE USA AT (410) 687-5500 FOR TECHNICAL ASSISTANCE.

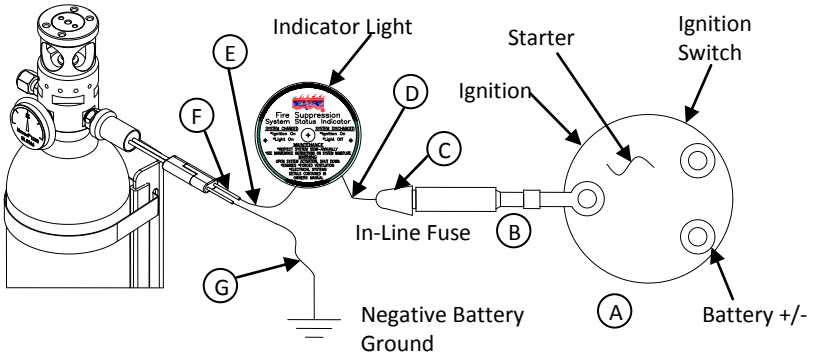


Figure 7

System Maintenance / Inspection
Cylinder Inspection / Cylinder Testing

The following instructions are according to applicable regulatory agencies. These regulations change periodically and may be different from rules in place when this system and manual were shipped. Confirm requirements with Sea-Fire, local authorities having jurisdiction or applicable agency. All inspections must be performed by an authorized/Qualified inspector (Current RIN for DOT) and other requirements per local authorities as applicable.

NFPA 2001 – Clean Agent Fire Extinguisher Systems:

All models, all cylinders:

- If more than 5 years has elapsed since the date of the last test and inspection, the cylinder shall not be recharged without retesting. The test shall be permitted to consist of a complete visual inspection as described in 49 CFR (explained below per cylinder type).
- Cylinders continuously in service without discharging shall be given a complete external visual inspection every 5 years or more frequently if required. The visual inspection shall be in accordance with Section 3 of CGA C-6, except that cylinders need not be emptied or stamped while under pressure.

49 CFR – Transportation (DOT) – Cylinder Requalification (Hydrostatic testing via proof pressure and volumetric testing; visual inspection methods)

Models NFG 25 – 200 built with DOT 39 NRC/TC-39M cylinders. These are non-refillable and are non-reusable. They do not require/ are not allowed to be tested for re-use. The systems may remain in service indefinitely as long as all other serviceability requirements are met. Systems with these cylinders, per 49 CFR requirements, are clearly marked, "Federal law forbids transportation if re-filled – penalty up to $500,000 fine and 5 years imprisonment (49 U.S.C. 5124).

Models NFD 225 – 825 built with DOT 3AL/TC-3ALM cylinders and **Models NFD 850 – 1800** built with DOT 4BW/TC 4BW welded steel cylinders.
Both of these cylinder types are reusable and must be periodically tested and re-qualified. The periodic inspection interval for both DOT 3AL and DOT 4BW cylinders filled as a Fire suppression system with the agent as supplied is 12 years from the date stamped on the cylinder. However, a cylinder filled before its re-qualification date (becomes due), and remains filled, may remain in service without testing until it is emptied for any reason (reference 49 CFR 180.205 (c).

- Correlation to NFPA 2001 (5 year) requirement. In both standards, if the cylinder is not already empty, it does not need to be emptied solely for inspection purposes. If the cylinder has more than 5 years of service, and has been emptied for whatever reason, it needs to be inspected per NFPA 2001 guidelines listed above.

- For DOT 4BW/ TC 4BWM welded steel cylinders only, a visual inspection in accordance with CGA C-6 or C-6.3, as appropriate, may be performed instead of the periodic hydrostatic tests. When this test method is applied, the subsequent inspection comes due after 5 years.
  - Applicable tests methods for DOT 4BW cylinders are by Proof Pressure Test which yields a subsequent test requirement after 7 years and a Volumetric Expansion test using the Water Jacket Method which yields a subsequent test requirement after 12 years.

- For DOT 3AL/TC 3ALM cylinders, visual inspections are not authorized to replace hydrostatic testing.
  - The only test method for DOT 3AL cylinders is the Volumetric Expansion test using the Water Jacket Method which yields a subsequent test requirement after 12 years.

For systems compliant to European Directives, (EC), specific cylinders may be used different than DOT / TC approved systems. International requirements need to be followed as well as other requirements according to the local authorities having jurisdiction (AHJ).

Models NFG 25 - 200 with EC approval are designated as "CE" marked in accordance with the Pressure Equipment Directive (PED) 97/23/EC. Those cylinders are built to technical specifications either BS EN12205 or ISO 11118. These systems are not refillable. Systems with these cylinders are not serviceable and therefore have no periodic inspection requirements. (Reference ISO 11118 and PED Directive 97/23/EC). Models with these cylinders, per European Agreement Governing the International Carriage of Dangerous Goods by Road (ADR) requirements, are clearly marked, "DO NOT REFILL".

Models NFD 225 – 1800 with EC approval are designated as "CE" marked in accordance with the Pressure Equipment Directive (PED) 97/23/EC. These systems are refillable.

