### TABLE OF CONTENTS

#### 1.0 AGENT
- 1.1 AGENT: 3M™ Novec™ 1230 (also referred to as FK-5-1-12)  
- 1.2 Pre-engineered fire suppression systems uses & limitations  
- 1.3 Agent exposure  
- 1.4 Chilling & visibility  
- 1.5 Pressure  
- 1.6 Agent storage containers  
- 1.7 Fill density  
- 1.8 Cylinder temperature & pressure relationship

#### 2.0 EQUIPMENT
- 2.1 Description  
- 2.2 Agent storage containers  
- 2.3 Valves  
- 2.4 Mounting brackets  
- 2.5 Burst Disc  
- 2.6 Pressure gauge  
- 2.7 Linear thermal detector & actuation tubing  
- 2.8 Cylinder name plate  
- 2.9 Manual release  
- 2.10 Solenoid actuator  
- 2.11 Piping  
- 2.12 Nozzles  
- 2.13 Construction features

#### 3.0 ANCILLARY EQUIPMENT
- 3.1 Caution-area protected by clean agent fire suppression system sign

#### 4.0 DESIGN
- 4.1 System design concept  
- 4.2 Hazard evaluation  
- 4.3 Determine concentration percentage  
- 4.4 Safety recommendations  
- 4.5 Determining agent quantity  
- 4.6 Determine enclosure integrity  
- 4.7 Locate the cylinder  
- 4.8 Determine the location & placement of the tubing  
- 4.9 Nozzle requirements  
- 4.10 Nozzle area & volume coverage  
- 4.11 Sample calculations

#### 5.0 INDIRECT LOW PRESSURE SYSTEMS LIMITATIONS
- 5.1 Temperature limitations  
- 5.2 Operating pressure  
- 5.3 Discharge time  
- 5.4 Closeable openings  
- 5.5 Ventilation shutdown  
- 5.6 System specifications  
- 5.7 Thermal detection tubing system design  
- 5.8 Discharge pipe requirements

#### 6.0 ILP SYSTEM INSTALLATION INSTRUCTIONS
- 6.1 Container location  
- 6.2 Storage temperature limitations  
- 6.3 Installation of 3, 7, & 14 lb systems  
- 6.4 Mounting brackets  
- 6.5 Physical mounting  
- 6.6 Pressurizing detection tubing  
- 6.7 Discharge pipe & nozzles

#### 7.0 FINAL SYSTEM CHECKOUT
- 7.1 Compartment (hazard) area check

#### 8.0 SYSTEM OPERATION
- 8.1 General  
- 8.2 Operating procedures  
- 8.3 Post fire operation  
- 8.4 Cylinder recharge  
- 8.5 Detection tubing

#### 9.0 MAINTENANCE
- 9.1 Maintenance program  
- 9.2 Agent storage containers

#### 10.0 POST FIRE SERVICE & MAINTENANCE
- 10.1 Replacement of detection tubing  
- 10.2 Cylinder valve

#### 11.0 WARRANTY STATEMENT
- APPENDIX A: SYSTEM & PARTS LIST  
- APPENDIX B: COMPONENT DRAWINGS  
- APPENDIX C: FILL PROCEDURE  
- APPENDIX D: MATERIAL SAFETY DATA SHEET 3M™ Novec™ 1230
FOREWORD

Minimax Design, Installation, & Maintenance Manual for MINIMAX SSP 1230 Clean Agent Fire Suppression Systems incorporates the latest design requirements found in NFPA Standard 2001, as well as the most up-to-date information available for our products. This manual is a comprehensive guide of information compiled as a result of research, development and testing. It has been provided for those individuals that are responsible for the design, installation, and/or maintenance of Minimax SSP 1230 Clean Agent Fire Suppression Systems. It is the responsibility of the designer and installer to remain within the parameters established in this design, installation and maintenance manual.

Sales and marketing personnel as well as architects, engineers, etc. will find the information contained in this manual useful. Minimax SSP 1230 Clean Agent Fire Suppression Systems are offered only in the Pre-Engineered format.

Pre-Engineered Systems are simple systems that operate within a predetermined set of design parameters with limitations that are pre-established by testing. Minimax fire suppression systems are tested and approved by Factory Mutual (FM) & Underwriters Laboratories (UL). These systems do not require the designer to perform any hydraulic flow calculations and they are intended to provide a means of designing 3M™ Novec™ 1230 fire suppression systems.

Minimax SSP 1230 Clean Agent Fire Suppression Systems must be installed and maintained in accordance with the limitations established in NFPA Standard 2001, Clean Agent Extinguishing Systems, as well as the limitations set forth by UL and FM. The information contained within this manual defines the established limitations in detail.

IMPORTANT

Minimax believes that the information incorporated into this manual is accurate as of the date this manual was prepared. It has been compiled to allow those responsible for designing and installing Minimax SSP 1230 Clean Agent Fire Suppression Systems to properly do so, and for the parties responsible for verifying the system design to determine if the design parameters have been met. The data contained within this manual is provided for informational purposes only. Minimax disclaims all liability for any other use that may be made of the data contained within this manual by any, and all, parties. Minimax believes this data to be accurate; however, all dimensions are approximate and this document is presented without any guarantee or warranty whatsoever. Any questions concerning the information presented in this manual should be addressed to:

Minimax USA LLC
3025 Independence Drive Suite C
Livermore, CA 94551
Minimax SSP 1230 Clean Agent Fire Suppression Systems are to be designed, installed, inspected, maintained, tested, and recharged by qualified, trained fire protection personnel in accordance with the following:

- Standard of the National Fire Protection Association No 2001, titled “Clean Agent Extinguishing Systems”
- Instructions and Limitations in this manual, Minimax Part Number 027650010
- Storage, handling, transportation, service, maintenance, recharge, and test of agent storage containers shall be performed only by qualified trained personnel in accordance with the information in this manual. Minimax Part Number 027650010, chemical manufacturers instructions for Safe Handling & Transferring 3M™ Novec™ 1230.
- Compressed Gas Association™ (CGA) pamphlets:
  - C-1, “Methods for Hydrostatic testing of Compressed Gas Cylinders”
  - C-6, “Standards for Visual Inspection of Compressed gas cylinders”
  - P-1, “Safe Handling of Compressed Gases in Containers”
- All information contained on the system container(s) nameplate *
- CGA pamphlets are published by and available for purchase from the Compressed Gas Association 4221 Walney Road, Fifth Floor, Chantilly, VA 20151-2923. Tel. (703)788-2700

**SAFETY**

The following symbols are used in this manual. Wherever they appear it indicates a need to exercise caution and pay attention to the details. The symbols are relevant to the safe use of the equipment described in this manual.

1. Always treat a cylinder as though it were fully charged.
2. When working with fire suppression agents always wear safety glasses.
3. When working with cryogenic agents always wear leather gloves to avoid cryogenic burns.
4. Before removing a cylinder from an installation: ensure the ball valve(s) are secure on the top of the cylinder, that the valve assembly is closed and in the “off” position, then remove the tubing.

---

**CAUTION**

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. CAUTION [signs] without a safety alert symbol may be used to alert against unsafe practices that can result in property damage only. (Triangular Sign)

**WARNING**

Indicates a hazardous situation which, if not avoided, could result in death or serious injury. WARNING [signs] should not be used for property damage hazards unless personal injury risk appropriate to this level is also involved (Circle Sign)

**DANGER**

Indicates a hazardous situation which, if not avoided, will result in death or serious injury. The signal word “DANGER” is to be limited to the most extreme situations. DANGER [signs] should not be used for property damage hazards unless personal injury risk appropriate to these levels is also involved. (Rectangle Sign)

**CAUTION**

Read and understand this manual and all material referred to in this manual before attempting to install, maintain or recharge any ilp fire suppression system.
1.0 AGENT

This section covers the fire suppressing agent utilized by Minimax SSP 1230 Clean Agent Fire Suppression Systems. All of the information contained herein is believed to be accurate and up-to-date. However, it should be noted that all dimensions shown are approximate and Minimax reserves the right to make adjustments as necessary.

1.1. AGENT- 3M™ NOVEC™ 1230 (ALSO REFERRED TO AS FK-5-1-12)

3M™ Novec™ 1230 extinguishing agent is a next-generation halon replacement, designed to alleviate concerns for human safety, performance, and the environment. Unlike first generation HFCs, 3M™ Novec™ 1230 has key features which define sustainable clean agent protection:
- Zero ozone depletion potential
- A global warming potential of one
- Five-day atmospheric lifetime
- A large margin of safety for occupied spaces

3M™ Novec™ 1230 is based on a proprietary chemical from 3M called a fluoroketone. The full chemical name for this compound is dodecafluoro-2-methylpentan-3-one. Its ASHRAE nomenclature -the way it is designated in the NFPA 2001 and ISO 14529 clean agent standards- is FK-5-1-12, however it will be designated as 3M™ Novec™ 1230 throughout this manual. 3M™ Novec™ 1230 is applied as a gas, but is liquid at room temperature, (See Physical Properties Table below). It is electrically non-conducting in both the liquid and gaseous state. 3M™ Novec™ 1230 has been tested and verified to be safe for use in occupied spaces when used as specified in the U.S. EPA Significant and New Alternative Policy (SNAP) rules. Tests have proven that exposure to 3M™ Novec™ 1230 is safe and effective in extinguishing fires at low concentrations, all of which are well below the EPA's maximum exposure levels. 3M™ Novec™ 1230 is approved for use in occupied areas up to 10.5% concentration by volume with a mandated egress time of 5 min or less.

1.1.1. EXTINGUISHING MECHANISM

In order to understand how 3M™ Novec™ 1230 extinguishes a fire, it is important to review the principal aspects of fire chemistry. Four components- fuel, oxygen, heat, and the combustion chain reaction- are often referred to as the “fire tetrahedron”

All four of these factors are required in the correct combination for a fire to ignite and sustain burning. The fire tetrahedron shows that a fire can be extinguished by breaking one or more links between these components or by changing the balance between them.
1. By interrupting the combustion chain reaction.
2. By containing or eliminating the source of fuel.
3. By cutting off or diluting the source of oxygen.
4. By removing sufficient heat from the fire.

1.2 PRE-ENGINEERED FIRE-SUPPRESSION SYSTEMS USES & LIMITATIONS

Minimax SSP 1230 Clean Agent Fire Suppression Systems must be designed and installed in accordance with the requirements outlined in this manual, PN 027650010, and in accordance with the requirements of the NFPA 2001 Standard for Clean Agent Extinguishing Systems, latest edition, ULand FM. Minimax SSP 1230 Clean Agent Fire Suppression Systems are used to protect hazards that are enclosed. An enclosed hazard area will provide a means to contain the 3M™ Novec™ 1230 agent. By containing the agent in the enclosure, when discharged it will establish and maintain an effective extinguishing concentration. Some typical hazards that can be protected with SSP 1230 Clean Agent Fire Suppression Systems include but are not limited to the following:
- Laboratory fume/exhaust cabinets
- Machinery Spaces
- Small compartments
- Electrical and electronic hazards
- Paint lockers
- Telecommunication areas
- CNC & VMC Machining Centers
- UPS Units
- Transformer cabinets
- Other high value assets

3M™ Novec™ 1230, like other halocarbon halon alternatives, extinguishes fire simply by removing heat from the fire. Upon discharge, 3M™ Novec™ 1230 creates a gaseous mixture with air. This agent/air mixture has a heat capacity much larger than that of air alone. A higher heat capacity means that this gas mixture will absorb more energy (heat) for each degree of temperature change it experiences.

At a proper system design concentration, the agent/air mixture absorbs sufficient heat to upset the balance of the fire tetrahedron. The amount of heat the fire loses to the surroundings is increased by the presence of the agent. This causes the combustion zone to cool to the point that the fire extinguishes. 3M™ Novec™ 1230 has the highest heat capacity among all of the commercially available halon alternatives. This results in Novec having the lowest extinguishing concentrations for a given fuel.

1.1.2. PHYSICAL PROPERTIES OF 3M™ NOVEC™ 1230

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical Pressure</td>
<td>18.65 bar (270.44 psi)</td>
</tr>
<tr>
<td>Critical Temperature</td>
<td>168.7 °C (335.6 °F)</td>
</tr>
<tr>
<td>Critical Pressure</td>
<td>106.0 °C (-362.4 °F)</td>
</tr>
<tr>
<td>Critical Temperature</td>
<td>18.65 bar (270.44 psi)</td>
</tr>
<tr>
<td>Critical Volume</td>
<td>494.5 cc/mol (0.0251 ft³/lbm)</td>
</tr>
<tr>
<td>Critical Density</td>
<td>639.1 kg/m³ (39.91 lbm/ft³)</td>
</tr>
<tr>
<td>Specific Heat, Liquid</td>
<td>1.103 kJ/kg °C (0.0634 BTU/lb. °F)</td>
</tr>
<tr>
<td>Specific Heat, Vapor @1 atm</td>
<td>0.891 kJ/kg °C (0.0527 BTU/lb. °F)</td>
</tr>
<tr>
<td>Heat of Vaporization (kJ/kg °C) at Boiling Point</td>
<td>37.8</td>
</tr>
<tr>
<td>Thermal Conductivity (W/m °C) of Liquid</td>
<td>0.034</td>
</tr>
<tr>
<td>Viscosity, Liquid</td>
<td>0.39 centistokes</td>
</tr>
<tr>
<td>Global Warming Potential</td>
<td>1</td>
</tr>
<tr>
<td>NOAEL (VOL %)</td>
<td>10</td>
</tr>
<tr>
<td>LOAEL (VOL %)</td>
<td>&gt; 10.0</td>
</tr>
<tr>
<td>Ozone Depletion Potential</td>
<td>0</td>
</tr>
<tr>
<td>US EPA SNAP Approval</td>
<td>Accepted</td>
</tr>
<tr>
<td>Estimated Atmospheric Lifetime</td>
<td>0.014 years</td>
</tr>
<tr>
<td>4 hr. Acute Inhalation</td>
<td>LC50 &gt;100,000 ppm</td>
</tr>
</tbody>
</table>

*3M™ Novec™ 1230 is a registered trademark of 3M
*Note: All Properties tested at room temp (25 °C) unless otherwise noted
1.0 AGENT

**1.2.1 3M™ Novoc™ 1230 is a gaseous fire suppression agent that is effective on:**
- Class A Fires - Surface Fires of combustible materials as paper, wood, cloth rubber and many plastics.
- Class B Fires - Fires of Flammable Liquids and Gases.
- Class C Fires - Fires that involved energized electrical equipment.

**1.2.2 Minimax SSP 1230 Clean Agent Fire Suppression Systems shall NOT be used on fires involving the following materials:**
- Self-oxidizing chemicals of rapid oxidizing chemicals
  Examples: Cellulose Nitrate and Gunpowder.

