

## LFP® Antifreeze+ Agency Listed Solution for Fire Sprinkler Systems

### IMPORTANT

Refer to Technical Data Sheet TFP2300 for warnings pertaining to regulatory and health information.

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### General Description

LFP® Antifreeze+ is a pre-mixed freeze protection solution designed and listed for use in wet sprinkler systems. The solution is designed for systems subject to freezing temperatures that can cause damage to equipment or impede the proper function of the system. The solution is developed to meet the requirements of UL 2901 for compliance to the 2019 editions of NFPA 13, 13R, 13D, and the 2020 edition of NFPA 25.

LFP® Antifreeze+ remains in a liquid state at temperatures as low as -25°F (-31,7°C). Upon operation of the sprinklers during a fire event, the solution immediately discharges from the sprinklers and is followed by water from the water supply. Use of the solution in sprinkler systems eliminates the delivery delay times associated with dry pipe systems.

### Allowable Temperature Range

Minimum use temperature:  
-25°F (-31,7°C)

Maximum use temperature:  
150°F (66°C)

### Fire Performance

LFP® Antifreeze+ is tested for exposure to fire and fire fighting effectiveness.

### Safe Handling Procedures

LFP® Antifreeze+ is formulated to reduce risks to humans and the environment. Wearing gloves and eye protection is best practice when handling LFP® Antifreeze+. For additional product information and Safety Data Sheet, refer to [www.tyco-fire.com](http://www.tyco-fire.com).

### Typical Properties

#### Appearance

Liquid, colorless

#### Freeze Point

-28,5°F (-33,6°C)

**Note:** Freeze point is the temperature at which crystallization begins.

#### Density

See Table E

#### pH

7-8

#### Conductivity

1200 to 1600 µS/cm

#### Refractive Index

See Table C

#### Specific Gravity

See Table C

#### Viscosity

See Table D, Graphs A and B

#### Pour Point

-28,8°F (-33,8°C)

### Technical Data

#### Approvals

UL and cUL Listed  
UL and cUL Certified  
FBC™ System Compatible



**Note:** FBC™ System Compatible indicates that this product has been tested, and is monitored on an ongoing basis, to assure its chemical compatibility with FlowGuard Gold®, BlazeMaster® and Corzan® pipe and fittings. FBC™, FlowGuard Gold®, BlazeMaster® and Corzan® are licensed trademarks of The Lubrizol Corporation or its affiliates.

### Compatibility

The following materials are compatible with LFP® Antifreeze+:

- Steel piping (not galvanized)
- Brass materials
- Stainless steel piping
- Black steel
- Copper
- Bronze
- Cast iron
- CPVC
- PEX
- EPDM
- Natural rubber
- Nitrile rubber (BUNA-N)
- Styrene-butadiene rubber (SBR)
- Fusion bonded epoxy coated ductile iron
- Butyl rubber
- Polyphenylene sulfide (PPS)

#### NOTICE

For use with other materials, contact Technical Services.