- **NFD models 225 - 825** have seamless aluminum cylinders built to technical standards either BS EN 1975 or ISO 7866. Systems with π marked cylinders built to ISO standard 7866 are to be maintained in accordance with ISO 10461, Gas Cylinders – Seamless Aluminum – Alloy Gas Cylinders – Periodic Inspection and Testing. Systems with π marked cylinders built to BS EN 1975 are to be maintained in accordance with BS EN 1802.
- **NFD models 850 to 1800** have welded steel cylinders built to technical standard EN 13322-1. These cylinders need to be maintained in accordance with BS EN 1803.

Summarizing these standards, there is no general requirement to periodically inspect a cylinder if the contents have not been used, even if the test interval has lapsed. In the event that contents have discharged, leaked or otherwise been exhausted, the inspection interval is 10 years from the manufacture date stamped on the cylinder. TPED Directive 96/36/EC also has requirements for periodic inspection.

<u>WARNING:</u> DO NOT ATTEMPT TO DISASSEMBLE ANY PART OR COMPONENT OF THE EXTINGUISHER. THIS UNIT IS PRESSURIZED AND SERIOUS INJURY COULD RESULT. CONTACT THE FACTORY OR AN AUTHORIZED DEALER FOR SERVICE INFORMATION.

Agent Weight Inspection

Weigh cylinder to insure ample extinguisher agent (every 6 months, minimum). All fire suppression systems containing liquefied gas require periodic weighing to ensure a fully charged unit. Pressure gauges indicate the ability to discharge the agent but not the quantity of extinguishing agent. The cylinder (less bracket) must be weighed on at least a semi-annual basis and be replaced immediately if gross weight has decreased by the quantity noted on the specification label. An inspection Tag is supplied on every new cylinder for recording this inspection. The specification label (example shown below) identifies the Model Type, Work Order #, Discharge Temperature Range, Agent Weight, Maximum Volume Protected, Gross Weight, and Manufacturer Date.

MODEL W.O.XXXXXX

NFD XXXM MANUAL/AUTO
DISCHARGE TEMPERATURE RANGE:
175 - 225 F (79 - 107 C)
CONTAINS: X.XX LBS (X.XKG) NOVEC 1230
MAXIMUM VOLUME PROTECTED
XXX CU. FT. (X.X CU. METERS)

GROSS WEIGHT
XX LBS. X OZS. (XX KGS)
REPLACE IMMEDIATELY IF GROSS WEIGHT
DECREASES BY X OZS. OR MORE

MANUFACTURE DATE: XX/XXXX REV: X

MODEL W.O.XXXXXX

NFG XXXA AUTOMATIC
DISCHARGE TEMPERATURE RANGE:
XXX - XXX F (XX - XXX C)
CONTAINS: X.XX LBS (X.XKG) NOVEC 1230
MAXIMUM VOLUME PROTECTED
XXX CU. FT. (X.X CU. METERS)

GROSS WEIGHT
XX LBS. X OZS. (XX KGS)
REPLACE IMMEDIATELY IF GROSS WEIGHT
DECREASES BY X OZS. OR MORE

MANUFACTURE DATE: XX/XXXX REV: X

Pressure Gauge Inspection

Frequently check gauge for proper pressure, (every 6 months, minimum).

Reading the Pressure Gauge (Inspection)

The green section of the gauge is designed to show proper filling and pressurization at 70°F (21°C). Per applicable design standards, this is defined as ± 10% of nominal fill pressure.
Sea Fire systems are rated for operating temperatures from 20°F (-7°C) or 32°F (0°C) up to 130°F (54°C). Note: This is storage and ambient operating temperature. A fire condition would obviously reach higher temperatures, with the system activating at 175°F (79°C) or 200°F (93°C).

The red section of the gauge, above and below the green section, indicate the acceptable pressure readings for temperatures below and above 70°F (21°C). The table located on the included tags show the pressure of the system at corresponding temperatures.
To inspect a unit when the ambient temperature is other than 70°F (21°C), measure the ambient temperature and find the corresponding nominal pressure in the table. Read the tip of the yellow pointer and determine what the internal pressure is by counting the division lines and adding or subtracting for each line segment from the black centerline marked, 500 psi (34.3 bar). (Each line segment within the green pie is equal to 10 psi (0.68 bar). Each line segment within the red sections is equal to 20 psi (1 bar).

- Compare the actual reading to the reference table on the card attached to the cylinder. The pressures should be within ± 20 psi (1 bar) of each other (one segment).
- Note: this allowance takes into account allowing for gauge manufacturing tolerance, temperature reading accuracy and the ability to precisely see the pointer location.
- If the yellow pointer is in either the white zone on the gauge, to the left "REPLACE" or to the right "OVERCHARGE", the unit is likely not functional and may require replacement.
- If time and serviceability permits, a suspect unit may be verified by stabilizing the temperature of the unit at 70°F (21°C) for a minimum of 4 hours and reading the pressure gauge at that point.

Indicator Light Inspection

Before operating, visually check to insure indicator light or alternate display is operational, and cylinder pressure indicator is in the normal range.

Glass Bulb (Temperature Sensor) Inspection

Never paint or obstruct the cylinder manifold or sensor valve / detector, as this will adversely affect its operating characteristic.

Check for presence of glass bulb. Figure 6 shows two states: Charged (Intact) and Discharged (Activated).