**SAFETY MARGIN COMPARISONS**

<table>
<thead>
<tr>
<th>Agent</th>
<th>3M™ Novoc™ 1230</th>
<th>HFC-125</th>
<th>HFC-227 ea</th>
<th>Inert Gas</th>
<th>CO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design concentration</td>
<td>4.2-5.9%</td>
<td>8.7-12.1%</td>
<td>6.25-8.7%</td>
<td>34.2-40.6%</td>
<td>30-75%</td>
</tr>
<tr>
<td>NOAEL</td>
<td>10%</td>
<td>7.50%</td>
<td>9%</td>
<td>43%</td>
<td>&lt;5%</td>
</tr>
<tr>
<td>Safety Margin</td>
<td>69-138%</td>
<td>Nil</td>
<td>3-44%</td>
<td>6-26%</td>
<td>Lethal at design concentration</td>
</tr>
</tbody>
</table>

3M™ Novoc™ 1230 is both low in acute toxicity and is a highly-efficient clean agent extinguisher, so that it puts out fires long before the agent reaches concentration that could harm humans. In fact, because its design concentration is much lower than its No Observable Adverse Effects Level (NOAEL), 3M™ Novoc™ 1230 offers the largest margin of safety among all other chemical clean agents, C02, and inert gas mixtures.

**1.3.1 SPACES NOT NORMALLY OCCUPIED**
Most Minimax suppression systems will be used to provide protection for hazards and compartments that are too small or too remote to be occupied. 3M™ Novoc™ 1230 systems can be designed for concentrations exceeding the LOAEL if the space is not normally occupied or that personnel in the hazard area can escape within 30 seconds.

**1.3.2 TOXICITY**
3M™ Novoc™ 1230 has been extensively tested and is approved for use in fire suppression systems around the world. The LC50 toxicity rating for 3m rM Novoc® 1230 is greater than 100,000 ppm. When one considers that most 3M™ Novoc™ 1230 systems are designed for concentrations providing less than 59,000 ppm it is evident that 3M™ Novoc™ 1230 is safe to use.

**Toxicity Testing Results for 3M™ Novoc™ 1230**

<table>
<thead>
<tr>
<th>Properties</th>
<th>3m™ Novoc™ 1230</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-hr Acute Inhalation</td>
<td>Practically Non-Toxic (LC50 &gt; 100,000 ppm)</td>
</tr>
<tr>
<td>Cardiac Sensitization</td>
<td>Not a sensitizer (NOAEL = 100,000 ppm)</td>
</tr>
<tr>
<td>Acute Dermal Toxicity</td>
<td>Low Toxicity (LD50 &gt; 2000 mg/kg)</td>
</tr>
<tr>
<td>Ames Assay</td>
<td>Negative</td>
</tr>
<tr>
<td>Primary Skin Irritation</td>
<td>Non Irritating</td>
</tr>
<tr>
<td>Primary Eye Irritation</td>
<td>Minimally Irritating</td>
</tr>
</tbody>
</table>

Although 3M™ Novoc™ 1230 has been shown that it is safe to use, there can be some health effects caused by its combustion. Hydrogen fluoride (HF) vapor can be produced in fires as a breakdown product of 3M™ Novoc™ 1230 and other fluorocarbon fire extinguishing agents and in the combustion of fluropolymers. The significant toxicological effects of HF exposure occur at the site of contact. As such one should know what to expect when dealing with this toxic vapor. Table 1.3.2.1, on the following page, shows the health problems caused by exposure to HF vapor.

**Potential Human Health Effects of HF in healthy individuals**

<table>
<thead>
<tr>
<th>Exposure Time</th>
<th>Hydrogen Fluoride (ppm)</th>
<th>Reaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;50</td>
<td>Slight eye and nasal irritation</td>
<td></td>
</tr>
<tr>
<td>50-100</td>
<td>Mild eye and upper respiratory tract irritation</td>
<td></td>
</tr>
<tr>
<td>100-200</td>
<td>Moderate eye and upper respiratory tract irritation; slight skin irritation</td>
<td></td>
</tr>
<tr>
<td>&gt;200</td>
<td>Moderate irritation of all body surfaces; increasing concentration may be escape impairing</td>
<td></td>
</tr>
<tr>
<td>5 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;50</td>
<td>Mild eye and nasal irritation</td>
<td></td>
</tr>
<tr>
<td>50-100</td>
<td>Increasing eye and nasal irritation; slight skin irritation</td>
<td></td>
</tr>
<tr>
<td>100-200</td>
<td>Moderate irritation of skin, eyes, and respiratory tract</td>
<td></td>
</tr>
<tr>
<td>&gt;200</td>
<td>Definite irritation of tissue surfaces; will cause escape impairing at increasing concentrations</td>
<td></td>
</tr>
<tr>
<td>10 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;50</td>
<td>Definite eye, skin, and upper respiratory tract irritation</td>
<td></td>
</tr>
<tr>
<td>50-100</td>
<td>Moderate irritation of all body surfaces; increasing concentration may be escape impairing</td>
<td></td>
</tr>
<tr>
<td>100-200</td>
<td>Moderate irritation of all body surfaces; escape impairing effects likely</td>
<td></td>
</tr>
<tr>
<td>&gt;200</td>
<td>Escape-impairing effects will occur; increasing concentrations can be lethal without medical intervention</td>
<td></td>
</tr>
</tbody>
</table>
1.7. FILL DENSITY

Each cylinder has been designed for a minimum and maximum fill density as shown in table 1.7. Fill Density and temperature affect the pressure in the system cylinder. As the temperature elevates the pressure increases significantly. Should the maximum fill density be exceeded, the cylinder pressure will increase significantly and may present a hazard to personnel as well as the equipment being protected. Adhering to the maximum fill requirements will minimize the possibility of an inadvertent discharge and or the possibility of the system pressure relief device rupturing.

1.8. CYLINDER TEMPERATURE & PRESSURE RELATIONSHIP

Minimax SSP 1230 Clean Agent Fire Suppression Systems are designed to operate between 32 °F and 130 °F (0 °C to 54.4 °C). Chart 1.8 shows the internal cylinder pressure as indicated on the cylinder gauge. The temperature pressure relationship is based on a maximum fill density of 75 pounds of agent per cubic foot at 70 °F (21.1 °C) and a charging pressure of 240 PSI.
1.0 AGENT (continued)

The MINIMAX SSP 1230 Clean Agent Fire Suppression Systems is available in three sizes; each size is assigned a model number:

- Model B07014509 charged with 3 lb. (1.36 kg) of 3M™ Novec™ 1230
- Model B07014510 charged with 7 lb. (3.18 kg) of 3M™ Novec™ 1230
- Model B07014511 charged with 14 lb. (6.35 kg) of 3M™ Novec™ 1230

MINIMAX SSP 1230 Clean Agent Fire Suppression Systems utilizes proprietary flexible pneumatic, thermally sensitive tubing that is used as a detection device. The tubing is pressurized with dry nitrogen when it is put into service. The thermally activated tubing is temperature sensitive. The tubing is installed in the hazard area as a continuous linear detector that will rupture from flame impingement or when the temperature reaches the release point. These systems are developed for use in total flooding applications, where the hazard area is not normally occupied. Please refer to NFPA 2001 for use of 3M™ Novec™ 1230 in occupied areas.

See paragraph 1.2 in this manual for areas where Indirect Low Pressure Systems may be applied to protect the hazard. Should an occasion arise where the hazard is not identified in paragraph 1.2 of this manual please review NFPA 2001, contact Minimax, or the applicable governmental or regulatory authority.

2.0 EQUIPMENT

2.1. DESCRIPTION

All agent storage containers are steel pressure vessels designed to hold the 3M™ Novec™ 1230 under pressure until the agent is discharged. All containers are suitable for use at storage temperatures between 32°F to 130 °F (0 °C to 54.4 °C). Each container is manufactured to DOT regulations and undergoes extensive pressure and leak testing before shipment to the field.

<table>
<thead>
<tr>
<th>Nom / Size</th>
<th>PN</th>
<th>Diameter</th>
<th>Height</th>
<th>Volume</th>
<th>Agent Fill</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>IN</td>
<td>CM</td>
<td>IN</td>
<td>CM</td>
</tr>
<tr>
<td>3</td>
<td>028800011</td>
<td>2.93</td>
<td>7.44</td>
<td>12.43</td>
<td>31.57</td>
</tr>
<tr>
<td>7</td>
<td>028800012</td>
<td>4.99</td>
<td>12.67</td>
<td>11.17</td>
<td>28.37</td>
</tr>
<tr>
<td>14</td>
<td>028800013</td>
<td>6.14</td>
<td>15.60</td>
<td>14.14</td>
<td>35.92</td>
</tr>
</tbody>
</table>

2.2. AGENT STORAGE CONTAINERS - PN 028800011, PN 028800012, & PN 028800013

CAUTION
Minimax SSP 1230 Clean Agent Fire Suppression Systems have been developed to protect a single hazard. It is a SINGLE automatic unit. There are no electric, manual or pneumatic actuators that can be used to discharge multiple cylinders.

CAUTION

2.2.1. Cylinder DOT Specifications

<table>
<thead>
<tr>
<th>Nom Size</th>
<th>DOT Spec</th>
<th>Service Pressure</th>
<th>Test Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>DOT-48240</td>
<td>240 (PSI)</td>
<td>16.55 (BAR)</td>
</tr>
<tr>
<td>7</td>
<td>DOT-48360</td>
<td>240 (PSI)</td>
<td>16.55 (BAR)</td>
</tr>
<tr>
<td>14</td>
<td>DOT-48360</td>
<td>240 (PSI)</td>
<td>16.55 (BAR)</td>
</tr>
</tbody>
</table>
2.0 EQUIPMENT (continued)

2.3. VALVES PN B07010209, PN B07010304

The Indirect Low Pressure valve(s) used on Minimax SSP 1230 Clean Agent Fire Suppression Systems developed for use in fire suppression systems that are actuated by a linear thermal detector. The valve is nickel plated brass equipped with a pressure gauge to monitor the system pressure, a quarter turn ball valve that is the interface between the tubing and the cylinder, and a pressure relief device.

The feature options of the Indirect Low Pressure Valves include:

1. Filling connector with integrated test valve
2. Pressure relief device

Each valve is equipped with 2 discharge ports. Each discharge port is fitted with a safety plug that must be installed in the discharge outlet whenever the cylinder is being transported or is not in service. The safety plugs are intended to prevent uncontrolled discharge of a cylinder in the event of accidental system activation.

Activation of the discharge valve is accomplished by any one of the following:

A. Manual actuation via manual release valve
B. Electric actuation via electric solenoid
C. Automatic actuation via tubing

Indirect Low Pressure Valves are not suitable for any other installation or other purpose. If the user of the product has any questions concerning the correct use or purpose of this product, they should call Minimax. A non-authorized use or application and/or a non-authorized modification of the product or its use or application can result in serious accidents or injuries. Minimax is not responsible for a non-authorized use or application.

### TABLE 2.3

<table>
<thead>
<tr>
<th>Valve technical data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approval</td>
</tr>
<tr>
<td>Product Group</td>
</tr>
<tr>
<td>Connection to gas container</td>
</tr>
<tr>
<td>Valve outlet</td>
</tr>
<tr>
<td>Ascending tube connection</td>
</tr>
<tr>
<td>Top connection</td>
</tr>
<tr>
<td>Pressure Gauge</td>
</tr>
<tr>
<td>Extinguishing Agent</td>
</tr>
<tr>
<td>Propellants</td>
</tr>
<tr>
<td>Minimum opening cross-section</td>
</tr>
<tr>
<td>at valve outlet</td>
</tr>
<tr>
<td>Working Pressure</td>
</tr>
<tr>
<td>Operating Temperature Range</td>
</tr>
<tr>
<td>Leakage Rate</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve body and cover</td>
</tr>
<tr>
<td>Primary seals (membrane)</td>
</tr>
<tr>
<td>Screw-in connections</td>
</tr>
<tr>
<td>Test Valve</td>
</tr>
<tr>
<td>Pressure Gauge</td>
</tr>
<tr>
<td>Secondary Seals</td>
</tr>
</tbody>
</table>

2.4. MOUNTING BRACKETS - 3LB PN 029900169, 7LB PN 029900171, 14 LB PN 029900170

The cylinder wall mounting bracket is epoxy powder coated and is used to mount the cylinder in the vertical position. Each system comes equipped with two stainless steel clamps to hold the cylinder in place.

2.5. BURST DISC - 3 LB (480PSI) PN 029200091, 7 & 14 LB (600PSI) PN 029200088

To protect the cylinder against overpressure.

2.5.1. OPTIONAL PRESSURE SWITCH PN 029900168 OR PN 029900178

The optional pressure switch is connected on to the valve assembly to provide additional electrical functions that may be required. Minimax recommends that a pressure switch be connected to some audio or audio visual device to alert personnel that a system has discharged.

Remark: the switch would still be options for units that have the manual actuator, but required for units that have the solenoid actuator.

2.6. PRESSURE GAUGE - PN 028200191

Pressure gauge indicates internal cylinder pressure. The pressure gauge is color coded to display the acceptable operating range, under pressure range, and over pressure range.

2.6.1. END OF LINE ADAPTOR (EOL) - PN B07810026

The EOL is required to pressurize the thermal activation tubing.
2.0 EQUIPMENT (continued)

2.7. LINEAR THERMAL DETECTOR & ACTUATION TUBING PN - B07800002 (RED TUBING), PN B07800200 (BLACK TUBING)

When the detection tubing is used in the indirect low Pressure system it is only used as a linear thermal detector and activation device. The thermally activated tubing is heat sensitive. Heat from a fire or direct flame impingement during a fire situation will cause the tubing to rupture. The tubing will rupture at any point along its entire length. If the temperature reaches approximately 240°F or 115°C, the release of pressure in the tubing then activates the fire suppression system, resulting in discharge of agent through the piping network and nozzles.

2.8. CYLINDER NAME PLATE

All cylinders are furnished with a nameplate that provides the following information that is specific to that container:

- Assembly number
- Weight information
- Tare weight
- Agent weight
- Gross weight
- Installation Instructions

2.9. MANUAL RELEASE - PN B04420128

The manual release is an inline device. When the push type valve is activated it releases the nitrogen in the tubing allowing the pressure differential valve to open and release the agent into the hazard area. This device mounted in line with the thermally activated tubing provides an independent means of operating the Minimax system without the need for external power. To operate the manual actuator, simply pull the yellow safety device and push the red handle.

2.10. SOLENOID ACTUATOR PN B04420127

The solenoid actuator is an electro mechanical device that allows the Minimax SSP 1230 Clean Agent Fire Suppression Systems to be actuated electrically from a control panel or other electric signal. The solenoid valve comes equipped with a supervisory pressure switch that gets connected to the control panel's supervisory circuit. Please refer to the control panel's installation manual for proper wiring information.

2.11. PIPING

2.11.1. PIPING REQUIREMENTS

Piping must be Schedule 40 steel pipe, either galvanized or black. Specifications ASTM A-53 or A-106, ANSI B36.10 must be used for steel pipe. The piping must also meet the diameter and length requirements as set forth in this manual. The pipe length values and number of elbows as seen in chart 2.12.1 are listed as the maximum pipe length and number of elbows available for use. The pipe diameter as seen in chart 2.12.1 shall not be changed. Max Height refers to the maximum height differential between the cylinder and the nozzle.