| Initial Fluid Volume gal (L) | Temperature Change                              |            |             |             |              |              |              |              |
|------------------------------|---|------------|-------------|-------------|--------------|--------------|--------------|--------------|
|                              | 20°F (-7°C)                                     | 40°F (4°C) | 60°F (16°C) | 80°F (27°C) | 100°F (38°C) | 120°F (49°C) | 140°F (60°C) | 160°F (71°C) |
|                              | Approximate Fluid Expansion/Contraction gal (L) |            |             |             |              |              |              |              |
| 25 (95)                      | 0.1 (0,4)                                       | 0.2 (0,8)  | 0.3 (1,1)   | 0.4 (1,5)   | 0.5 (1,9)    | 0.6 (2,3)    | 0.7 (2,6)    | 0.9 (3,4)    |
| 50 (189)                     | 0.2 (0,8)                                       | 0.4 (1,5)  | 0.6 (2,3)   | 0.8 (3,0)   | 1.1 (4,2)    | 1.3 (4,9)    | 1.5 (5,7)    | 1.7 (6,4)    |
| 75 (284)                     | 0.3 (1,1)                                       | 0.6 (2,3)  | 0.9 (3,4)   | 1.3 (4,9)   | 1.6 (6,1)    | 1.9 (7,2)    | 2.2 (8,3)    | 2.6 (9,8)    |
| 100 (379)                    | 0.4 (1,5)                                       | 0.8 (3,0)  | 1.3 (4,9)   | 1.7 (6,4)   | 2.1 (7,9)    | 2.5 (9,5)    | 3.0 (11,4)   | 3.4 (12,9)   |
| 150 (568)                    | 0.6 (2,3)                                       | 1.3 (4,9)  | 1.9 (7,2)   | 2.5 (9,5)   | 3.2 (12,1)   | 3.8 (14,4)   | 4.5 (17,0)   | 5.1 (19,3)   |
| 200 (757)                    | 0.8 (3,0)                                       | 1.7 (6,4)  | 2.5 (9,5)   | 3.4 (12,9)  | 4.2 (15,9)   | 5.1 (19,3)   | 6.0 (22,7)   | 6.8 (25,7)   |
| 250 (946)                    | 1.0 (3,8)                                       | 2.1 (7,9)  | 3.1 (11,7)  | 4.2 (15,9)  | 5.3 (20,1)   | 6.4 (24,2)   | 7.5 (28,4)   | 8.6 (32,6)   |
| 300 (1136)                   | 1.2 (4,5)                                       | 2.5 (9,5)  | 3.8 (14,4)  | 5.0 (18,9)  | 6.3 (23,8)   | 7.6 (28,8)   | 8.9 (33,7)   | 10.3 (39,0)  |
| 350 (1325)                   | 1.5 (5,7)                                       | 2.9 (11,0) | 4.4 (16,7)  | 5.9 (22,3)  | 7.4 (28,0)   | 8.9 (33,7)   | 10.4 (39,4)  | 12.0 (45,4)  |
| 400 (1514)                   | 1.7 (6,4)                                       | 3.3 (12,5) | 5.0 (18,9)  | 6.7 (25,4)  | 8.5 (32,2)   | 10.2 (38,6)  | 11.9 (45,0)  | 13.7 (51,9)  |
| 450 (1703)                   | 1.9 (7,2)                                       | 3.8 (14,4) | 5.7 (21,6)  | 7.6 (28,8)  | 9.5 (36,0)   | 11.5 (43,5)  | 13.4 (50,7)  | 15.4 (58,3)  |
| 500 (1893)                   | 2.1 (7,9)                                       | 4.2 (15,9) | 6.3 (23,8)  | 8.4 (31,8)  | 10.6 (40,1)  | 12.7 (48,1)  | 14.9 (56,4)  | 17.1 (64,7)  |

**NOTES**

- Interpolation and extrapolation can be calculated for values outside temperatures and volumes listed in Table A.
- For examples on calculating fluid expansion and contraction, see the sections titled Expansion Example and Contraction Example, respectively.

**TABLE A**  
**LFP® ANTIFREEZE+ EXPANSION**

| Pipe/Tube Size | Approximate Gallons of Fluid/100 ft |          |           |                    |
|----------------|-------------------------------------|----------|-----------|--------------------|
|                | Steel Schedule 40 Pipe              | PEX Tube | CPVC Pipe | Copper Pipe Type L |
| 1/2 in.        |                                     | 1        |           | 1.5                |
| 3/4 in.        |                                     | 2        | 3.5       | 2.5                |
| 1 in.          | 4.5                                 | 3        | 5         | 4.5                |
| 1 1/4 in.      | 8                                   | 4.5      | 8         | 6.5                |
| 1 1/2 in.      | 11                                  | 6.5      | 10.5      | 9.5                |
| 2 in.          | 17.5                                | 11       | 16.5      | 16.0               |
| 2 1/2 in.      | 25                                  |          | 24.0      | 25                 |
| 3 in.          | 38.5                                |          | 35.5      |                    |
| 4 in.          | 66.5                                |          |           |                    |

**NOTES**

- Values are approximate.

**TABLE B**  
**LFP® ANTIFREEZE+ PIPE FILL**

| Concentration of LFP® Antifreeze+ % | Specific Gravity at 77°F (25°C) | Refractive Index at 77°F (25°C) |
|-------------------------------------|---------------------------------|---------------------------------|
| 100                                 | 1.1465 to 1.1535                | 1.4065 to 1.4095                |

**TABLE C**  
**ACCEPTABLE PROPERTY RANGES OF LFP® ANTIFREEZE+ FOR MINIMUM USE TEMPERATURE -25°F (-31,7°C)**

| Temperature °F (°C) | Viscosity Centipoise |
|---------------------|----------------------|
| -25 (-31,7)         | 335.9                |
| 38,5 (3,6)          | 19.6                 |
| 70 (21,1)           | 8.9                  |
| 117,9 (47,7)        | 4.1                  |
| 150 (65,6)          | 3.0                  |