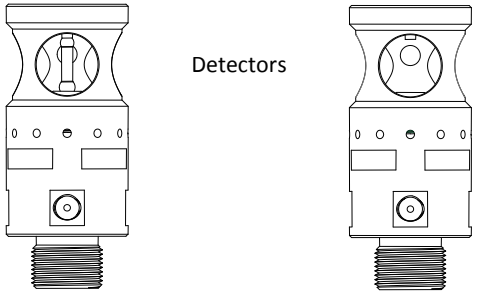


Figure 8

Cable Inspection

Manual activation cables should be checked for proper operation every 6 months while cylinder inspection is being performed. Cable runs should be visually checked to ensure no damage has been done to the cable. (No excessive wear or pinching exists).

Take safety pin out of 'backstop' position in the release bracket and place into center hole, securing release arm. Disengage 'S'-hook from release arm, remove pin from fire release handle, and test cable for smooth operation. Re-assemble in reverse order (see Figure 6, page 14).

Additional Servicing

Further servicing of Sea-Fire pre-engineered systems is reserved to competent individuals who have completed training by Sea-Fire Marine personnel. Service Manual 123-349 is available to these individuals.

Specification Table
Sea-Fire "NFG" Series Automatic and Manual/Automatic Fire Suppression systems

NFG Model		Area of Protection		Minimum Novec 1230 Agent		Maximum Novec 1230 Agent		Cylinder Diameter		Installation Dimension Requirements					
Auto	Manual/ Auto	CU FT Range	CU M Range	LBS	KG	LBS	KG	IN	mm	W		H		D	
										IN	mm	IN	mm	IN	mm
NFG 25A	NFG 25M	17-25	0.48-0.7	0.9	0.4	1.3	0.6	2.9	74	5	127	12.7	323	4.4	112
NFG 50A	NFG 50M	26-50	0.7-1.4	1.4	0.6	2.7	1.2	3.5	89	5	127	18.8	478	4.9	124
NFG 75A	NFG 75M	51-75	1.4-2.1	2.7	1.2	4.0	1.8	3.5	89	5	127	18.8	478	4.9	124
NFG100A	NFG100M	76-100	2.1-2.8	4.0	1.8	5.4	2.4	4.3	108	5.2	132	19	483	5.2	132
NFG125A	NFG125M	101-125	2.8-3.5	5.4	2.4	6.7	3.0	5.3	133	5.7	145	20.6	523	6.4	163
NFG150A	NFG150M	126-150	3.5-4.2	6.7	3.1	8.1	3.7	5.3	133	5.7	145	20.6	523	6.4	163
NFG175A	NFG175M	151-175	4.2-5.0	8.1	3.7	9.4	4.3	5.3	133	5.7	145	20.6	523	6.4	163
NFG200A	NFG200M	176-200	5.0-5.7	9.4	4.3	10.7	4.9	5.3	133	5.7	145	20.6	523	6.4	163

Operating Temperature Range: 20°F (-7°C) to 130°F (54°C).

Discharge Temperature Range: NFG 25 through NFG 75: 200 - 250°F (93 - 121°C)
NFG 100 through NFG 200: 175 - 225°F (79 - 107°C)

- All NFG Models approved for vertical or horizontal mounting.
- All NFG Models are available with multiple approved cylinders, DOT/TC and CE.
- All NFG Models are non-refillable (non-serviceable)
- ABYC, A-4, Fire Equipment Standard: Fixed fire extinguishing systems (August 1, 2009) shall be capable of both Automatic and Manual operation.
- NFG and NFD systems are designed for only one cylinder (single nozzle) to protect the entire space. Using two cylinders to achieve combined coverage is not acceptable.

Abbreviations:
CU FT = Cubic Feet
CU M = Cubic Meters
KG = Kilograms
LBS = Pounds
IN = Inches
MM = Millimeters

Specification Table
Sea-Fire "NFD" Series Automatic and Manual/Automatic Fire Suppression systems
DOT 3AL / TC 3ALM or TPED/ADR Cylinders