<table>
<thead>
<tr>
<th>Agent System</th>
<th>Test Cell Volume</th>
<th>Test Cell Height</th>
<th>Max Area Coverage</th>
<th>Pipe Diameter</th>
<th>Pipe Length</th>
<th>Elbows</th>
</tr>
</thead>
<tbody>
<tr>
<td>3M ™ Novec ™ 1230</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 lb</td>
<td>77.2 ft³</td>
<td>8'</td>
<td>8' x 5.8'</td>
<td>3/4&quot;</td>
<td>192&quot;</td>
<td>5</td>
</tr>
<tr>
<td>7 lb</td>
<td>180.2 ft³</td>
<td>10'</td>
<td>12' x 9'</td>
<td>3/4&quot;</td>
<td>204&quot;</td>
<td>5</td>
</tr>
<tr>
<td>14 lb</td>
<td>360.3 ft³</td>
<td>12'</td>
<td>16' x 13.5'</td>
<td>1/2&quot;</td>
<td>169&quot;</td>
<td>5</td>
</tr>
<tr>
<td>7 lb. (2)</td>
<td>180.2 ft³</td>
<td>10'</td>
<td>12' x 9'</td>
<td>1/2&quot; - Feed, 3/4&quot; - T to Nozzle</td>
<td>Feed: 98&quot; T to Nozzle: 39&quot;</td>
<td>4 - Feed, 1 - T to Nozzle</td>
</tr>
<tr>
<td>14 lb. (2)</td>
<td>360.3 ft³</td>
<td>12'</td>
<td>16' x 13.5'</td>
<td>Feed: 142&quot; T to Nozzle: 60&quot;</td>
<td>Feed: 4 - T to Nozzle: 1&quot;</td>
<td></td>
</tr>
</tbody>
</table>
2.11.2. PIPE FITTINGS

Piping joints shall be Malleable Iron 300 pound class only - ASTM A-197 and have a minimum working pressure of 620 psi (42 bars). Temperature ratings of the fittings must not be exceeded. All threaded joints must be in accordance with ANSI B-20.1 Ductile Iron 300-pound class or higher ASTM A-395, or Steel ASTM-234 is acceptable. Piping, fittings, and pipe supports shall be in accordance with the latest edition of NFPA 2001. Also consult ANSI B 31.1, The Power Piping Code. The method of joining all pipe must be in accordance with the latest requirements listed in NFPA 2001. Acceptable fittings include screwed, flanges, welded, or Victaulic.

2.11.3. PIPE REDUCTIONS

All reductions in pipe size must be made by using concentric reducer fittings after the tee. Reducing bushings are not acceptable.

2.11.4. PIPE SUPPORTS

Pipe supports must be installed with allowance for expansion and contraction. They must be rated to support the dead weight of the piping and the thrust forces of the 3M™ Novec™ 1230 discharge. The piping shall be installed in accordance with good commercial practices. Refer to ANSI B-21;1 for bracing requirements.

2.12 NOZZLES PN 026200106, PN 026200108, PN 026200109, PN 026200110, PN 026200111

The nozzle controls the flow of and distributes the agent into the hazard area. Minimax unique nozzles are available in brass 360° dispersal patterns; each nozzle has predetermined discharge orifices to meet the flow requirements of the pre-engineered systems.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>System Diameter</th>
<th>Orifice Diameter</th>
<th>Orifice Quantity</th>
<th>Max Height</th>
<th>Max Area Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>026200110</td>
<td>3 lb.</td>
<td>1/4”</td>
<td>0.06”</td>
<td>12</td>
<td>60”</td>
</tr>
<tr>
<td>026200111</td>
<td>7 lb.</td>
<td>3/8”</td>
<td>0.063”</td>
<td>16</td>
<td>85”</td>
</tr>
<tr>
<td>026200108</td>
<td>14 lb.</td>
<td>1/2”</td>
<td>0.109”</td>
<td>24</td>
<td>56”</td>
</tr>
<tr>
<td>026200106</td>
<td>7 lb./2 Nozzle</td>
<td>3/8”</td>
<td>0.049”</td>
<td>24</td>
<td>34”</td>
</tr>
<tr>
<td>026200109</td>
<td>14 lb./2 Nozzle</td>
<td>5/8”</td>
<td>0.049”</td>
<td>24</td>
<td>38.5”</td>
</tr>
</tbody>
</table>

MAXIMUM VOLUME - Please note that the maximum volume varies as a function of minimum design concentration and minimum temperature.

2.13 CONSTRUCTION FEATURES

2.13.1. EMERGENCY CONTROL

For normal operation, a system shall be either automatically controlled or operable from a manual control easily accessible to the hazard or both. All systems shall be provided with an alternate means of fully mechanical emergency control, regardless of their normal means of operation. Fully mechanical emergency controls shall not require an electric power source. These emergency controls shall be located at or near the device being controlled.

2.13.2. FM APPROVED SYSTEM

In addition to the manual actuator (B04420128), an FM Approved system also requires the use of the solenoid actuator (B04420127). The solenoid actuator shall be connected to an FM Approved detection device & control panel.

2.13.3 UL LISTED SYSTEM

An extinguishing system shall be provided with:
- An automatic and manual means of actuation
- A manual means of actuation could be either a mechanical type manual actuation like the end of line device (B04420128) or an electric type, that would operate the solenoid (B04420127) vice the control panel.

Control Panel additional detection:
When electronic monitoring and backup actuation is achieved using a control panel, the panel must be a UL Listed Fire Alarm and Control Panel, and compatible with the solenoid valve actuator. Additionally, when electronic pull stations, supplemental detection, and electronic notification devices are used in conjunction with a control panel, the devices must be compatible with the control panel. Reference the control panel installation manual for compatibility information.
3.0 ANCILLARY EQUIPMENT

3.1 CAUTION – AREA PROTECTED BY CLEAN AGENT FIRE SUPPRESSION SYSTEM SIGN (PN 028000060)

This sign is provided to alert personnel that the room is protected with clean agent fire suppression system and that they should not enter the area during or after discharge. The sign should be placed in a conspicuous location at the entrance to the protected hazard and or on the cabinet or machine that is being protected.

4.0 DESIGN

4.1. SYSTEM DESIGN CONCEPT

Minimax SSP 1230 Clean Agent Fire Suppression Systems are balanced flow configurations that are simple to design and easy to install. The Pre-Engineered concept minimizes the engineering effort required to design an effective system by utilizing a fixed series of nozzles and a tightly defined set of design criteria. As long as nozzle selection, pipe size, and pipe length limitations are adhered to, computerized flow calculations are not required.

4.2. HAZARD EVALUATION

This section of the manual will detail the steps necessary to design a Minimax SSP 1230 Clean Agent Fire Suppression Systems within the limitations established by NFPA 2001, FM, and UL approvals. The design of the system MUST be verified by following the steps outlined in this manual prior to installing any Minimax fire suppression system. When evaluating hazards one should record the following properties:

- Ambient temperature
- Minimum & Maximum temperature
- Hazard Class
- Enclosure integrity

Once the previous properties have been recorded, calculate the quantity of 3M™ Novec™ 1230 required to provide the proper design concentration at the minimum anticipated ambient temperature in the hazard enclosure. An example calculation can be seen in Section 4.10.

4.2.1. IDENTIFY HAZARD TYPE

The Hazard Type generally falls into one of or a combination of the three following categories. The designer must be aware of the Hazard Type to determine the correct design concentration, agent quantity, etc. The three Hazard Types are:

- Class “A” (wood, paper, cloth – anything that leaves an ash residue after combustion)
- Class “B” (Flammable liquid or gas)
- Class “C” (electrical)

CAUTION

If the specified limitations are not followed, the system may not supply the required quantity of extinguishing agent which may result in a fire not being suppressed.
4.0 DESIGN (continued)

4.3. DETERMINE CONCENTRATION PERCENTAGE

The following is a guideline to be used to determine the proper agent concentration percentage for the hazard(s) being protected.

4.3.1. MINIMAX SSP 1230 CLEAN AGENT FIRE SUPPRESSION SYSTEMS FOR CLASS A, B, OR C HAZARDS

Fire suppression systems utilizing 3M™ Novec™ 1230 as the agent can be used to suppress Class A, B, & C fires. Table 4.3.1 shows minimum design concentrations for 3M™ Novec™ 1230 on Class A & B hazards.

<table>
<thead>
<tr>
<th>Flammable Liquid</th>
<th>Design Concentration % v/v</th>
<th>Flammable Liquid</th>
<th>Design Concentration % v/v</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Butane</td>
<td>6.37</td>
<td>Isooctane</td>
<td>6.11</td>
</tr>
<tr>
<td>1-Propanol</td>
<td>7.02</td>
<td>Isopropanol Alcohol</td>
<td>6.37</td>
</tr>
<tr>
<td>2,2,4-trimethylpentane</td>
<td>6.11</td>
<td>Methane</td>
<td>7.28</td>
</tr>
<tr>
<td>2-butoxyethanol</td>
<td>6.76</td>
<td>Methanol</td>
<td>8.45</td>
</tr>
<tr>
<td>Acetone</td>
<td>5.59</td>
<td>Methyl Ethen Ketone</td>
<td>5.85</td>
</tr>
<tr>
<td>Acetonitrile</td>
<td>4.20</td>
<td>Methyl Isobutyl Ketone</td>
<td>5.72</td>
</tr>
<tr>
<td>Commercial Heptane</td>
<td>5.72</td>
<td>MethylTert Butyl Ether</td>
<td>5.95</td>
</tr>
<tr>
<td>Commercial Hexanes</td>
<td>5.59</td>
<td>n-Heptane</td>
<td>5.85</td>
</tr>
<tr>
<td>Cyclohexane</td>
<td>5.85</td>
<td>n-Heptane</td>
<td>6.11</td>
</tr>
<tr>
<td>Cyclopentanone</td>
<td>5.98</td>
<td>Octane</td>
<td>5.72</td>
</tr>
<tr>
<td>Denatured Alcohol (92.2% EtOH, 4.6% IPA, and 3.1% MeOH)</td>
<td>6.89</td>
<td>Propane</td>
<td>7.54</td>
</tr>
<tr>
<td>Diesel Fuel</td>
<td>4.42</td>
<td>Pyrrolidine</td>
<td>6.11</td>
</tr>
<tr>
<td>Diethl Ether</td>
<td>6.37</td>
<td>Technical Heptane</td>
<td>5.59</td>
</tr>
<tr>
<td>Ethanol</td>
<td>7.15</td>
<td>Tetrahydrofuran</td>
<td>6.50</td>
</tr>
<tr>
<td>Ethyl Acetate</td>
<td>6.11</td>
<td>Toluene</td>
<td>4.55</td>
</tr>
<tr>
<td>Gasoline-87 oct. unleaded</td>
<td>5.85</td>
<td>Transformer Oil</td>
<td>5.85</td>
</tr>
<tr>
<td>Hexene</td>
<td>5.98</td>
<td>Class A &amp; de-energized Class C Fires</td>
<td>4.20</td>
</tr>
</tbody>
</table>

*Note: Design Concentration for Class B Fire are shown in the above table and includes a 30% safety factor from the minimum extinguishing concentration.

4.4. SAFETY RECOMMENDATIONS

The following are safety recommendations as outlined in NFPA 2001. The designer must be aware of the occupancy of the hazard(s) being protected in order to complete their evaluation of the project and make adjustments or recommendations as necessary.

4.4.1. SPACES NOT NORMALLY OCCUPIED

Protected spaces that are considered to be Not Normally Occupied (e.g. flammable liquids storage room, cabinets, some machinery spaces, etc.) can be designed for concentrations above the LOAEL concentration. If there is a potential for personnel to be exposed, measures shall be taken to limit exposure.

4.5. DETERMINE AGENT QUANTITY

The following steps are necessary to determine the amount of 3M™ Novec™ 1230 agent required to protect from a hazard(s).

4.5.1. DETERMINE THE HAZARD VOLUME

When determining the hazard volume one must conduct a survey of the hazard to be protected. In doing so, one must review the hazard dimensions and verify the volume. This can be done by first determining the volume of the compartment(s) being protected. Volume is calculated by multiplying the Length by the Width by the Height (V = L x W x H) of the hazard area(s). The volume used to calculate the quantity of agent required should be based on the empty (gross) volume. Additional considerations include:

- The volume taken by solid, non-permeable, and non-removable objects can be deducted from the protected volume.
- Any volume that is open to the space being protected must be added (i.e. undamped ductwork, unclosable openings, etc.).

4.5.2. EVALUATE COMPARTMENT (HAZARD) INTEGRITY

Evaluate the integrity of the hazard area and determine if additional agent will be required to offset leakage of agent. (Refer to NFPA 2001, Annex C latest edition for details).

4.5.3. DETERMINE DESIGN CONCENTRATION

4.5.3.1. Taking into consideration the type of fuels in the hazard area determine the design concentration. Design concentration increases the safety of a system which contains highly flammable material.

CAUTION

Minimax does not recommend 3M™ Novec™ 1230 systems to be used in any normally occupied spaces where the required design concentration is above 10%.
### 4.0 DESIGN (continued)

#### 4.5.3.2. The flame extinguishing concentrations shall be used in determining the agent design concentration for a particular fuel.

#### 4.5.4. FLAME EXTINGUISHMENT

4.5.4.1. The flame extinguishing concentration for Class B fuels shall be determined by the cup burner method, refer to NFPA 2001 (Latest Edition) Annex B for more details.

The minimum design concentration for smoldering combustion hazards (deep-seated fire hazard) shall be determined by application specific test.

4.5.4.2. The flame extinguishing concentration for Class A fuels shall be determined by test as part of a listing program. As a minimum, the listing program shall conform to UL 2166 or equivalent.

4.5.4.3. Class C is 1.35 times the Class A extinguishing concentration determined by test as part of the FireDetec listing program.

The minimum design concentration for spaces containing energized electrical hazards supplied at greater than 480 volt that remain powered during or after discharge shall be determined by testing, as necessary, and hazard analysis.

#### 4.5.5. CALCULATE AGENT REQUIRED

Determine the quantity of agent required to provide the desired concentration within the hazard(s) being protected. This calculation must be based upon two important criteria: the lowest expected ambient temperature and the design concentration required to protect this type of hazard.

#### 4.5.6. CALCULATE AGENT REQUIRED BY FORMULA

To determine the agent quantity needed to produce the design concentration level, the Hazard Volume is multiplied by the factors as determined in the formula below.

\[
W = (V/S) \times (C/(100-C))
\]

Where:
- \( W \) = Weight of clean agent (lb. (kg))
- \( V \) = Hazard Volume (ft³ (m³))
- \( C \) = Design Concentration, % by volume
- \( S \) = Specific volume of the superheated agent vapor at 1 atmosphere and the temperature, \( t \) (ft³/lb. (m³/kg)).

\[
S = k_1 + k_2 (t)
\]

Where:
- \( k_1 = 0.9856 \), \( k_2 = 0.002441(t) \), \( t \) = temperature (°F)
- \( k_1 = 0.0664 \), \( k_2 = 0.0002741(t) \), \( t \) = temperature (°C)

The equation to calculate \( S \) is an approximation.

---

#### CAUTION

Under certain conditions, it can be dangerous to extinguish a burning gas jet. As a first measure the gas supply shall be shut off.

---

### 4.5.7. FLOODING FACTOR TABLE - ENGLISH UNITS

As an alternative, the following tables have been compiled to make it an easier process for the system designer. The information provided is derived from the formulas shown on the previous page.