**NOTES**  
• For other data points, use Graph A or B. Interpolation is not permitted.

**TABLE D**  
**LFP® ANTIFREEZE+ VISCOSITY ACROSS TEMPERATURE RANGES**

| Temperature °F (°C) | Density <sup>a</sup> |                   |                     |
|---------------------|----------------------|-------------------|---------------------|
|                     | lb/gal               | kg/m <sup>3</sup> | lb/ft <sup>3b</sup> |
| -25 (-31,7)         | 9.76                 | 1169.0            | 73.0                |
| 0.0 (-17,8)         | 9.71                 | 1163.4            | 72.6                |
| 38.5 (3,6)          | 9.64                 | 1154.6            | 72.1                |
| 77 (25)             | 9.55                 | 1144.2            | 71.4                |
| 117.9 (47,7)        | 9.49                 | 1136.5            | 71.0                |
| 150 (65,6)          | 9.42                 | 1129.2            | 70.5                |

**NOTES**  
a. Density data may be interpolated to calculate other values.  
b. The lb/ft<sup>3</sup> column is used in the K-factor equation in the Hydraulic Calculations section.

**TABLE E**  
**LFP® ANTIFREEZE+ DENSITY**

## Design Criteria

LFP® Antifreeze+ is a solution specifically tested and listed by UL for use within the strict parameters and requirements in this Technical Data Sheet.

All fire protection systems shall conform to state, local, and NFPA requirements if employing the use of LFP® Antifreeze+.

### Layout and Design

Flow rates, pipe sizing, sprinkler spacing, hanging methods, and system design must be in accordance with NFPA 13, 13R, and 13D. Fire sprinkler systems utilizing LFP® Antifreeze+ shall meet the system size limitations, as shown in Table F.

### NOTICE

LFP® Antifreeze+ is not listed for use in protecting extra hazard occupancies, flammable liquids, or use with ESFR sprinklers.

### Hydraulic Calculations

For all systems, the following requirements shall apply:

- The use of the antifreeze solution is limited to the aboveground system piping only except for a limited length of underground piping that connects sections of the aboveground system.
- The viscosity of the antifreeze solution at the lowest anticipated temperature of the system shall be considered in the hydraulic design. Where the system application temperature is between 0°F (-17.8°C) and -25°F (-31.7°C), the curves shown in Graphs A and B may be used to determine the value of viscosity.

- The friction loss shall be determined using the Hazen-Williams formula for water and the Darcy-Weisbach formula to account for the antifreeze solution fluid properties.
- The K-factor of the sprinkler shall be adjusted to account for the density of the antifreeze

The flowing pressures are to be based upon a K-factor calculated using the following equation:

$$K_A = 7.94K_W \sqrt{\frac{1}{\gamma_A}}$$

$K_A$  = sprinkler k-factor discharging the antifreeze solution

$K_W$  = sprinkler K-factor discharging water

$\gamma_A$  = density of the antifreeze solution at the temperature used for testing in lb/ft<sup>3</sup>

Where the use of antifreeze in accordance with the listing requires the hydraulic design to be based on the dry system hydraulic design criteria, the hydraulic calculations are to be performed in accordance with the applicable NFPA Standard dry system design even though the system is filled with antifreeze. The following points are examples of dry system design criteria:

1. All applicable design area increases shall apply, such as:
  - a. 30 percent increase for dry systems.
  - b. 30 percent increase for sloped ceiling applications where applicable.

2. Where using QR sprinklers, the QR reduction in design area shall not apply.
3. Where a system is being designed using specific application attic or concealed space sprinklers, the dry system hydraulic design criteria in the manufacturers installation instructions shall be used.

The friction loss coefficient (c-factor or c values) for a wet system is permitted to be used for the dry system hydraulic calculation using antifreeze. It is not required to use the c-factor for the dry system.

**Note:** See Table E for density in lb/ft<sup>3</sup>.

### Minimum Design Pressure

For system design, a minimum operating pressure of 20 psi must be used at the most hydraulically remote sprinkler. This is an additional requirement for the hydraulic calculations. Also, the minimum operating pressure of the sprinklers must be at least the required pressure for the sprinklers used.