Model		Area of Protection		Minimum Novec 1230 Agent		Maximum Novec 1230 Agent		Cylinder Dia		Installation Dimension Requirements W		H		D	
Auto	Manual/ Auto	Cubic FT Range	Cubic M Range	LBS	KG	LBS	KG	IN	mm	IN	mm	IN	mm	IN	mm
NFD 225 A	NFD 225 M	201 – 225	5.7 – 6.4	10.8	4.9	12.1	5.5	6.9	175	8	203	20.1	511	8	203
NFD 250 A	NFD 250 M	226 – 250	6.4 – 7.1	12.1	5.5	13.4	6.1	6.9	175	8	203	20.1	511	8	203
NFD 275 A	NFD 275 M	251 – 275	7.1 – 7.8	13.4	6.1	14.8	6.7	6.9	175	8	203	20.1	511	8	203
NFD 300 A	NFD 300 M	276 – 300	7.8 – 8.5	14.8	6.7	16.1	7.3	6.9	175	8	203	20.1	511	8	203
NFD 325 A	NFD 325 M	301 – 325	8.5 – 9.2	16.1	7.3	17.5	7.9	6.9	175	8	203	24.7	627	8	203
NFD 350 A	NFD 350 M	326 – 350	9.2 – 9.9	17.5	7.9	18.8	8.5	6.9	175	8	203	24.7	627	8	203
NFD 375 A	NFD 375 M	351 – 375	9.9 – 10.6	18.8	8.5	20.1	9.1	6.9	175	8	203	24.7	627	8	203
NFD 400 A	NFD 400 M	376 – 400	10.6 – 11.3	20.2	9.1	21.5	9.7	6.9	175	8	203	24.7	627	8	203
NFD 425 A	NFD 425 M	401 – 425	11.4 – 12.0	21.5	9.7	22.8	10.4	6.9	175	8	203	28.7	729	8	203
NFD 450 A	NFD 450 M	426 – 450	12.1 – 12.7	22.8	10.4	24.2	11.0	6.9	175	8	203	28.7	729	8	203
NFD 475 A	NFD 475 M	451 – 475	12.8 – 13.4	24.2	11.0	25.5	11.6	6.9	175	8	203	28.7	729	8	203
NFD 500 A	NFD 500 M	476 – 500	13.5 – 14.2	25.5	11.6	26.9	12.2	6.9	175	8	203	28.7	729	8	203
NFD 525 A	NFD 525 M	501 – 525	14.2 – 14.9	26.9	12.2	28.2	12.8	6.9	175	8	203	28.7	729	8	203
NFD 550 A	NFD 550 M	526 – 550	14.9 – 15.6	28.2	12.8	29.5	13.4	8	203	9	229	29	737	9.4	239
NFD 575 A	NFD 575 M	551 – 575	15.6 – 16.3	29.6	13.4	30.9	14.0	8	203	9	229	29	737	9.4	239
NFD 600 A	NFD 600 M	576 – 600	16.3 – 17.0	30.9	14.0	32.2	14.6	8	203	9	229	29	737	9.4	239
NFD 625 A	NFD 625 M	601 – 625	17.0 – 17.7	32.2	14.6	33.6	15.2	8	203	9	229	29	737	9.4	239
NFD 650 A	NFD 650 M	626 – 650	17.7 – 18.4	33.6	15.2	34.9	15.8	8	203	9	229	29	737	9.4	239
NFD 675 A	NFD 675 M	651 – 675	18.4 – 19.1	34.9	15.8	36.3	16.4	8	203	9	229	29	737	9.4	239
NFD 700 A	NFD 700 M	676 – 700	19.1 – 19.8	36.3	16.4	37.6	17.1	8	203	9	229	33.8	859	9.4	239
NFD 725 A	NFD 725 M	701 – 725	19.8 – 20.5	37.6	17.1	38.9	17.7	8	203	9	229	33.8	859	9.4	239
NFD 750 A	NFD 750 M	726 – 750	20.6 – 21.2	38.9	17.7	40.3	18.3	8	203	9	229	33.8	859	9.4	239
NFD 775 A	NFD 775 M	751 – 775	21.3 – 21.9	40.3	18.3	41.6	18.9	8	203	9	229	33.8	859	9.4	239
NFD 800 A	NFD 800 M	776 – 800	22.0 – 22.6	41.6	18.9	43.0	19.5	8	203	9	229	33.8	859	9.4	239
NFD 825 A	NFD 825 M	801 – 825	22.7 – 23.4	43.0	19.5	44.3	20.1	8	203	9	229	33.8	859	9.4	239

(Continued on next page)

Operating Temperature Range: NFD 225-825: 20°F (-7°C) to 130°F (54°C)
NFD 850-1800: 32°F (0°C) to 130°F (54°C)

Discharge Temperature Range: NFD 225 through NFD 1800: 175 - 225°F (79 - 107°C)

- Models NFD 225 through NFD 825 approved for vertical or horizontal mounting.
- Models NFD 850 through NFD 1800 for vertical mounting only.
- All NFD Models are refillable.
- NFD Models are only offered in either US DOT/TC or European, CE. (Not Both)
- US Coast Guard approval requires the installation of manual discharge capability on all systems installed in compartments of 1,000 cubic feet (28.3 cubic meter) and larger.
- ABYC, A-4, Fire Equipment Standard: Fixed fire extinguishing systems (August 1, 2009) shall be capable of both Automatic and Manual operation.
- NFG and NFD systems are designed for only one cylinder (single nozzle) to protect the entire space. Using two cylinders to achieve combined coverage is not acceptable.

Abbreviations:
CU FT = Cubic Feet KG = Kilograms LBS = Pounds
CU M = Cubic Meters IN = Inches MM = Millimeters

Specification Table
Sea-Fire "NFD" Series Manual/Automatic Fire Suppression systems
DOT 4BW / TC 4BWM or TPED/ADR Cylinders