<table>
<thead>
<tr>
<th>Temp (t) (°F)</th>
<th>Specific Vapor Volume (s) (ft³/lb)</th>
<th>W/V [agent weight requirements (kg/m³)]</th>
<th>Weight Requirements of Hazard Volume, W/V (lb/ft³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>1.05883</td>
<td>0.0292</td>
<td>0.0394</td>
</tr>
<tr>
<td>40</td>
<td>1.08324</td>
<td>0.0286</td>
<td>0.0385</td>
</tr>
<tr>
<td>50</td>
<td>1.10765</td>
<td>0.0279</td>
<td>0.0376</td>
</tr>
<tr>
<td>60</td>
<td>1.13206</td>
<td>0.0273</td>
<td>0.0368</td>
</tr>
<tr>
<td>70</td>
<td>1.15647</td>
<td>0.0267</td>
<td>0.0360</td>
</tr>
<tr>
<td>80</td>
<td>1.18088</td>
<td>0.0262</td>
<td>0.0353</td>
</tr>
<tr>
<td>90</td>
<td>1.20529</td>
<td>0.0257</td>
<td>0.0346</td>
</tr>
<tr>
<td>100</td>
<td>1.22970</td>
<td>0.0252</td>
<td>0.0339</td>
</tr>
<tr>
<td>110</td>
<td>1.25411</td>
<td>0.0247</td>
<td>0.0332</td>
</tr>
<tr>
<td>120</td>
<td>1.27852</td>
<td>0.0242</td>
<td>0.0326</td>
</tr>
<tr>
<td>130</td>
<td>1.30293</td>
<td>0.0237</td>
<td>0.0320</td>
</tr>
</tbody>
</table>

The manufacturer’s listing specifies the temperature range for operation.

- \( W/V \) [agent weight requirements (kg/m³)] = pounds of agent required per m³ of protected volume needed to produce the indicated concentration at the temperature specified.
- \( t \) [temperature (°C)] = the design temperature in the hazard area.

- \( s \) [specific volume (m³/kg)] = specific volume of superheated 3M™ Novec™ 1230 vapor as approximated by the formula: \( s = 0.1269 + 0.0005(t) \), where \( t \) is in °C
- \( C \) [concentration (%)] = volumetric concentration of 3M™ Novec™ 1230 in air at the temperature indicated.
4.0 DESIGN (continued)

4.5.8. FLOODING FACTOR TABLE – METRIC UNITS

<table>
<thead>
<tr>
<th>Temp (t) (°C)</th>
<th>Specific Vapor Volume (s) (m³/kg)</th>
<th>Weight Requirements of Hazard Volume, W/V (kg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>0</td>
<td>0.0664000</td>
<td>0.4658</td>
</tr>
<tr>
<td>5</td>
<td>0.0677715</td>
<td>0.4564</td>
</tr>
<tr>
<td>10</td>
<td>0.0691430</td>
<td>0.4473</td>
</tr>
<tr>
<td>15</td>
<td>0.0705145</td>
<td>0.4386</td>
</tr>
<tr>
<td>20</td>
<td>0.0718860</td>
<td>0.4302</td>
</tr>
<tr>
<td>25</td>
<td>0.0732575</td>
<td>0.4222</td>
</tr>
<tr>
<td>30</td>
<td>0.0746290</td>
<td>0.4144</td>
</tr>
<tr>
<td>35</td>
<td>0.0760005</td>
<td>0.4069</td>
</tr>
<tr>
<td>40</td>
<td>0.0773720</td>
<td>0.3997</td>
</tr>
<tr>
<td>45</td>
<td>0.0787435</td>
<td>0.3928</td>
</tr>
<tr>
<td>50</td>
<td>0.0801150</td>
<td>0.3860</td>
</tr>
<tr>
<td>55</td>
<td>0.0814865</td>
<td>0.3795</td>
</tr>
</tbody>
</table>

The manufacturer’s listing specifies the temperature range for operation.

- \( W/V \) [agent weight requirements (kg/m³)] = pounds of agent required per m³ of protected volume needed to produce the indicated concentration at the temperature specified.
- \( t \) [temperature (°C)] = the design temperature in the hazard area.
- \( s \) [specific volume (m³/kg)] = specific volume of superheated 3M™ Novoc™ 1230 vapor as approximated by the formula: \( s = 0.1269 + 0.0005(t) \), where \( t \) is in °C
- \( C \) [concentration (%)] = volumetric concentration of 3M™ Novoc™ 1230 in air at the temperature indicated.

4.6 DETERMINE ENCLOSURE INTEGRITY

Ensure all openings are capable of being closed at the time of agent discharge.

CAUTION

Only one cylinder may be used to protect a hazard

4.7 LOCATE THE CYLINDER

Determine the location of the system cylinder. Ensure that it is capable of being properly mounted and in a safe accessible location free from high traffic areas and damp or wet locations.

Storage containers and accessories shall be located and arranged so that inspection, testing, recharging, and other maintenance activities are facilitated and interruption of protection is held to a minimum.

4.7.1. STORAGE CONTAINER SIZING

Minimax SSP 1230 Clean Agent Fire Suppression Systems, all containers supplying the same manifold outlet for distribution of 3M™ Novoc™ 1230 shall be interchangeable and of one select size and charge.
4.0 DESIGN (continued)

4.8 DETERMINE THE LOCATION & PLACEMENT OF THE TUBING

Determine the location of the linear thermal detection tubing; ensure that it is not subject to damage but located to detect a fire.

4.9 NOZZLE REQUIREMENTS

¼” Nozzles are available for use with the 3 pound unit. The small system may be configured to use 1 nozzle.

⅜” Nozzles are available for use with the 7 pound unit. These systems may be configured with 1 or 2 nozzles.

½” Nozzles are available for use with the 14 pound unit. These systems may be configured with 1 or 2 nozzles.

4.10 NOZZLE AREA & VOLUME COVERAGE

The nozzles shall only be used with the system with which they are listed. In chart 4.10 Max Height refers to the maximum amount of height differential between the cylinder and the nozzle. Area and Volume coverages shall not be exceeded.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>System</th>
<th>Nozzle Diameter</th>
<th>Orifice Diameter</th>
<th>Orifice Quantity</th>
<th>Max Height</th>
<th>Max Area Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>026200110</td>
<td>3 lb.</td>
<td>¼”</td>
<td>0.06”</td>
<td>12</td>
<td>61”</td>
<td>46.33 ft²</td>
</tr>
<tr>
<td>026200111</td>
<td>7 lb.</td>
<td>⅜”</td>
<td>0.063”</td>
<td>16</td>
<td>86”</td>
<td>108.10 ft²</td>
</tr>
<tr>
<td>026200108</td>
<td>14 lb.</td>
<td>½”</td>
<td>0.109”</td>
<td>24</td>
<td>103.5”</td>
<td>216.10 ft²</td>
</tr>
<tr>
<td>026200106</td>
<td>7 lb./2 Nozzle</td>
<td>¼”</td>
<td>0.049”</td>
<td>16</td>
<td>96”</td>
<td>108.10 ft²</td>
</tr>
<tr>
<td>026200109</td>
<td>14 lb./2 Nozzle</td>
<td>½”</td>
<td>0.049”</td>
<td>24</td>
<td>37”</td>
<td>216.19 ft²</td>
</tr>
</tbody>
</table>

Note: Orifice Quantity measures the amount of holes per nozzle

Maximum Volume - Please note that the maximum volume varies as a function of minimum design concentration and minimum temperature.

4.10.(a) MAXIMUM VOLUME THAT CAN BE PROTECTED BY THE 3.0LB 3M NOVEC TM 1230 SYSTEM UNIT

<table>
<thead>
<tr>
<th>Minimum anticipated design temperature °F</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>95.8</td>
<td>71.1</td>
<td>56.3</td>
<td>46.4</td>
<td>39.4</td>
<td>34.1</td>
<td>30.0</td>
<td>26.7</td>
</tr>
<tr>
<td>10</td>
<td>98.0</td>
<td>72.7</td>
<td>57.6</td>
<td>47.5</td>
<td>40.3</td>
<td>34.8</td>
<td>30.6</td>
<td>27.3</td>
</tr>
<tr>
<td>20</td>
<td>100.3</td>
<td>74.5</td>
<td>59.0</td>
<td>48.6</td>
<td>41.2</td>
<td>35.7</td>
<td>31.4</td>
<td>27.9</td>
</tr>
<tr>
<td>30</td>
<td>102.7</td>
<td>76.2</td>
<td>60.4</td>
<td>49.8</td>
<td>42.2</td>
<td>36.5</td>
<td>32.1</td>
<td>28.6</td>
</tr>
<tr>
<td>40</td>
<td>105.1</td>
<td>78.0</td>
<td>61.7</td>
<td>50.9</td>
<td>43.2</td>
<td>37.4</td>
<td>32.9</td>
<td>29.2</td>
</tr>
<tr>
<td>50</td>
<td>107.4</td>
<td>79.8</td>
<td>63.1</td>
<td>52.1</td>
<td>44.1</td>
<td>38.2</td>
<td>33.6</td>
<td>29.9</td>
</tr>
<tr>
<td>60</td>
<td>109.8</td>
<td>81.5</td>
<td>64.5</td>
<td>53.2</td>
<td>45.1</td>
<td>39.1</td>
<td>34.3</td>
<td>30.6</td>
</tr>
<tr>
<td>70</td>
<td>112.2</td>
<td>83.3</td>
<td>65.9</td>
<td>54.4</td>
<td>46.1</td>
<td>39.9</td>
<td>35.1</td>
<td>31.2</td>
</tr>
<tr>
<td>80</td>
<td>114.5</td>
<td>85.0</td>
<td>67.3</td>
<td>55.5</td>
<td>47.1</td>
<td>40.7</td>
<td>35.8</td>
<td>31.9</td>
</tr>
<tr>
<td>90</td>
<td>116.9</td>
<td>86.8</td>
<td>68.7</td>
<td>56.6</td>
<td>48.0</td>
<td>41.6</td>
<td>36.6</td>
<td>32.5</td>
</tr>
<tr>
<td>100</td>
<td>119.3</td>
<td>88.5</td>
<td>70.1</td>
<td>57.8</td>
<td>49.0</td>
<td>42.4</td>
<td>37.3</td>
<td>33.2</td>
</tr>
<tr>
<td>110</td>
<td>121.6</td>
<td>90.3</td>
<td>71.5</td>
<td>58.9</td>
<td>50.0</td>
<td>43.3</td>
<td>38.0</td>
<td>33.9</td>
</tr>
<tr>
<td>120</td>
<td>124.0</td>
<td>92.1</td>
<td>72.9</td>
<td>60.1</td>
<td>51.0</td>
<td>44.1</td>
<td>38.8</td>
<td>34.5</td>
</tr>
<tr>
<td>130</td>
<td>126.4</td>
<td>93.8</td>
<td>74.3</td>
<td>61.2</td>
<td>51.9</td>
<td>45.0</td>
<td>39.5</td>
<td>35.2</td>
</tr>
</tbody>
</table>
### 4.10. (b) Maximum Volume That Can Be Protected by the 7.0lb 3M™ NOVEC™ 1230 System Unit

<table>
<thead>
<tr>
<th>Minimum anticipated design temperature °F</th>
<th>Maximum hazard volume (ft³)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Design concentration, C (% by volume)</td>
</tr>
<tr>
<td></td>
<td>3</td>
</tr>
<tr>
<td>0</td>
<td>223.6</td>
</tr>
<tr>
<td>10</td>
<td>228.6</td>
</tr>
<tr>
<td>20</td>
<td>234.1</td>
</tr>
<tr>
<td>30</td>
<td>239.6</td>
</tr>
<tr>
<td>40</td>
<td>245.2</td>
</tr>
<tr>
<td>50</td>
<td>250.7</td>
</tr>
<tr>
<td>60</td>
<td>256.2</td>
</tr>
<tr>
<td>70</td>
<td>261.7</td>
</tr>
<tr>
<td>80</td>
<td>267.3</td>
</tr>
<tr>
<td>90</td>
<td>272.8</td>
</tr>
<tr>
<td>100</td>
<td>278.3</td>
</tr>
<tr>
<td>110</td>
<td>283.8</td>
</tr>
<tr>
<td>120</td>
<td>289.4</td>
</tr>
<tr>
<td>130</td>
<td>294.9</td>
</tr>
</tbody>
</table>

### 4.10. (c) Maximum Volume That Can Be Protected by the 14.0lb 3M™ NOVEC™ 1230 System Unit

<table>
<thead>
<tr>
<th>Minimum anticipated design temperature °F</th>
<th>Maximum hazard volume (ft³)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Design concentration, C (% by volume)</td>
</tr>
<tr>
<td></td>
<td>3</td>
</tr>
<tr>
<td>0</td>
<td>447.2</td>
</tr>
<tr>
<td>10</td>
<td>457.2</td>
</tr>
<tr>
<td>20</td>
<td>468.2</td>
</tr>
<tr>
<td>30</td>
<td>479.3</td>
</tr>
<tr>
<td>40</td>
<td>490.3</td>
</tr>
<tr>
<td>50</td>
<td>501.4</td>
</tr>
<tr>
<td>60</td>
<td>512.4</td>
</tr>
<tr>
<td>70</td>
<td>523.5</td>
</tr>
<tr>
<td>80</td>
<td>534.5</td>
</tr>
<tr>
<td>90</td>
<td>545.6</td>
</tr>
<tr>
<td>100</td>
<td>556.6</td>
</tr>
<tr>
<td>110</td>
<td>567.7</td>
</tr>
<tr>
<td>120</td>
<td>578.7</td>
</tr>
<tr>
<td>130</td>
<td>589.8</td>
</tr>
</tbody>
</table>

### 4.11. Sample Calculations

The requirements given in Sections 4.1 – 4.10 describe the procedures to be used to design and size a Minimax SSP 1230 Clean Agent Fire Suppression Systems. The following example provides guidelines following procedures.

**Example:**

**Given:**
- Hazard — Small Room Housing Propanol
- Class B Hazard
- Room Size: W = 4 ft..., L = 8 ft..., H = 6’. One access door equipped with self-closing apparatus.
- Minimum anticipated ambient temperature: 60 °F
- Maximum anticipated ambient temperature: 90 °F

**Procedure:**

a. Determine minimum design concentration required (Refer to Table 4.3.1)
   Use 7.02% minimum design concentration for Class B Flammable Liquids Hazard

b. Calculate Hazard Volume (V) and Area Coverage (A)
   \[ V = W \times L \times H = 4 \times 8 \times 6 = 192 \text{ ft}^3 \]
   \[ A = W \times L = 4 \times 8 = 32 \text{ ft}^2 \]

c. Calculate minimum quantity (W) of 3M™ NOVEC™ 1230 required
   \[ W = \frac{(V/S)\times(C/(100-C))}{A} \]
   \[ W = \frac{(192/1.13206)\times(7.02/(100-7.02))}{32} \]
   \[ W = 12.8 \]

This shows that a 14 lb 3M™ NOVEC™ 1230 System is necessary to protect this Hazard.
5.0 INDIRECT LOW PRESSURE SYSTEM LIMITATIONS

Minimax SSP 1230 Clean Agent Fire Suppression Systems are limited in their application. Length of tubing, enclosure volume and shape can influence system capabilities and should be taken into account when selecting a system.