### Fluid Sampling Valve Connection

The riser must be installed in an area not subject to freezing with a minimum temperature of 40°F (4°C). A fluid sampling valve connection must be located at the top of each system riser. The sampling valves should be located for ease of access to the valve by contractors.

The sampling connection will facilitate implementing the service requirements outlined in the Care and Maintenance section.

| Temperature Range   | Application  | Maximum Volume of Antifreeze in Sprinkler System   |
|---|--|--|
| -25°F to 150°F<br>(-32°C to 66°C)   | NFPA 13D <sup>1</sup>  | ≤500 gal; in accordance with NFPA 13D design criteria  |
|   | NFPA 13R – Residential Only (including corridors, garages that serve only a single dwelling unit, and compartmented Ordinary Hazard areas ≤500 sq ft) <sup>1</sup><br><br><b>Note:</b> Where NFPA 13R requires the use of NFPA 13 design criteria, refer to the NFPA 13 applications and volume limitations. | ≤500 gal; in accordance with NFPA 13R design criteria<br><br><b>Note:</b> Where NFPA 13 design criteria is required in areas of an NFPA 13R Occupancy, such as an attic, common and large garages, or a clubhouse; use the applicable volume limitation for the hazard area for NFPA 13. |
|   | NFPA 13 - Light Hazard <sup>1</sup>  | ≤200 gal; in accordance with NFPA 13 design criteria<br><br>or<br><br>>200 gal to ≤500 gal; in accordance with NFPA 13 using the dry system hydraulic design criteria, where the system hydraulics are designed as a dry system even though the system is filled with antifreeze         |
|   | NFPA 13 - Ordinary Hazard Groups 1 & 2 <sup>1</sup>  | ≤40 gal; in accordance with NFPA 13 design criteria  |
|   | NFPA 13 – Storage <sup>1</sup>   | ≤40 gal; in accordance with NFPA 13 design criteria  |
| <b>NOTES</b><br>1. The antifreeze solution is intended to be installed in accordance with the manufacturer's instructions. For all systems, the following requirements shall apply: <ul style="list-style-type: none"> <li>• Use of the antifreeze solution is limited to the aboveground system piping only except for a limited length of underground piping that connects sections of the aboveground system.</li> <li>• Viscosity of the antifreeze solution at the lowest anticipated temperature of the system shall be considered in the hydraulic design.</li> <li>• Friction loss shall be determined using the Hazen-Williams formula for water and the Darcy-Weisbach formula to account for the antifreeze solution fluid properties.</li> <li>• K-factor of the sprinkler shall be adjusted to account for the density of the antifreeze.</li> </ul> |  |  |
| <b>TABLE F</b><br><b>LFP® ANTIFREEZE+ LISTINGS LIMITATIONS</b>  |  |  |

**Fluid Contraction and Expansion**

Fluids expand and contract when exposed to changes in temperatures, resulting in changes in fluid density. Thermal expansion shall be taken into account when designing or retrofitting a sprinkler system that will use LFP® Antifreeze+ by use of an expansion tank. Table A shows the thermal expansion or contraction of the solution at different temperatures in sprinkler system volumes, using the equation for sizing the expansion chamber due to thermal expansion in NFPA 13.

These values and the NFPA 13, 13R, and 13D Standards for the Installation of Sprinkler Systems can be used by the installer to determine the proper expansion or contraction arrangement of a sprinkler system containing LFP® Antifreeze+.

**Expansion Example**

A sprinkler system containing 50 gal (189 L) of LFP® Antifreeze+ is subjected to an environmental temperature of 0°F (-18°C) in the winter months and an increase of system temperature to 100°F (38°C) in the summer months, or a temperature change of 100°F (38°C). This results in fluid expansion of approximately 1.1 gal (4.2 L).

**Contraction Example**

A sprinkler system containing 300 gal (1136 L) of LFP® Antifreeze+ is subjected to an environmental temperature of 70°F (21°C) with a later decrease in system temperature to -10°F (-23°C), or a temperature change of 80°F (27°C). This results in a fluid contraction of approximately 5.0 gal (18.9 L).

**Expansion Tank**

Reference NFPA 13 for guidance on the addition of expansion tanks in new and existing systems. Vessel sizing should be based on the anticipated operating conditions the system will experience and the corresponding expansion values in Table A.

An expansion tank is highly recommended for all systems (including existing). Without an expansion tank there is potential for water to enter the system which can alter the performance of LFP® Antifreeze+.

Reference NFPA 13, System Requirements of Antifreeze Systems for alternate methods.