										Installation Dimension Requirements					
Model		Area of Protection		Minimum Novec 1230 Agent		Maximum Novec 1230 Agent		Cylinder Dia		W		H		D	
	Manual/ Auto	Cubic FT Range	Cubic M Range	LBS	KG	LBS	KG	IN	MM	IN	MM	IN	MM	IN	MM
VERTICAL MOUNT ONLY	NFD 850 M	826 – 850	23.4 – 24.1	44.3	20.1	45.7	20.7	10	254	16.5	419	30.7	780	11.4	290
	NFD 875 M	851 – 875	24.1 – 24.8	45.7	20.7	47.0	21.3	10	254	16.5	419	30.7	780	11.4	290
	NFD 900 M	876 – 900	24.8 – 25.5	47.0	21.3	48.3	21.9	10	254	16.5	419	30.7	780	11.4	290
	NFD 925 M	901 – 925	25.5 – 26.2	48.3	21.9	49.7	22.5	10	254	16.5	419	30.7	780	11.4	290
	NFD 950 M	926 – 950	26.2 – 26.9	49.7	22.5	51.0	23.1	10	254	16.5	419	30.7	780	11.4	290
	NFD 975 M	951 – 975	26.9 – 27.6	51.0	23.1	52.4	23.8	10	254	16.5	419	30.7	780	11.4	290
	NFD 1000 M	976 – 1000	27.6 – 28.3	52.4	23.8	53.7	24.4	10	254	16.5	419	30.7	780	11.4	290
	NFD 1025 M	1001 – 1025	28.3 – 29.0	53.7	24.4	55.0	25.0	10	254	16.5	419	30.7	780	11.4	290
	NFD 1050 M	1026 – 1050	29.1 – 29.7	55.1	25.0	56.4	25.6	10	254	16.5	419	30.7	780	11.4	290
	NFD 1075 M	1051 – 1075	29.8 – 30.4	56.4	25.6	57.7	26.2	10	254	16.5	419	30.7	780	11.4	290
	NFD 1100 M	1076 – 1100	30.5 – 31.1	57.7	26.2	59.1	26.8	10	254	16.5	419	30.7	780	11.4	290
	NFD 1125 M	1101 - 1125	31.2 – 31.9	59.1	26.8	60.4	27.4	10	254	16.5	419	30.7	780	11.4	290
	NFD 1150 M	1126 – 1150	31.9 – 32.6	60.4	27.4	61.8	28.0	10	254	16.5	419	30.7	780	11.4	290
	NFD 1175 M	1151 – 1175	32.6 – 33.3	61.8	28.0	63.1	28.6	10	254	16.5	419	30.7	780	11.4	290
	NFD 1200 M	1176 – 1200	33.3 – 34.0	63.1	28.6	64.4	29.2	10	254	16.5	419	30.7	780	11.4	290
	NFD 1225 M	1201 – 1225	34.0 – 34.7	64.5	29.2	65.8	29.8	10	254	16.5	419	30.7	780	11.4	290
	NFD 1250 M	1226 – 1250	34.7 – 35.4	65.8	29.8	67.1	30.4	10	254	16.5	419	30.7	780	11.4	290
	NFD 1275 M	1251 – 1275	35.4 – 36.1	67.1	30.5	68.5	31.1	10	254	16.5	419	39.9	1013	11.4	290
	NFD 1300 M	1276 – 1300	36.1 – 36.8	68.5	31.1	69.8	31.7	10	254	16.5	419	39.9	1013	11.4	290
	NFD 1325 M	1301 – 1325	36.8 – 37.5	69.8	31.7	71.2	32.3	10	254	16.5	419	39.9	1013	11.4	290
	NFD 1350 M	1326 – 1350	37.5 – 38.2	71.2	32.3	72.5	32.9	10	254	16.5	419	39.9	1013	11.4	290
	NFD 1375 M	1351 – 1375	38.3 – 38.9	72.5	32.9	73.8	33.5	10	254	16.5	419	39.9	1013	11.4	290
	NFD 1400 M	1376 – 1400	39.0 – 39.6	73.9	33.5	75.2	34.1	10	254	16.5	419	39.9	1013	11.4	290
	NFD 1425 M	1401 – 1425	39.7 – 40.3	75.2	34.1	76.5	34.7	10	254	16.5	419	39.9	1013	11.4	290
	NFD 1450 M	1426 – 1450	40.4 – 41.1	76.5	34.7	77.9	35.3	10	254	16.5	419	39.9	1013	11.4	290
	NFD 1475 M	1451 – 1475	41.1 – 41.8	77.9	35.3	79.2	35.9	10	254	16.5	419	39.9	1013	11.4	290
	NFD 1500 M	1476 – 1500	42.0 – 42.5	79.2	35.9	80.6	36.5	10	254	16.5	419	39.9	1013	11.4	290
	NFD 1525 M	1501 – 1525	42.5 – 43.2	80.6	36.5	81.9	37.1	10	254	16.5	419	39.9	1013	11.4	290
	NFD 1550 M	1526 – 1550	43.2 – 43.9	81.9	37.2	83.2	37.8	10	254	16.5	419	39.9	1013	11.4	290
	NFD 1575 M	1551 – 1575	43.9 – 44.6	83.2	37.8	84.6	38.4	10	254	16.5	419	39.9	1013	11.4	290
	NFD 1600 M	1576 – 1600	44.6 – 45.3	84.6	38.4	85.9	39.0	10	254	16.5	419	39.9	1013	11.4	290
	NFD 1625 M	1601 – 1625	45.3 – 46.0	85.9	39.0	87.3	39.6	10	254	16.5	419	39.9	1013	11.4	290
	NFD 1650 M	1626 – 1650	46.0 – 46.7	87.3	39.6	88.6	40.2	10	254	16.5	419	39.9	1013	11.4	290
	NFD 1675 M	1651 – 1675	46.7 – 47.4	88.6	40.2	89.9	40.8	10	254	16.5	419	39.9	1013	11.4	290
	NFD 1700 M	1676 – 1700	47.5 – 48.1	90.0	40.8	91.3	41.4	10	254	16.5	419	39.9	1013	11.4	290
	NFD 1725 M	1701 – 1725	48.2 – 48.8	91.3	41.4	92.6	42.0	10	254	16.5	419	39.9	1013	11.4	290
	NFD 1750 M	1726 – 1750	48.9 – 49.6	92.6	42.0	94.0	42.6	10	254	16.5	419	39.9	1013	11.4	290
	NFD 1775 M	1751 – 1775	49.6 – 50.3	94.0	42.6	95.3	43.2	10	254	16.5	419	39.9	1013	11.4	290
	NFD 1800 M	1776 – 1800	50.3 – 51.0	95.3	43.2	96.7	43.8	10	254	16.5	419	39.9	1013	11.4	290