The maximum length of tubing limits the dimensions of the enclosure which can be protected. The volume of the hazard being protected varies as a function of the design concentration, fuel in the enclosure, and temperature.

The pre-engineered automatic unit concept minimizes the amount of engineering required when evaluating a design for a specific application. As long as the discharge piping, tubing, & 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 area coverage, hazard volume, maximum height, design concentration, agent quantity, tubing arrangement, etc. are also met, the unit installation may be understood to comply with the design requirements of NFPA 2001, UL & FM approvals. Therefore, no discharge tests or concentration measurements should be required.

5.1. TEMPERATURE LIMITATIONS

Minimax SSP 1230 Clean Agent Fire Suppression Systems are designed to be stored and operated between 32°F and 130°F (0°C and 54.4°C).

5.2. OPERATING PRESSURE

The normal operating pressure of a Minimax SSP 1230 Clean Agent Fire Suppression Systems is 240 PSIG (16.5 BAR) at 70°F (21.1°C)

5.3. DISCHARGE TIME

The maximum discharge time of a Minimax SSP 1230 Clean Agent Fire Suppression Systems is based on the requirements of NFPA 2001. The system discharge must attain a 95% agent concentration level in the hazard area within 10 seconds or less; or as required by the applicable governmental or regulatory authority.

5.4. CLOSEABLE OPENINGS

Due to the nature of total flooding systems all openings in the hazard enclosure must be closed at the time of system discharge.

5.5. VENTILATION SHUTDOWN

Provisions must be made to shut off ventilation systems when the suppression system is actuated and discharging.
5.0 INDIRECT LOW PRESSURE SYSTEM LIMITATIONS (continued)

5.6. SYSTEM SPECIFICATIONS

The numbers published in the table below are approved by UL and FM as the minimum values for the system to work properly. The Nozzles shall not to be altered. The pipe diameter corresponding with its system must be used. Pipe Length and Number of Elbows are maximum values.

<table>
<thead>
<tr>
<th>Agent</th>
<th>System</th>
<th>Pipe Diameter</th>
<th>Pipe Length</th>
<th>Elbows</th>
<th>Max Height</th>
<th>Nozzle Size</th>
<th>Orifice Diameter</th>
<th>Orifice Quantity</th>
<th>Average Nozzle Pressure</th>
<th>Discharge Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 lb.</td>
<td>¼&quot;</td>
<td>192&quot;</td>
<td>5</td>
<td>60°</td>
<td>¼&quot;</td>
<td>0.06&quot;</td>
<td>12</td>
<td>34.5 psi</td>
<td>6.3 s</td>
<td></td>
</tr>
<tr>
<td>7 lb.</td>
<td>¼&quot;</td>
<td>204&quot;</td>
<td>5</td>
<td>85°</td>
<td>¼&quot;</td>
<td>0.063&quot;</td>
<td>16</td>
<td>43.0 psi</td>
<td>9.1 s</td>
<td></td>
</tr>
<tr>
<td>14 lb.</td>
<td>½&quot;</td>
<td>169&quot;</td>
<td>5</td>
<td>74°</td>
<td>½&quot;</td>
<td>0.109&quot;</td>
<td>24</td>
<td>30.1 psi</td>
<td>6.0 s</td>
<td></td>
</tr>
<tr>
<td>7 lb./2</td>
<td>Feed: ½&quot; T to Nozzle: ¼&quot;</td>
<td>Feed: 98° T to Nozzle: 39°</td>
<td>Feed: 4 T to Nozzle: 1</td>
<td>37&quot;</td>
<td>¾&quot;</td>
<td>0.049&quot;</td>
<td>16</td>
<td>41.8 psi</td>
<td>6.7 s</td>
<td></td>
</tr>
<tr>
<td>14 lb./2</td>
<td>Feed: ¾&quot; T to Nozzle: ½&quot;</td>
<td>Feed: 142° T to Nozzle: 60°</td>
<td>Feed: 4 T to Nozzle: 1</td>
<td>38.5&quot;</td>
<td>½&quot;</td>
<td>0.049&quot;</td>
<td>24</td>
<td>45.7 psi</td>
<td>6.3 s</td>
<td></td>
</tr>
</tbody>
</table>

5.7. THERMAL DETECTION TUBING SYSTEM DESIGN

When an indirect low pressure system is used as fire suppression system the thermal tubing serves as the detection device. When the tubing ruptures due to flame impingement it releases the system and the agent is delivered to the hazard area via a piping or tubing network and nozzle. Placement of the tubing is important because it is heat sensitive; it should be placed above the hazard area being protected. In small enclosures it should be at ceiling level.

<table>
<thead>
<tr>
<th>Maximum Length</th>
<th>Max. Distance Between Layers</th>
<th>Min. Distance off a Wall</th>
</tr>
</thead>
<tbody>
<tr>
<td>120 ft... (36.5 m)</td>
<td>3.3 ft... (1 m)</td>
<td>18 in (.457 m)</td>
</tr>
</tbody>
</table>

5.7.1. TABLE

<table>
<thead>
<tr>
<th>Red Tubing</th>
<th>Black (UV Protected) Tubing</th>
<th>Tubing Lengths Available for Purchase</th>
</tr>
</thead>
<tbody>
<tr>
<td>PART NUMBER</td>
<td>PART NUMBER</td>
<td>FEET</td>
</tr>
<tr>
<td>B07800017</td>
<td>B07800203</td>
<td>25</td>
</tr>
<tr>
<td>B07800018</td>
<td>B07800204</td>
<td>50</td>
</tr>
<tr>
<td>B07800019</td>
<td>B07800205</td>
<td>100</td>
</tr>
<tr>
<td>B07800020</td>
<td>B07800200</td>
<td>328</td>
</tr>
</tbody>
</table>

Note: The maximum length of tubing to use is 120 ft but the max length for purchase is 328 ft.

5.8. DISCHARGE PIPE REQUIREMENTS

Discharge piping, and fittings must conform to the requirements as outlined in NFPA 2001, section 2-2.1 latest edition. The thickness of the pipe or tubing wall shall be calculated in accordance with ASME B31.1 Power Piping Code. Minimax fire suppression systems use a minimum piping pressure of 240 PSI @70°F (16.5Bar @21°C).
6.0 ILP SYSTEM INSTRUCTIONS

6.1 CONTAINER LOCATION

The type and location(s) of the storage container(s) is based on several considerations.

A. Agent Quantity – The agent storage container(s) selected must have the capacity to store the total quantity of agent required for the hazard area to be protected.
B. Serviceability – In general, the larger the container, the more difficult it will be to remove it from the system for maintenance and service.
C. Proximity – 3M™ Novec™ 1230 – system containers should be located close to the hazard(s) that they protect. In some cases the container may be mounted in the hazard area.
D. Environmental Effects – Do not locate containers where they would be subject to excessive moisture, physical damage, exposure to corrosive chemicals, or harsh weather conditions.

6.2 STORAGE TEMPERATURE LIMITATIONS

Minimax SSP 1230 Clean Agent Fire Suppression Systems have been tested and are approved for a service temperature range of 32°F to 130°F (0°C to 54.4°C).

6.3 INSTALLATION OF 3, 7, & 14 POUND SYSTEMS

Position the 3M™ Novec™ 1230 container in its designated location; container must be mounted in the vertical position. Mount the bracket so the Minimax SSP 1230 Clean Agent Fire Suppression Systems will not be subject to accidental damage. Provide protection for the cylinder where necessary to prevent physical damage. The cylinder should be installed in a manner to facilitate maintenance, service, inspection and testing.

6.4 MOUNTING BRACKETS

6.4.1. MOUNTING BRACKETS – 3lb PN 029900169, 7lb PN 029900171

Fix the bracket to a bulkhead, structural column or deck using four (4) ¼” bolts. Once cylinder is in place tighten the stainless steel bands, so that cylinder is secure.

6.4.2. MOUNTING BRACKET - 14 lb PN 029900170

Fix the bracket to a bulkhead, structural column or deck using four (4) ¼” bolts. Once cylinder is in place tighten the stainless steel bands, so that cylinder is secure.
6.0 SYSTEM INSTRUCTIONS (continued)

6.5 PHYSICAL MOUNTING OF SYSTEMS

6.5.1. SETTING THE CONTAINER

Upon completing the mounting of the bracket, place the 3M™ Novec™ 1230 container in the bracket and secure it in place with the stainless steel straps provided. Orient the cylinder in the vertical position with the valve facing up and the gauge facing out and away from the wall or mounting bracket for ease of inspection.

WARNING
When mounting a fire suppression system the cylinder mounting bracket must be mounted on a structural column. If a secure location such as a structural column is not available the cylinder mounting bracket should be mounted on a backing plate. The backing plate can be constructed of ¼” marine grade plywood, aluminum or stainless plate designed to withstand the force associated with rough seas.

Upon completing the mounting of the bracket, place the 3M™ Novec™ 1230 container in the bracket and secure it in place with the stainless steel straps provided. Orient the cylinder in the vertical position with the valve facing up and the gauge facing out and away from the wall or mounting bracket for ease of inspection.

6.5.2. LINEAR THERMAL DETECTION TUBING FOR ILP SUPPRESSION SYSTEMS

Ensure the tubing is installed in accordance with the guidelines in section 5.7.

6.5.3. Do not install thermal detection tubing in an environment where the maximum ambient temperature exceeds 180 °F (82.2 °C)

6.5.4. Install clips every 18” to secure the linear flexible tubing in the hazard area.

6.5.5. Do not kink or crush the linear detection tubing to prevent leaks which may result in an accidental discharge.

6.5.6. Do not set the tubing on a surface that exceeds 150°F (65.6 °C)

6.5.7. When the tubing is routed through a wall or cabinet be sure to use the appropriate bulkhead adapter or grommet to prevent chafing or damage to the tubing.

6.5.8. The maximum length of the linear detection tubing shall not exceed 120 ft..... (36.5 meters)

6.5.9. Connect the end of line adapter to the tubing.

6.5.10. Install the tubing to the end of the discharge valve, ensure the tubing is fitted to the shoulder of the quick coupling.

6.5.11. Pressurize the tubing with nitrogen, refer to Appendix B for filling procedure

6.6 PRESSURIZING DETECTION TUBING

Ensure all connections to the end of line adapter and cylinder discharge valve are secured and tight

6.6.1. Attach the tubing fill adapter (PN B07810005) to the tubing end of line adapter.

6.6.2. Using a portable on sight dry nitrogen cylinder with a regulator connected to the fill adapter, charge the tubing to 240 PSIG.

6.6.3. The tubing is pressurized to 240 PSIG at 70 °F if the temperature is higher the fill pressure may be higher (see the chart in section 1.7) when the proper pressure is attained (check the tubing pressure with a calibrated test gauge). This procedure will ensure that the tubing is pressurized to 240 PSI. Remove the fill adapter and fit the pressure gauge or the supervising pressure switch and “O” ring to the end of line device to ensure that the tubing is pressurized properly.

6.6.4. ALLOW THE GAUGE TO REMAIN IN PLACE AND BEGIN LEAK TEST PROCEDURE.

6.6.4.1. Apply a soapy water solution to all connections, check all connections for bubbles.

6.6.4.2. Allow 30 to 45 minutes for all the connections to set in place and to ensure there are no leaks. Check the gauge to ensure the tubing is retaining the pressure, if the pressure drops it is indicative of a leak.

6.6.5. If an optional pressure switch is to be installed, remove the pressure gauge and install the pressure switch in the EOL adapter, and check the connection with soapy solution to detect any leaks.

6.6.6. Confirm that all connections and the tubing are leak free, then SLOWLY rotate the ball valve to the “ON” position (allow the cylinder pressure and tubing pressure to stabilize). The system is now active and ready for use.

6.6.7. Check all ancillary connections for functionality, pressure switch, shut downs etc.

6.6.8. Secure the ball valve in the on position by attaching a tamper seal.

WARNING
When mounting a fire suppression system the cylinder mounting bracket must be mounted on a structural column. If a secure location such as a structural column is not available the cylinder mounting bracket should be mounted on a backing plate. The backing plate can be constructed of ¼” marine grade plywood, aluminum or stainless plate designed to withstand the force associated with rough seas.

CAUTION
Ensure the ball valve on top of the cylinder valve is in the off position during installation. Failure to follow instructions will result in the system discharging and may cause damage or injury.

CAUTION
Slowly rotate the ball valve to the open position by turning the handle counter clockwise. Opening the valve quickly may result in an accidental discharge.
6.0 SYSTEM INSTRUCTIONS (continued)

6.7 DISCHARGE PIPE OR TUBE & NOZZLES

6.7.1. Determine the routing of the discharge pipe or tubing from the cylinder to the nozzle(s), follow the design guidelines.

6.7.2. Locate the nozzle(s) following the guidelines established in section 4.9

6.7.3. Remove one or two safety plugs from the discharge ports as required

6.7.4. Attach a male connection fitting to each open port.

6.7.5. Install the pipe or tubing from the cylinder to the nozzle location(s).

6.7.6. Secure the pipe or tubing to the structure with the appropriate size clamps as required.

6.7.7. Connect the pipe or tubing to the nozzle(s) and secure in place

6.7.8. Make all electrical connections to the cylinder valve pressure switch and to the end of line pressure switch to annunciate system discharge, shut down ventilation and other functions required by the applicable governmental or regulatory authority.

6.7.9. Mount all warning signs in their selected locations.

6.8 SYSTEM RECHARGE

6.8.1. Remove one safety plug from a discharge port and connect the 3M™ Novec™ 1230 recharge adapter (Note: the other discharge port must be sealed).

6.8.2. With the system ball valve closed, connect a dry nitrogen supply to the system ball valve

6.8.3. Weigh and record the system empty weight.

6.8.4. Fill the cylinder with the appropriate amount of 3M™ Novec™ 1230

6.8.5. Once filled with 3M™ Novec™ 1230, open the system ball valve to allow the system to be super-pressurized with dry nitrogen to 240 psig at 70°F (10.3 bar at 21°C) (pressure may have to be adjusted for temperatures higher or lower than 70°F).

6.8.6. Close the system ball valve and disconnect the 3M™ Novec™ 1230 recharge adapter, immediately threading the discharge port plug into the valve (Note: there will be 3M™ Novec™ 1230 trapped in the valve and supply tube that will be vented. Venting will only occur for a short period of time until the valve and supply lines are clear.

6.8.7. Shake the system thoroughly to ensure complete absorption of the nitrogen into the 3M™ Novec™ 1230. (Note: nitrogen absorption will result in some pressure loss).

6.8.8. Open the system ball valve, pressurize back up to 240 psig at 70°F, and close the system ball valve.

6.8.9. Repeat steps 7 and 8 until shaking of the system does not result in any pressure (i.e., no further nitrogen absorption) and a pressure of 240 psig is reached

6.8.10. Disconnect the dry nitrogen supply.

6.8.11. Verify the system gross weight by checking it against what is printed on the label

6.8.12. Leak test the cylinder

6.8.13. The system is now ready to be transported to the installation site.

**DANGER**

The system ball valve must be closed during removal of the FM-200® recharge adapter and installation of the safety plug to assure that the cylinder valve does not inadvertently actuate while the valve outlet port is wide open. Failure to follow this procedure could result in personal injury and damage to property.

**CAUTION**

Any prolonged hissing or discharge coming from vent valve indicates that the piston is not seated properly or has opened. If the occurs, repressurize with dry nitrogen to attempt to reseat the piston.

**NOTE**

- The pressure gauge attached to the extinguishing system is not to be used to determine when the intended changing pressure has been reached.
- A pressure regulator is to be used when the pressure source is a tank of high pressure gas.
7.0 FINAL SYSTEM CHECK OUT

The checkout procedures outlined in this section are intended to represent the minimum requirement for the extinguishing portion of the system. Additional procedures may be required by the applicable governmental or regulatory authority.

7.1 COMPARTMENT (HAZARD) AREA CHECK

7.1.1. AREA CONFIGURATION

A good review of the hazard area is just as important as the proper operation of system components. Certain aspects about the hazard may have changed, or been overlooked, which could affect overall system performance. The following should be thoroughly checked.

7.1.2. AREA LEAKAGE

The hazard area dimensions should be checked against those shown on the system plan(s). If the area volume or geometry has changed, the agent weight should be recalculated and compared with the agent weight supplied. The area should also be checked for bulkheads or movable partitions, which have been added or changed. If partitions have been added, check to see that all areas within the compartment still receive adequate agent distribution.

7.1.3. CONTAINERS

Check to ensure all containers and brackets are securely fastened.

7.1.3.1. Check all pressure gauges. They should be reading 240 PSIG at 70°F (16.6 bar at 21°C). For temperatures other than 70°F (21°C), reference Section 1.8. Activate all auxiliary system functions.

7.1.3.2. Verify that containers of correct weight and pressure are installed in accordance with the design drawings.

7.1.4. AUXILIARY FUNCTIONS

Operation of auxiliary functions such as door closures, damper closures, air handling shutdown, etc. should be verified when the pressure switch is activated.

**WARNING**

If the air handling system is NOT shut down during system discharge, it must be of the recirculating type, and enough agent should have been added to compensate for the duct and plenum volumes. After all checkout functions have been performed, proceed with arming of the system, as outlined in Section 6.6.

8.0 SYSTEM OPERATION

8.1 GENERAL

Compressed 3M™ Novec™ 1230 liquid is held in the container by a discharge valve. When the discharge valve is actuated by an opening in the tubing due to flame impingement, the pressure drop in the tubing allows the valve to open and release the agent from the container to the hazard area through the piping network.

8.2 OPERATING PROCEDURES

Operating instructions are a critical part of the Minimax SSP 1230 Clean Agent Fire Suppression Systems installation. Instructions posted remotely from the cylinder storage area should indicate the location of the 3M™ Novec™ 1230 cylinders.
8.0 SYSTEM OPERATION (continued)

8.3 POST FIRE OPERATION

After a Minimax SSP 1230 Clean Agent Fire Suppression Systems discharge, one must observe all posted warnings, (see below), before entering the hazard area. Integrity of the hazard area must be maintained to prevent the migration of products of decomposition to adjacent areas outside of the protected space. After extinguishment, a minimum agent hold time of 10 minutes must be maintained in accordance with NFPA 2001. No one should enter the area until it is cooled down and the person in charge deems it safe to enter the protected space. When ventilating the protected space of products of combustion, care should be taken to allow smoke, decomposition products, etc., to clear the area; away from personnel or critical equipment.

In the event of a fire and system operation the following procedures shall be put in place: Remove the cylinder assembly from the piping network.

8.4 CYLINDER RECHARGE

After a Minimax SSP 1230 Clean Agent Fire Suppression Systems discharges, all containers must be recharged and the fire suppression system returned to a full service condition in a reasonable amount of time.

8.4.1. Return all discharged cylinders to a Minimax fire suppression system distributor to be recharged.

8.5 TUBING

A fire condition causes the tubing to rupture; remove all tubing from the hazard area and replace with new tubing.

9.0 MAINTENANCE

The following maintenance procedures and intervals indicated are meant to represent the minimum requirements for Minimax SSP 1230 Clean Agent Fire Suppression Systems. These procedures do not preclude those required by NFPA 2001 and or the applicable governmental or regulatory authority. More frequent service intervals may be necessary if systems are installed in more severe service applications.

In order to disable any system that is connected to a fire alarm control panel for maintenance or repair, first remove the pressure switch from the end of line solenoid valve, which will cause a supervisory signal at the control panel.

9.1 MAINTENANCE PROGRAM

A regular maintenance program must be established for the continuous operation of all Minimax SSP 1230 Clean Agent Fire Suppression Systems. A periodic maintenance program shall be established and followed. A maintenance log must be maintained for ready reference. The log must include the following accumulated data:

A. Inspection Interval
B. Inspection procedure performed
C. Maintenance performed as a result of the inspection
D. Name of inspector performing the task

Any time rust or corrosion is found on a fire suppression cylinder it should be taken out of service and replaced.

Failure to comply may result in system failure or personal injury.
9.0 MAINTENANCE (continued)

9.2 AGENT STORAGE CONTAINERS

9.2.1. EVERY MONTH

A. Check the container and discharge equipment for physical damage, deterioration or corrosion. If any deterioration or corrosion is evident replace the damaged parts.
B. Check all support brackets. Tighten loose fittings; replace all damaged or corroded parts.
C. Inspect the tubing ensure there is no abrasion, cuts, kinks, accumulation of dirt.
D. Ensure the tubing is free of obstructions that would prevent detection of a fire.
E. Check the pressure gauge to ensure that pressure is 240 PSIG at 70°F.
F. Verify enclosure measurements and ensure there are no changes to size or volume.
G. Check to verify that no changes have been made to the ventilation system.
H. If any changes have been made or the gauge is not registering the correct pressure contact an authorized service company to make the necessary changes or re-gauge the system if necessary.
I. Check tamper devices on cylinder tubing ball valve and solenoid valve coil (if coil will use a tamper device)

9.2.2. EVERY SIX MONTHS:

A. Verify the weight of the agent in the container matches the agent weight stamped on the label. If the weight indicates a shortage exceeding five percent of required weight, the container must be removed from service for repair and/or recharge.
B. To check the weight of the agent in the cylinder:
   a. Remove the tamper seal from the ball valve and close the valve. Ensure it is in the “off” position.
   b. Disconnect the tubing at the ball valve. There will be a loss of pressure in the tubing at this time.
      Remark: removal of the pressure switch from the solenoid valve will cause a supervisory signal at the control panel.
   c. Remove the cylinder from the bracket.
   d. Weigh the cylinder with a certified scale. If there is a weight loss of more than 5% of the weight stamped on the cylinder label or if there is a 10% loss of pressure; remove and recharge or replace the cylinder assembly.
C. Reinstall the cylinder and pressurize the tubing in accordance with Section 6.6 of this manual.

9.2.3. FIVE YEAR MAINTENANCE PROCEDURE:

Minimax SSP 1230 Clean Agent Fire Suppression Systems cylinders in continuous service for 5 years shall be given a complete external visual inspection in place.

9.2.4. CONTAINER TEST AND INSPECTION

The containers shall not be recharged without a retest if more than five years have elapsed since the last test. The retest consists of a complete external and internal visual inspection in accordance with the Code of Federal Regu-
10.0 POST FIRE SERVICE & MAINTENANCE

10.1 REPLACEMENT OF DETECTION TUBING

A fire condition causes the tubing to rupture; remove all tubing from the hazardous area and replace with new detection tubing.

10.2 CYLINDER VALVE

Because 3M™ Novec™ 1230 will dissolve lubricants it is necessary to disassemble the control valve to inspect, lubricate and service components prior to recharging the system. Prior to the removal of the valve from the container make certain that all pressure has been relieved. Prior to recharging the cylinder clean and lubricate (with Parker Super O-lube) all valve components and “O” rings.

10.2.1. DISASSEMBLY OF THE CYLINDER VALVE

a. MAKE SURE the cylinder pressure has been relieved
b. When the cylinder pressure has been relieved, remove the valve from the cylinder.
c. Unscrew the valve cap; inspect it and the “O” ring for damage. Replace if necessary, otherwise lubricate the “O” ring.
d. Pull the piston out; inspect it and the “O” ring for damage Replace if necessary, otherwise lubricate the “O” ring.
e. Clean the valve seat, lubricate lightly.
f. Place the piston in the valve and screw the valve cap on the valve body; tighten
g. Inspect “O” ring on the cylinder neck, Lubricate or replace and lubricate if necessary.
h. Fit the valve to the cylinder and refill cylinder with 3M™ Novec™ 1230.

WARNING
3M™ Novec™ 1230 and Nitrogen cylinders must be handled, installed, inspected and serviced by qualified technicians who have attended a factory sponsored training program. Handling of 3M™ Novec™ 1230 and nitrogen cylinders shall be by those trained personnel.

WARNING
Prior to removal of the valve from the cylinder ensure that all pressure has been released. Relieve any remaining pressure by making sure the ball valve remains open (in the “ON” position) allowing any residual pressure to escape.

11.0 WARRANTY STATEMENT

MINIMAX LIMITED WARRANTY

Minimax isoly warrants to the original purchasers that the products manufactured by it shall be free from defects in materials and workmanship under normal use for a period of one (1) year from the date of manufacture.

CONDITIONS

The limited warranty is based upon the customer satisfying the following conditions:

A. The product must be supplied and installed by an authorized Minimax distributor, in accordance with the written instructions contained in this manual or other data supplied with Minimax products.
B. The products have not been altered or modified.
C. The original purchaser must maintain a semi-annual maintenance agreement with an authorized Minimax distributor, commencing with the date the Minimax product was accepted by the purchaser and placed into service. The service agreement must remain in effect for the duration of the warranty.
D. Buyer may not return any goods, under warranty claim or otherwise, without first reporting to Minimax the reasons for such return and first obtaining and then observing such reasonable instructions as Minimax may give authorizing the return.

WARNING
Failure to comply may result in system failure or personal injury.
11.0 WARRANTY STATEMENT (continued)

LIMITATIONS

This warranty does not extend to any product or parts that is not installed and used continuously after installation in accordance with Minimax’s instructions in this manual, all applicable state and local regulations, and all applicable national standards, such as those promulgated by NFPA, DOT and ANSI. This warranty does not extend to any product or part that has been damaged by accident, misuse, abuse, failure to maintain, or neglect, nor does it extend to any product or party which has been modified, altered, disassembled, or repaired in the field.

This warranty does not cover any cosmetic issues, such as scratches, dents, marring, fading of colors or discoloration. In no event shall Minimax be liable for consequential or incidental damages arising from the purchase and or use of Minimax products, including but not limited to: damages resulting from loss of use of Minimax products, the costs of replacing discharge suppression agent, damages for lost profits or income, or damages for resulting harm to property other than the Minimax products.

Furthermore, Minimax is not liable for variations in product performance due to normal wear of parts, which by their nature, are subject to continuous wear.

Except as expressly set forth above, and subject to the limitation of liability below, Minimax MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, with respect to its products and parts, whether used alone or in combination with others. Minimax disclaims all warranties not stated herein.

LIMITATION OF LIABILITY

The parties agree that the total liability of Minimax for any and all claim for losses and/or damages allegedly arising out of the use of any Minimax product, or arising out of any alleged breach of this warranty, shall in no event exceed the purchase price of the products or parts involved, whether such claim be based on theories of contract, negligence, strict liability, tort or otherwise.

Minimax shall not be liable for incidental, consequential, lost profit or punitive damages or other losses arising out of or alleged caused by the use of any Minimax product. Minimax shall not be liable for, and the purchaser assumes any liability for, all personal injury and property damage connected with the handling, transportation, possession, further manufacture, other use or resale of products, whether used alone or in combination with any other products or materials.

NOTE: Some States do not allow the exclusion or limitation of incidental, consequential, or punitive damages, so the above limitation or exclusion may not apply to you. The warranty gives you specific legal rights, and you may have other rights that vary from state to state. The portions of this limited warranty and limitation of liability shall be considered severable and all portions which are not disallowed by applicable law shall remain in full force and effect.

NON-ASSIGNMENT OF WARRANTY

The limited warranty set forth herein may not be assigned, transferred or sold in any way and extends only to the original purchaser.

Because of a policy of continuous improvement, Minimax reserves the right to change designs, materials or specifications without notice.

All Minimax products are mechanical devices that will eventually become inoperative due to wear, corrosion and aging of components made of materials such as rubber, etc. The environment and conditions of use will determine the safe service of these products. Periodic inspection and maintenance are essential to avoid serious injury and property damage.

Many Minimax products are manufactured components which are incorporated by others on or in other products or systems used for storage, transport and transfer and otherwise for use of toxic, flammable and dangerous liquids and gases. Such substances must be handled by experienced and trained personnel only, using accepted governmental and industrial safety procedures.

All Minimax products are furnished using all Minimax components. All units must exclusively use Minimax components, especially for connection(s) to the tubing. Failure to use Minimax components exclusively voids all warranties and will release Minimax of any and all liability on the performance of the Minimax components and unit.

Because of a policy of continuous improvement, Minimax reserves the right to change designs, materials or specifications without notice. FAILURE TO FOLLOW THESE INSTRUCTIONS AND THE OTHER INSTRUCTIONS IN THE USER MANUAL MAY RESULT IN SEVERE PERSONAL INJURY OR DEATH.

WARNING

All Minimax products are mechanical devices that will eventually become inoperative due to wear, corrosion and aging of components made of materials such as rubber, etc. The environment and conditions of use will determine the safe service of these products. Periodic inspection and maintenance are essential to avoid serious injury and property damage.

Many Minimax products are manufactured components which are incorporated by others on or in other products or systems used for storage, transport and transfer and otherwise for use of toxic, flammable and dangerous liquids and gases. Such substances must be handled by experienced and trained personnel only, using accepted governmental and industrial safety procedures.
APPENDIX A | SYSTEM & PARTS LIST

SENSOR TUBING

Spool of detection tubing in various lengths

KEY FEATURES
- Choice of standard or heavy duty versions
- Available in various lengths

STANDARD SENSOR TUBING

- 25 feet: B07800017
- 50 feet: B07800018
- 100 feet: B07800019
- 328 feet: B07800002

HEAVY DUTY SENSOR TUBING

- 25 feet: B07800203
- 50 feet: B07800204
- 100 feet: B07800205
- 328 feet: B07800200

Outside Diameter: 0.234" / 6 mm
Inside Diameter: 0.156" / 4 mm
Color: Red RAL 3000
Min. bend radius: 4" / 100 mm

Outside Diameter: 0.234" / 6 mm
Inside Diameter: 0.156" / 4 mm
Color: Black RAL 9005
Min. bend radius: 5.9" / 150 mm

022200040 | PROTECTION SPRING

To protect the sensor tubing from damage

KEY FEATURES
- Coils around the entire length of the sensor tube to provide a protective casing

Product code

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<thead>
<tr>
<th>Standard end connections</th>
<th>Quick connect connections</th>
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<tbody>
<tr>
<td>B07850030</td>
<td>022200040</td>
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</tbody>
</table>

Length: 19.4" / 5,8 meters
Material: Stainless Steel
END OF LINE DEVICES

**KEY FEATURES**
- Nickel plated brass body

<table>
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<tr>
<th>END OF LINE PLUG</th>
<th>END OF LINE GAUGE</th>
<th>MANUAL ACTUATOR</th>
<th>SOLENOID ACTUATOR</th>
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<td>029510056</td>
<td>B07810026</td>
<td>B04420128</td>
<td>B04420127</td>
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Basic plug to seal the end of line
Includes: check valve, pressure gauge & fittings to connect to sensor tubing

Includes: pressure gauge, connection for filling adaptor and fittings to connect to sensor tubing.
Large, easily visible knob
Yellow safety collar
For supplemental actuation via electronic sensor or control room

<table>
<thead>
<tr>
<th>Tube connection</th>
<th>Length</th>
<th>Hex flats</th>
<th>Gauge scale</th>
<th>Charging port</th>
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<td>9W / 24 V</td>
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</table>

**B07810005 | FILLING ADAPTOR**

Allows connection of a charging cylinder to an end-of-line device to pressurize the sensor tube

**KEY FEATURES**
- Includes: quick coupling connector and threaded end-of-line connection
Dispersion nozzles for pre-engineered Kits using 3M™ Novec™ extinguishing agent.