Three (3) Year "NFG" and "NFD" Series Limited Warranty

We warrant to the original retail purchaser, the NFD and NFG suppression systems for a period of three (3) years after retail purchase against defective material and faulty workmanship. Any system found to be defective during the warranty period will repaired if possible, or replaced free of charge if classified as non-refillable (according to the product label) upon the ***prepaid*** return of the defective system to Sea-Fire facility or authorized service party. Proof of purchase required, otherwise date of manufacturer on cylinder specification label will apply. This warranty gives you specific legal rights which may vary by state or country.

The foregoing warranty is made in lieu of all other warranties with respect to the system including any implied warranty of merchantability or fitness for a particular purpose. No person is authorized to give any other warranty, or assume for Sea-Fire Marine any other liability in connection with the sale or installation of its products. Replacement of the system will be the sole remedy with respect to any loss or damage to property. Buyer is not relying on seller's judgment regarding buyer's particular requirements and buyer has had an opportunity to inspect the product to buyer's satisfaction.

Conditions

All Sea-Fire products are leak tested after manufacture and shipped in perfect working order. Damage noted upon receipt of shipment should be addressed as a shipping claim, the filing of which is the sole responsibility of the consignee for which the total compensatory award will be limited to that appropriated by the carrier. Insured freight costs are the responsibility of the consignee. Missing component parts and damage noted upon installation are typically the result of mishandling during the installation process and will not qualify for warranty coverage. Incidents of accidental discharge are not indicative of product failure – heed product warnings to avoid injury and / or associated costs. **No returns will be processed without proper return authorization.**

Out of Warranty Replacements / Recharges

Sea-Fire "NFG" Model Series cylinders comply with US DOT Specification 39 and PED. These cylinders are **not refillable**. The discharged cylinder will be replaced with a comparable Sea-Fire cylinder upon ***prepaid*** return of the discharged system for one-half of the current suggested list price.

Sea-Fire "NFD" Model Series cylinders comply with DOT/TC or European Specifications (TPED/ADR), as detailed in the cylinder inspection/ cylinder testing section, which allow discharged cylinders to be **refilled** and serviced. The discharged cylinder may be refilled upon the ***prepaid*** return of the discharged system. Contact factory or an authorized dealer for details.

Return to:

Sea-Fire Marine - USA
Baltimore, Maryland
Website: www.Sea-Fire.com

or

Sea-Fire Europe, LTD
Hampshire
United Kingdom
Website: www.Sea-Fire.co.uk

Section 1 – Company and Chemical Identification

Metalcraft / Sea-Fire Marine
9331-A Philadelphia Road
Baltimore, Maryland 21237
http://www.sea-fire.com

Emergency Phone: 1-800-535-5053 (InfoTrac)
International Phone: 352-323-3500
Phone: 1-800-445-7680
Issue Date: August 30, 2009
Product Name: **Fire Extinguisher / System**

Product Name: 3M (TM) Novec (TM) 1230 Fire Protection Fluid [FK-5-1-12]

Section 2: Ingredients

C.A.S.	Ingredient Name	OSHA PEL	ACGIH TLV	OSHA STEL	%
756-13-8	1,1,1,2,2,4,5,5,5-NONAFLUORO-4-(Trifluoromethyl)-3- Pentanone	N/A	N/A	N/A	> 99
7727-37-9	Nitrogen, Compressed	None	Simple Asphyxiant	N/A	1

There are NO substances presenting a health or environmental hazard within the meaning of Directive 67/548/EEC, in concentrations equal to or greater than those laid down in the table set out in Article 3 (3) of Directive 1999/45/EC, nor with lower limits given in Annex I to Directive 67/548/EEC or in Annexes II, III or V to Directive 1999/45/EC.
There are NO substances for which there are Community workplace exposure limits, which are not already included in above.
NOTE: Unless a component presents a severe hazard, it does not need to be considered in the MSDS if the concentration is less than 1%. [According to Directive 1999/45/EC.]

Section 3: Hazards Identification

3.1 Emergency Overview
Odor, Color, Grade: Clear colorless, low odor gas.
3.2 Potential Health Effects
(Acute Exposure):
Eye Contact
Contact with the eyes during product use is not expected to result in significant irritation.
Skin Contact: Contact with the skin during product use is not expected to result in significant irritation.
Inhalation: Prolonged or repeated exposure, above recommended guidelines, may be absorbed following inhalation and cause target organ effects.
Ingestion: No health effects are expected.
Chronic Exposure:
FOR HUMANS:
EU Classification: This product is not classified as dangerous according to Directive 1999/45/EC.
Limit Values for Exposure: 1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone.
TWA Limit: 150 ppm. Limit set by 3M Company.
Neither this preparation nor the substances contained in it have been listed as carcinogenic by National Toxicology Program, I.A.R.C., or OSHA.
AS PART OF GOOD INDUSTRIAL AND PERSONAL HYGIENE AND SAFETY PROCEDURE, avoid all unnecessary exposure to the chemical substance and ensure prompt removal from skin, eyes, and clothing. DO NOT eat, drink or smoke when using this product.