### KEY FEATURES
- Corresponds to NFPA 2001 guidelines regarding diameter, orifice size and orifice quantity
- Raw brass

### NOZZLES FOR 3M™ NOVEC™ 1230

**APPENDIX A | SYSTEM & PARTS LIST (continued)**

<table>
<thead>
<tr>
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**Table: Nozzle Specifications**

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<th>Thread Diameter</th>
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<th>Orifice Diameter</th>
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APPENDIX A | SYSTEM & PARTS LIST (continued)

QUICK CONNECTION FITTINGS FOR SENSOR TUBING

**KEY FEATURES**
- Plug-in connections for quick, secure and leak-free installations
- Nickel plated brass

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<th>STRAIGHT COUPLING</th>
<th>ELBOW</th>
<th>TEE</th>
<th>END ELBOW</th>
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<td>B07831006</td>
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</table>

CROSS PANEL PROTECTIVE FITTINGS

**KEY FEATURES**
- Polymer construction to protect from sharp metal edges

<table>
<thead>
<tr>
<th>THROUGH - PANEL FASTENER</th>
<th>THROUGH PANEL PROTECTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>B07830005</td>
<td>B07860001</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Material</th>
<th>Orifice Diameter</th>
<th>Max. panel thickness</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nylon</td>
<td>0.25” / 6mm</td>
<td>0.95” / 2.4mm</td>
<td>1.18” / 30mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Material</th>
<th>Orifice Diameter</th>
<th>Max. panel thickness</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rubber</td>
<td>0.25” / 6.3mm</td>
<td>0.07” / 1.8mm</td>
<td>0.20” / 5mm</td>
</tr>
</tbody>
</table>

Exerts radial compression when tightened to securely hold tubing in place
Protects the sensor tubing from sharp edges

Fittings to connect sensor tubing

Fittings to attach and/or protect sensor tubing through a panel
APPENDIX A | SYSTEM & PARTS LIST (continued)

**B07860000 | SELF ADHESIVE CLIPS FOR SENSOR TUBE ATTACHMENT**

Self-adhesive clips to secure Ø 6mm sensor tubing

**KEY FEATURES**
- Self-adhesive
- Clip-in/Clip out design

<table>
<thead>
<tr>
<th>Material</th>
<th>Polyamide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>0.75” x 0.75” / 19 x 19mm</td>
</tr>
<tr>
<td>Attachment</td>
<td>Self-adhesive base</td>
</tr>
</tbody>
</table>

**B07860005 | CABLE BINDER STRIPS FOR SENSOR TUBE ATTACHMENT**

Cable tie to bundle sensor tubing together with electrical cables and bind onto supports

**KEY FEATURES**
- Self-adhesive base
- Rachet design stays securely fastened

<table>
<thead>
<tr>
<th>Material</th>
<th>Polyamide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>1.10” x 1.10” / 28 x 28mm</td>
</tr>
<tr>
<td>Attachment</td>
<td>Self-adhesive base</td>
</tr>
</tbody>
</table>

**B07860002 | SCREWED CLIPS FOR SENSOR TUBE ATTACHMENT**

Screwed attachment clip to secure 6mm sensor or discharge tubing

**KEY FEATURES**
- Includes protective rubber sleeve

<table>
<thead>
<tr>
<th>Material</th>
<th>Aluminium and chloroprene</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>0.20” / 5.2 mm hole</td>
</tr>
<tr>
<td>Attachment</td>
<td>screws (not included)</td>
</tr>
</tbody>
</table>
APPENDIX A | SYSTEM & PARTS LIST (continued)

029900168 & 029900178 | PRESSURE SWITCH – 5 BAR

For supplemental functionalities when the system actuates such as sounding an alarm, closing ventilator ducts or cutting power supply.

KEY FEATURES 029900168

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch type</td>
<td>SPST</td>
</tr>
<tr>
<td>Fixture</td>
<td>1/8” NPT</td>
</tr>
<tr>
<td>Proof Pressure</td>
<td>400 psi</td>
</tr>
<tr>
<td>Type</td>
<td>Normally open</td>
</tr>
<tr>
<td>Electrical rating</td>
<td>120 / 240 VAC - 375 VA</td>
</tr>
</tbody>
</table>

KEY FEATURES 029900178

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch type</td>
<td>SPST</td>
</tr>
<tr>
<td>Fixture</td>
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<tr>
<td>Proof Pressure</td>
<td>400 psi</td>
</tr>
<tr>
<td>Type</td>
<td>Normally closed</td>
</tr>
<tr>
<td>Electrical rating</td>
<td>120 / 240 VAC - 375 VA</td>
</tr>
</tbody>
</table>

B07850006 | ALARM 110-220 V AC

Audio alarm for connection to pressure switches to warn if system actuates.

KEY FEATURES

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audible signal</td>
<td>87d</td>
</tr>
<tr>
<td>Power supply</td>
<td>110-220 V AC / 6 mA</td>
</tr>
<tr>
<td>Frequency</td>
<td>3kHz</td>
</tr>
</tbody>
</table>

029900168 & 029900178 | PRESSURE RELIEF DEVICE

<table>
<thead>
<tr>
<th>Product code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>029200091</td>
<td>(Clean Agent) 400 psi, 3lb</td>
</tr>
<tr>
<td>029200088</td>
<td>(Clean Agent) 600 psi, 7lb &amp; 14 lb</td>
</tr>
</tbody>
</table>
## PARTS & ACCESSORIES | QUICK GUIDE

### PARTS & ACCESSORIES

#### PRE-ENGINEERED CLEAN AGENT FIRE SUPPRESSION SYSTEMS

<table>
<thead>
<tr>
<th>FILLED &amp; PRESSURIZED SYSTEMS, Includes bracket &amp; straps</th>
</tr>
</thead>
<tbody>
<tr>
<td>B07014509 3 POUND SYSTEM 3M™ Novec™ 1230</td>
</tr>
<tr>
<td>B07014510 7 POUND SYSTEM 3M™ Novec™ 1230</td>
</tr>
<tr>
<td>B07014511 14 POUND SYSTEM 3M™ Novec™ 1230</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RED TUBING</th>
</tr>
</thead>
<tbody>
<tr>
<td>B07800017 25 Feet</td>
</tr>
<tr>
<td>B07800018 50 Feet</td>
</tr>
<tr>
<td>B07800019 100 Feet</td>
</tr>
<tr>
<td>B07800020 328 Feet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BLACK TUBING (UV PROTECTED)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B07800203 25 Feet</td>
</tr>
<tr>
<td>B07800204 50 Feet</td>
</tr>
<tr>
<td>B07800205 100 Feet</td>
</tr>
<tr>
<td>B07800200 328 Feet</td>
</tr>
</tbody>
</table>

### TUBE CONNECTORS

<table>
<thead>
<tr>
<th>STRAIGHT COUPLING</th>
</tr>
</thead>
<tbody>
<tr>
<td>B07831010</td>
</tr>
<tr>
<td>ELBOW</td>
</tr>
<tr>
<td>B07831007</td>
</tr>
<tr>
<td>TURNING END QUICK COUPLING</td>
</tr>
<tr>
<td>B07831008</td>
</tr>
</tbody>
</table>

### END OF LINE DEVICES

<table>
<thead>
<tr>
<th>EOL PLUG</th>
</tr>
</thead>
<tbody>
<tr>
<td>B07810026</td>
</tr>
<tr>
<td>EOL ADAPTER W/GAUGE</td>
</tr>
<tr>
<td>B04420128</td>
</tr>
<tr>
<td>PULL TAB FOR MANUAL RELEASE</td>
</tr>
<tr>
<td>B06800016</td>
</tr>
<tr>
<td>RUPTURE DISC FOR MANUAL RELEASE</td>
</tr>
<tr>
<td>B029200500</td>
</tr>
<tr>
<td>EOL W/SOLENOID/GAUGE</td>
</tr>
<tr>
<td>B04420127</td>
</tr>
</tbody>
</table>

### DISCHARGE NOZZLES 3M™ Novec™ 1230

<table>
<thead>
<tr>
<th>1/4” Nozzle (3 lb 3M™ Novec™ 1230 systems)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B026200111</td>
</tr>
<tr>
<td>3/8” Nozzle (7 lb 3M™ Novec™ 1230 systems)</td>
</tr>
<tr>
<td>B026200110</td>
</tr>
<tr>
<td>½” Nozzle (14 lb 3M™ Novec™ 1230 systems)</td>
</tr>
<tr>
<td>B026200106</td>
</tr>
<tr>
<td>¾” Nozzle (7 lb 2 Nozzle 3M™ Novec™ 1230 systems)</td>
</tr>
<tr>
<td>B026200108</td>
</tr>
<tr>
<td>⅝” Nozzle (14 lb 2 Nozzle 3M™ Novec™ 1230 a systems)</td>
</tr>
<tr>
<td>B026200109</td>
</tr>
</tbody>
</table>

### ADAPTORS

<table>
<thead>
<tr>
<th>QUICK CONNECT TUBE PRESSURIZING ADAPTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>B07810005</td>
</tr>
<tr>
<td>NITROGEN CYLINDER CHARGING BOTTLE &amp; VALVE</td>
</tr>
<tr>
<td>B07502004</td>
</tr>
<tr>
<td>COMPACT DEMO / RECHARGE KIT</td>
</tr>
<tr>
<td>B0700KIT1</td>
</tr>
</tbody>
</table>

### CYLINDER BRACKETS

<table>
<thead>
<tr>
<th>CYLINDER BRACKETS</th>
</tr>
</thead>
<tbody>
<tr>
<td>B07900169 Cylinder bracket &amp; SS Straps 3 pound cylinder</td>
</tr>
<tr>
<td>B07900171 Cylinder bracket &amp; SS Straps 7 pound cylinder</td>
</tr>
<tr>
<td>B07900170 Cylinder bracket &amp; SS Straps 14 pound cylinder</td>
</tr>
</tbody>
</table>

### VALVE ASSEMBLIES

<table>
<thead>
<tr>
<th>Valve assembly 3 pound (1 in.) 3M™ Novec™ 1230 a</th>
</tr>
</thead>
<tbody>
<tr>
<td>B07010209</td>
</tr>
<tr>
<td>Valve assembly 7 &amp; 14 pound (1.5 in.) 3M™ Novec™ 1230</td>
</tr>
<tr>
<td>B07010304</td>
</tr>
</tbody>
</table>

### ADDITIONAL ITEMS

<table>
<thead>
<tr>
<th>PRESSURE RELIEF DEVICE (Clean Agent) 600 psi 7 lb &amp; 14 lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>B029200088</td>
</tr>
<tr>
<td>PRESSURE RELIEF DEVICE (Clean Agent) 480 psi 3 lb</td>
</tr>
<tr>
<td>B029200091</td>
</tr>
<tr>
<td>PROTECTION SPRING 5.9 M (19.4FEET)</td>
</tr>
<tr>
<td>B02200040</td>
</tr>
<tr>
<td>9 VOLT SOUNDER (No Battery)</td>
</tr>
<tr>
<td>B07850006</td>
</tr>
<tr>
<td>AUDIBLE ALARM, RED 9VCC</td>
</tr>
<tr>
<td>B07850008</td>
</tr>
<tr>
<td>SCREWED METAL CLIP for Tube Attachment</td>
</tr>
<tr>
<td>B07860002</td>
</tr>
<tr>
<td>THROUGH PANEL PROTECTOR</td>
</tr>
<tr>
<td>B07860001</td>
</tr>
<tr>
<td>THROUGH PANEL FASTENER</td>
</tr>
<tr>
<td>B07830005</td>
</tr>
<tr>
<td>SCREWED METAL CLIP WITH MAGNET (ASSEMBLY)</td>
</tr>
<tr>
<td>B029900177</td>
</tr>
<tr>
<td>SELF ADHESIVE CLIP FOR SENSOR TUBE ATTACHMENT</td>
</tr>
<tr>
<td>B07860000</td>
</tr>
<tr>
<td>CABLE BINDER STRIPS FOR SENSOR TUBE ATTACHMENT</td>
</tr>
<tr>
<td>B07860005</td>
</tr>
<tr>
<td>SENSOR TUBE GRIPPING TOOL</td>
</tr>
<tr>
<td>B04920014</td>
</tr>
<tr>
<td>TUBE CUTTER</td>
</tr>
<tr>
<td>B07850001</td>
</tr>
<tr>
<td>PRESSURE SWITCH (NORMALLY OPEN) UL/FM</td>
</tr>
<tr>
<td>B029900168</td>
</tr>
<tr>
<td>PRESSURE SWITCH (NORMALLY CLOSED) UL/FM</td>
</tr>
<tr>
<td>B029900178</td>
</tr>
<tr>
<td>EU PRESSURE SWITCH (Non UL/FM - Dual switch option)</td>
</tr>
<tr>
<td>B02825003</td>
</tr>
<tr>
<td>PRESSURE GAUGE 3M™ Novec™ 1230</td>
</tr>
<tr>
<td>B028200191</td>
</tr>
<tr>
<td>SSP 1230 Design, installation and maintenance manual</td>
</tr>
<tr>
<td>B027650010</td>
</tr>
</tbody>
</table>
APPENDIX B | COMPONENT DRAWINGS

CYLINDER & VALVE ASSEMBLY | 3LB NOVEC 1230

Product code | B07014509

Shipping cap
Ball valve
Valve
Outlet port ¼" NPT" (2X)
Pressure gauge
Burst disc
Cylinder
Label

16.75"
Ø 2.929"
CYLINDER & VALVE ASSEMBLY | 14LB NOVEC 1230

Product code: B07014511

- Shipping cap
- Ball valve
- Valve
- Outlet port ½” NPT” (2X)
- Pressure gauge
- Burst disc
- Cylinder
- Label

Dimensions:
- Ø 6.135”
- 19.6”
FILLING ADAPTOR

FDT line filling procedure:
1. Unscrew the pressure gauge out of the end of line (EOL) adapter
2. Screw adapter A into the EOL adapter
3. Plug the quick coupling B into EOL adapter A
4. Open the ball valve from DHP valve
5. When pressure has been built up in the FDT tube, close the ball valve
6. Plug out the quick coupling adapter B
7. Unscrew the adapter A from the EOL adapter
8. Plug in the pressure gauge
**APPENDIX B | COMPONENT DRAWINGS (continued)**

VALVE | B07010209

Outlet port ¼" NPT

124.5"

1"-14 UNS-2A

Green sector 190-216 psi

Green sector 216-264 psi

Red sector 264-290 psi

USE WITH FK - 5 - 1 - 12 ONLY

**Minimax SSP 1230, Design, Installation and Maintenance Manual**

Part Number 027650010 - Date 07/16

3025 Independence Drive Suite C Livermore, CA 94551 / sales@minimaxfp.com www.minimaxfp.com

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APPENDIX B | COMPONENT DRAWINGS (continued)

END OF LINE WITH QUICK COUPLING FITTING  | B07810026

Product code  B07810026

Nickel plated fitting for tube 4x6
Nickel plated connector
Nickel plated nut
Pressure gauge

SW 22
SOLENOID ACTUATOR | B04420127

Technical datas:
- Electrical connection: DIN 43560 A
- Voltage: 24 V DC
- Power: 9 W
- Max. working pressure: 30 bar
- Temperature range: 0°F -> 130°F
APPENDIX B | COMPONENT DRAWINGS (continued)

MANUAL RELEASE | B04420128

Product code | B04420128

Pressure gauge

Release button

Quick connector

Locking device

Course: 13,5 mm

M 20 x 1,5

81

25

126,7

50

0 41
END OF LINE PLUG | 029510056

| Product code | 029510056 |

Plug

Quick coupling connector

Ø 6
ASSEMBLY PRESSURE SWITCH WITH ADAPTOR | 029900168 & 029900178

SPECIFICATIONS 029900168

1. Auto-reset pressure switch (SPST)
2. Type: Normally open (N/O) at atmospheric conditions (0 psig)
3. Operation:
   - Open: 160 ± 7 psig
   - Close: 185 ± 5 psig
4. Proof pressure: 400 psig
5. Burst disc: 5000 psig
6. Electrical ratings: 120/240 VAC-375 VA
   - 24 VAC - 125 VA
7. Cycle life: 100,000 minimum
8. Ambient temperature: -30 to +70°C
9. Fluid temperature: -45 to +135°C
10. Agency recognition:
    - CE0035
    - UL us E196928

SPECIFICATIONS 029900178

1. Auto-reset pressure switch (SPST)
2. Type: Normally closed (N/C) at atmospheric conditions (0 psig)
3. Operation:
   - Open: 160 ± 7 psig
   - Close: 185 ± 5 psig
4. Proof pressure: 400 psig
5. Burst disc: 5000 psig
6. Electrical ratings: 120/240 VAC-375 VA
   - 24 VAC - 125 VA
7. Cycle life: 100,000 minimum
8. Ambient temperature: -30 to +70°C
9. Fluid temperature: -45 to +135°C
10. Agency recognition:
    - CE0035
    - UL us E196928
3 LB BRACKET | 029900169

Product code 029900169

Cylinder clamp
APPENDIX B | COMPONENT DRAWINGS (continued)

7 LB BRACKET | 029900171

Product code | 029900171

Cylinder clamp

Dimensions:
- 300
- 185
- 175
- 30
APPENDIX B | COMPONENT DRAWINGS (continued)

14 LB BRACKET | 029900170

Product code 029900170

---

Bracket

Cylinder clamp

Dimensions:
- 320
- 165
- 88
- 115
- Ø 10
APPENDIX C | FILL PROCEDURE

FILLING PROCEDURE INDIRECT LOW PRESSURE CYLINDERS

3M™ Novec™ 1230 containers shall be filled by an authorized Minimax system distributor in accordance with fill procedures outlined in this section of the manual. PN- 027650010

01. Weigh the cylinder and check the Tare weight against that listed on the label. Record the tare weight.
02. Remove one safety plug from a discharge port and connect the appropriate recharge adapter.
03. With the cylinder on the scale connect the agent supply to the adapter. Record weight and zero the scale.
04. Open the cylinder ball valve and open the agent supply valve on the bulk tank.
05. Fill the cylinder to the desired weight. (Fill Weight)
06. Close the agent supply valve but maintain the connection.
07. Close the cylinder ball valve but maintain the connection.
08. Attach the spring top unit with tubing to the top of the cylinder valve as outlined in section.
09. Using the quick connect adapter connect the tubing.
10. Regulate the nitrogen regulator to 240 PSIG, connect the nitrogen supply to the fill adapter.
11. Open the ball valve and super pressurize the cylinder to 240 PSIG.
12. Close the ball valve and shake the cylinder allowing the nitrogen to be absorbed into the agent.
13. Check the cylinder pressure, absorption of nitrogen results in a loss of pressure, open the ball valve and allow the pressure to build back up to 240 PSIG.
14. Repeat the last two steps until shaking the cylinder does not result in a loss of cylinder pressure and the cylinder pressure stabilizes at 240 PSI.
15. Slowly open the vent on the agent recharge line. Trapped agent in the valve and supply line WILL VENT. Constant discharge from the vent valve indicates that the piston is not seated properly or has opened. If this occurs repeat steps 12 and 13.
16. Disconnect the agent source, remove the recharge adapter and fit a safety plug in the discharge port.
17. Close the ball valve and close the nitrogen supply valve. Vent the nitrogen line.
18. Remove the nitrogen supply hose.
19. Unscrew the spring top from the ball valve.
20. Attach a tamper seal to the ball valve to ensure it is in the “OFF” position.
21. Verify and record the cylinder Full weight. (Gross weight)
22. Leak test the cylinder with a calibrated leak detector.
23. Cylinder is now ready for installation.
APPENDIX D | MATERIAL SAFETY DATA SHEET 3M™ NOVEC™ 1230

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SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: 3M™ Novac™ 1230 Fire Protection Fluid (FK-5-112)
MANUFACTURER: 3M
DIVISION: Electronics Markets Materials Division
ADDRESS: 3M Center, St. Paul, MN 55144-1000

EMERGENCY PHONE: 1-800-364-3577 OR (651) 737-6501 (24 HOURS)

Issue Date: 12/13/11
Supercedes Date: 08/01/11
Document Group: 16-3425-2

Product Use: Intended Use: Streaming and Flooding Fire Protection

SECTION 2: INGREDIENTS

INGREDIENT: I, I, 1.2,2,4,5,5,5-Nonafluoro-4-(Tri fluoromethyl)-3-Pentanone
C.A.S. NO.: 756-13-8
% BY WT: > 99.9

SECTION 3: HAZARDS IDENTIFICATION

3.1 EMERGENCY OVERVIEW

Specific Physical Form: Liquid
Odor, Color, Grade: Clear, colorless, low odor.
General Physical Form: Liquid Immediate health, physical, and environmental hazards:

3.2 POTENTIAL HEALTH EFFECTS

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:
If thermal decomposition occurs: May be harmful if inhaled

No health effects are expected.

3.3 POTENTIAL ENVIRONMENTAL EFFECTS

This substance has a high Henry’s Law constant and therefore will be primarily found in the atmosphere where photolysis will be the dominant reaction pathway. The ultimate degradation products of the photolysis reaction are HF, CO2 and trifluoroacetic acid (TFA).

This substance does not contribute to ozone depletion; it has an atmospheric lifetime of approximately 5 days and a Global Warming Potential (GWP) of 1 (IPCC 2001 Method).
APPENDIX D | MATERIAL SAFETY DATA SHEET 3M™ NOVEC™ 1230 (continued)

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:** No need for first aid is anticipated.

**Skin Contact:** No need for first aid is anticipated.

**Inhalation:** If signs/symptoms develop, remove person to fresh air. If signs/symptoms persist, get medical attention.

**If Swallowed:** No need for first aid is anticipated.

SECTION 5: FIRE FIGHTING MEASURES

5.1 FLAMMABLE PROPERTIES

- **Autoignition temperature:** Not Applicable
- **Flash Point:** No flash point
- **Flammable Limits (LEL):** Not Applicable
- **Flammable Limits (UEL):** Not Applicable

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:**

No unusual effects are anticipated during fire extinguishing operations. Avoid breathing the products and substances that may result from the thermal decomposition of the product or the other substances in the fire zone. Keep containers cool with water spray when exposed to fire to avoid rupture.

---

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Ventilate the area with fresh air.

6.2. ENVIRONMENTAL PRECAUTIONS

For larger spills, cover drains and build dikes to prevent entry into sewer systems or bodies of water. Collect the resulting residue containing solution. Place in a metal container approved for transportation by appropriate authorities. Dispose of collected material as soon as possible.

**Clean-up methods**

Observe precautions from other sections. Call 3M-HELPS line (1-800-364-3577) for more information on handling and managing the spill. Contain spill. 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. Clean up residue with detergent and water. Seal the container.

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

For industrial or professional use only. Contents may be under pressure, open carefully. Do not breathe thermal decomposition products.

7.2 STORAGE

Keep container in well-ventilated area. Store out of direct sunlight. Store away from heat. Store away from strong bases, amines, and alcohols.
SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 ENGINEERING CONTROLS

Provide appropriate local exhaust ventilation on open containers. For those situations where the material might be exposed to extreme overheating due to misuse or equipment failure, use with appropriate local exhaust ventilation sufficient to maintain levels of thermal decomposition products below their exposure guidelines.

8.2 PERSONAL PROTECTIVE EQUIPMENT (PPE)

8.2.1 Eye/Face Protection

Not applicable.

8.2.2 Skin Protection

Not applicable. Gloves are not required.

8.2.3 Respiratory Protection

As a good industrial hygiene practice: Avoid breathing of vapors, mists or spray. Under normal use conditions, airborne exposures are not expected to be significant enough to require respiratory protection. If thermal decomposition occurs do not breathe vapors.

Select one of the following NIOSH approved respirators based on airborne concentration of contaminants and in accordance with OSHA regulations:

- Half facepiece or full face supplied-air respirator

Select and use respiratory protection to prevent an inhalation exposure based on the results of an exposure assessment. Consult with your respirator manufacturer for selection of appropriate types of respirators. If thermal decomposition occurs, wear supplied air respiratory protection.

8.2.4 Prevention of Swallowing

Not applicable.

8.3 EXPOSURE GUIDELINES

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Authority</th>
<th>Type</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,1,1,2,2,4,5,5,5 - Nonafluoro-4-(Trifluoromethyl) - 3-Pentanone</td>
<td>Manufacturer determined</td>
<td>TWA</td>
<td>150 ppm</td>
</tr>
</tbody>
</table>

SOURCE OF EXPOSURE LIMIT DATA

ACGIH: American Conference of Governmental Industrial Hygienists
CMRG: Chemical Manufacturer Recommended Guideline
OSHA: Occupational Safety and Health Administration
AIHA: American Industrial Hygiene Association
WEEL: Workplace Environmental Exposure Level

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Specific Physical Form</th>
<th>Odor, Color, Grade</th>
<th>pH</th>
<th>Melting point</th>
<th>Solubility in Water</th>
<th>Evaporation rate</th>
<th>Volatile Organic Compounds</th>
<th>Kow- Oct/Water partition coeff</th>
<th>Percent volatile</th>
<th>Vapor Density</th>
<th>Vapor Pressure</th>
<th>Specific Gravity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid</td>
<td>Clear, colorless, low odor.</td>
<td>Not Applicable</td>
<td>-108 °C</td>
<td>Nil</td>
<td>&gt; 1 (Ref Std BUOAC=1)</td>
<td>1600 g/l (Test Method: calculated SCAQMD rule 443.1)</td>
<td>Not Applicable</td>
<td>100 %</td>
<td>11.6 (Ref Std. AIR= 1)</td>
<td>32.8 kPa (@ 20.3 °C)</td>
<td>1.6 (Ref Std. WATER=1)</td>
</tr>
</tbody>
</table>
APPENDIX D | MATERIAL SAFETY DATA SHEET 3M™ NOVEC™ 1230 (continued)

SECTION 10: STABILITY AND REACTIVITY

Stability: Stable.

HAZARDOUS DECOMPOSITION OR BY-PRODUCTS

Carbon monoxide: During Combustion
Carbon dioxide: During Combustion
Hydrogen Fluoride: During Combustion
Toxic Vapor, Gas, Particulate: During Combustion

MATERIALS AND CONDITIONS TO AVOID:

Conditions to avoid: Light
Materials to avoid: Strong bases, Amines, Alcohols

Additional Information: Listed materials to avoid should not be mixed with liquid Novec 1230 fluid. Avoid direct sunlight and ultraviolet light.

Hazardous Polymerization: Hazardous polymerization will not occur.

SECTION 11: TOXICOLOGICAL INFORMATION

Please contact the address listed on the first page of the MSDS for Toxicological Information on this material and/or its components.

SECTION 12: ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL INFORMATION
Not determined.
Please refer to existing literature on TFA

CHEMICAL FATE INFORMATION
Not determined.
Photolytic halflife 3-5 days.
Photolytic degradation products may include Trifluoroacetic acid (TFA)

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal Method: Reclaim if feasible. To reclaim or return, contact your 3M sales representative. Incinerate in an industrial or commercial facility in the presence of a combustible material. As a disposal alternative, dispose of waste product in a facility permitted to accept chemical waste. Combustion products will include HF. Facility must be capable of handling halogenated materials.

For information on product return, contact your distributor.

EPA Hazardous Waste Number (RCRA): Not regulated
Since regulations vary, consult applicable regulations or authorities before disposal

SECTION 14: TRANSPORT INFORMATION

ID NUMBER(S):

Note
For Transport Information, please visit http://3M.com/Transportinfo or call 1-800-364-3577 or 651-737-6501.

Hydrolysis is not expected to be a significant degradation pathway. Product is highly insoluble in water and volatile, and use as a clean extinguishing agent would not typically result in releases to aquatic environments.

Note
For Transport Information, please visit http://3M.com/Transportinfo or call 1-800-364-3577 or 651-737-6501.
APPENDIX D | MATERIAL SAFETY DATA SHEET 3M™ NOVEC™ 1230 (continued)

SECTION 15: REGULATORY INFORMATION

US FEDERAL REGULATIONS

Contact 3M for more information.

3111312 Hazard Categories:
Fire Hazard- No Pressure Hazard- No Reactivity Hazard - No Immediate Hazard - No Delayed Hazard - No

STATE REGULATIONS

Contact 3M for more information.

CHEMICAL INVENTORIES

The components of this product are in compliance with the chemical notification requirements of TSCA.

All the components of this product are listed on China's Inventory of Chemical Substances.

The components of this material are in compliance with the new chemical notification requirements for the Korean Existing Chemicals Inventory.

Contact 3M for more information.

Additional Information: The components of this product are in compliance with the chemical notification requirements of the National Industrial Chemical Notification and Assessment Scheme (NICNAS) of Australia, the Canadian Environmental Protection Act (CEPA) and the Ministry of Economy, Trade and Industry of Japan. This product is notified in the Philippines as PMPIN-2005-3.

INTERNATIONAL REGULATIONS

Contact 3M for more information.

ADDITIONAL INFORMATION

U.S EPA. Significant New Alternatives Policy Program (SNAP) approved for uses is streaming and flooding fire protection application.

This MSOS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.