Prolonged or repeated exposure, above recommended guidelines, may cause liver effects. Signs / symptoms may include loss of appetite, weight loss, fatigue, weakness, abdominal tenderness and jaundice.
MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: None known.
FOR ENVIRONMENT: No harm to the environment is expected from an accidental release of this preparation. See Section 12, ECOLOGICAL INFORMATION.

Section 4: First Aid Measures

4.1 First Aid Procedures
The following first aid recommendations are based on an assumption that appropriate personal and industrial hygiene practices are followed.
Eye Contact: Flush eyes with large amounts of water. If signs / symptoms persist, get medical attention.
Skin Contact: Wash affected area with soap and water. If signs / symptoms develop, get medical attention.
Inhalation: If signs / symptoms develop, remove person to fresh air. If signs / symptoms persist, get medical attention.
If Swallowed: Do not induce vomiting. Give victim two glasses of water. Never give anything by mouth to an unconscious person.
If signs / symptoms develop, get medical attention.

Section 5: Fire Fighting Measures

5.1 Flammable Properties
Autoignition temperature: *Not Applicable.*
Flash Point: *Not Applicabl.e*
Flammable Limits - LEL [*Details:* Nonflammable].
Flammable Limits - UEL [*Details:* Nonflammable].
5.2 Extinguishing Media
Product is a fire-extinguishing agent.
5.3 PROTECTION OF FIRE FIGHTERS
Special Fire Fighting Procedures: Wear full protective equipment (Bunker Gear) and a self-contained breathing apparatus (SCBA).
Unusual Fire and Explosion Hazards: Not applicable.
Note: See STABILITY AND REACTIVITY (SECTION 10) for hazardous combustion and thermal decomposition information.

Section 6: Accidental Release Measures

For personal protection: Prevent skin and eye contact, see Section 8 EXPOSURE CONTROLS / PERSONAL PROTECTION.
Clean up: Ventilate the area with fresh air. Contain spill. For larger spills, cover drains and build dikes to prevent entry into sewer systems or bodies of water. Working from around the edges of the spill inward, cover with bentonite, vermiculite, or commercially available inorganic absorbent material. Mix in sufficient absorbent until it appears dry.
Collect as much of the spilled material as possible. Clean up residue. Place in a metal container approved for transportation by
appropriate authorities. Seal the container. Dispose of collected material as soon as possible.
See Section 13, DISPOSAL CONSIDERATIONS.
NO harm to the environment is expected from an accidental release of this preparation.
See Section 12, ECOLOGICAL INFORMATION.
In the event of a release of this material, the user should determine if the release qualifies as reportable according to local, state, and federal regulations.

Section 7: Handling and Storage

7.1 Handling

Contents under pressure. Avoid breathing of vapors, mists or spray. Avoid eye contact with vapors, mists, or spray. Handle, transport and store carefully and securely to avoid accidental knocking over or other severe physical impacts. Do not expose to direct heat sources. See incompatibility information in Section 10, STABILITY AND REACTIVITY.

7.2 Storage

Keep container in well-ventilated area. Do not store in temperature above 130^{o}F (54^{o}C). See incompatibility information in Section 10, STABILITY AND REACTIVITY. There is minimal danger to the environment from a storage release. See Section 12, ECOLOGICAL INFORMATION.

7.3. Specific use

The intended or recommended use of this preparation is as a FIRE EXTINGUISHING AGENT / SYSTEM.

Section 8: Exposure Controls / Personal Protection

8.1 Personal Protective Equipment (PPE)

Proper handling should not incur exposure to agent. As a precaution for accidental discharge or leakage, the following should be followed:

8.1.1 Eye / Face Protection

Avoid eye contact.

The following eye protection(s) are recommended: Indirect Vented Goggles.

8.1.2 Skin Protection

Avoid prolonged or repeated skin contact.

Select and use gloves and / or protective clothing to prevent skin contact based on the results of an exposure assessment. Consult with your glove and / or protective clothing manufacturer for selection of appropriate compatible materials.

Gloves made from the following material(s) are recommended: Butyl Rubber.

8.1.3 Respiratory Protection

Avoid breathing of vapors, mists or spray. Under normal use conditions, airborne exposures are not expected to be significant enough to require respiratory protection.

Select one of the following NIOSH approved respirators based on airborne concentration of contaminants and in accordance with OSHA regulations: Half face piece or full face air-purifying respirator with organic vapor cartridges. Consult the current 3M

Respiratory Selection Guide for additional information or call 1-800-243-4630 for 3M technical assistance. If thermal decomposition

occurs, wear supplied air respiratory protection.

8.1.4 Prevention of Swallowing

Do not eat, drink or smoke when using this product. Wash exposed areas thoroughly with soap and water.

8.1.5 Hand protection

Butyl Rubber gloves are recommended. Select and use gloves and / or protective clothing to prevent skin contact based on the results of an exposure assessment. Consult with your glove and / or protective clothing manufacturer for selection of appropriate compatible materials.

8.2 Exposure Limit Values

1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone

TWA Limit: 150 ppm. Limit set by 3M Company.

8.3 Environmental exposure controls

There is minimal danger to the environment from a storage release. See Section 12, ECOLOGICAL INFORMATION.

Section 9: Physical And Chemical Properties

Specific Physical Form: Liquid and gas mixture

Odor, Color, Grade: Clear colorless, low odor.

General Physical Form: Liquid and gas

Specific Gravity: 1.6 [*Ref Std:* WATER=1]

Melting point -108^{o}C

Solubility in Water: Nil

Autoignition temperature: *Not Applicable*
Flash Point: *Not Applicable*
Flammable Limits - LEL [*Details:* Nonflammable]
Flammable Limits - UEL [*Details:* Nonflammable]
Boiling point: 49°C (120.6°F)
Vapor Density: 11.6 [*Ref Std:* AIR=1]
pH: *Not Applicable*

Evaporation rate: > 1 [*Ref Std:* BUOAC=1]
Volatile Organic Compounds: *No Data Available*
Percent volatile: 100 %
VOC Less H2O & Exempt Solvents: *No Data Available*
Viscosity: 0.6 centipoise [@ 25°C]
Vapor Pressure: 244 mmHg [@ 20 °C]

Section 10: Stability and Reactivity

Stability: Stable under normal conditions of handling and use.
Materials and Conditions to Avoid: Strong bases; Amines; Alcohols: Avoid direct sunlight and ultraviolet light for extended periods. Do not store above 130°F (54°C) taking into account effects of sunlight.
Hazardous Polymerization: Hazardous polymerization will not occur.
Hazardous Decomposition or By-Products:
Combustion or decomposition products include carbon monoxide, carbon dioxide, and hydrogen fluoride.

Section 11: Toxicological Information

Product:
Toxicity Data: Inhalation LC50 (rat) >10 % v/v.
NOAEL for cardiac sensitization >10 % v/v.

Section 12: Ecological Information

12.1. Ecotoxicity: Not determined.
12.2. Mobility: Product is highly insoluble in water and volatile.
12.3. Persistence and degradability: Photolytic half-life is 3 to 5 days. The persistent photolytic degradation product is trifluoroacetic acid.
12.4. Bioaccumulative potential: Not determined.
12.5. Other adverse effects: Ozone depletion potential: None.
Photochemical ozone creation potential: None. Global warming potential: 1.

Section 13: Disposal Considerations

Waste Disposal Method: Reclaim if feasible. For information on product return, contact Sea-fire Marine. Incinerate in an industrial or commercial facility in the presence of a combustible material. Combustion products will include HF. Facility must be capable of handling halogenated materials.
As a disposal alternative, dispose of waste product in a facility permitted to accept chemical waste. **EPA Hazardous Waste Number (RCRA):** Not regulated.
Since regulations vary, consult applicable local regulations or authorities before disposal.

Section 14: Transport Information

Hazard Class or Division: 2.2.
Label: Non flammable gas.
Proper Shipping Name: Compressed Gas, n.o.s, (nitrogen and fluorinated ketone mixture)
ID Number: UN 1956
Packing Group: N/A
Packing Instructions: 200
For additional transport information, contact Sea-fire Marine.
No harm to the environment is expected from this preparation. See Section 12, ECOLOGICAL INFORMATION.

Section 15: Regulatory Information

EU Classification: This product is not classified as dangerous according to Directive 1999/45/EC.
Exposure Limit Values: 1,1,1,2,2,4,5,5,5-Nonafluoro-4-(trifluoromethyl)-3-pentanone.
TWA Limit: 150 ppm. Limit set by 3M Company.
EINECS Status: The component of this product has been notified to ELINCS (European List of Notified or New Chemical
Substances). Certain restrictions apply. Contact your distributor for additional information.
EPA TSCA Status: All components are included in TSCA inventories or are exempt from listing.
Canadian DSL (Domestic Substances List): All components are included in the DSL or are exempt from listing.
The product also complies with the chemical notification requirements for Korea (KECI), Australia (AICS), Japan (METI),
and China (CICS).
Environmental restrictions: None are known.
Restrictions on Marketing and Use: None are known.
Refer to any other national measures that may be relevant.

Section 16: Other Information

Format is from directive 2001/58/EC.
There is no data in EINECS http://exb.jrc.it/existing-chemicals/.
Data used to compile the data sheet is from 3M Material Safety Data Sheet, Jan. 21, 2004 and other product literature.
The EU Classification is in accordance with Directive 1999/45/EC.
(WHMIS) CANADIAN WORKPLACE HAZARDOUS MATERIAL IDENTIFICATION SYSTEM RATINGS:
This product is rated: **Not Hazardous.**
(HMIS) HAZARDOUS MATERIAL IDENTIFICATION SYSTEM RATINGS:

HEALTH: 0	4. Severe Hazard ___	1. Slight Hazard
FLAMMABILITY: 0	3. Serious Hazard ___	0. Minimal Hazard
REACTIVITY: 1	2. Moderate Hazard ___	

PROTECTION: See Section 8. EXPOSURE CONTROLS / PERSONAL PROTECTION.

Section 17: Disclaimer of Expressed and Implied Warranties

Metalcraft / Sea-Fire Marine, Inc. has taken reasonable care in preparing this document, however, since the use of this information and the conditions of use of the product are not within the control of Metalcraft / Sea-Fire Marine, Inc., it is the user's obligation to determine the conditions of safe use of this product. The information in this document is offered with no warranties or representations as to accuracy or completeness and it is the responsibility of each individual to determine the suitability of the information for their particular purpose(s).

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