



BestSolv™ ZULU FS

FIRE PROTECTION FLUID

Technical Data Sheet

Features and Benefits

- Low Surface Tension
- Low Viscosity
- No Flash Point
- High Boiling
- Excellent fire and combustion protection

Environmental Properties

- GWP of 1
- ODP 0

Typical Applications

- Anechoic Chamber Protection
- Maritime Vessels
- Aerospace / Military
- Electronics/Data Center/Server Rooms
- Laboratories
- Telecommunications
- Medical, Legal, Museum & Archives Storage
- Oil & Gas Mining
- Paint Rooms
- Energy Generation & Storage

Introduction

BestSolv™ Zulu FS Fluid is a exact molecule replacement (dodecafluoro-2-methyl-3-pentanone or (CF₃CF₂C(O)CF(CF₃)₂) for 3M™ Novec 1230™.

BestSolv™ Zulu FS fluid offers a unique combination of safety, low environmental impact and extinguishing performance, making it the only chemical halon replacement to offer a viable, long-term, environmentally sustainable technology for special hazards fire protection.

Designed to be used for fire suppression. Its higher boiling point, flammability properties and low conductivity make it a perfect halon alternative. It is designed to be used in the same pressurized systems as the 3M™ Novec 1230™, converting from stored liquid to gas when released through nozzles in properly designed systems.

BestSolv™ Zulu FS has low toxicity and can be used as a clean extinguishing agent. Discharge of BestSolv™ Zulu FS in areas with localized or total flooding to protect critical assets such as computer and electrical equipment can be accomplished without the danger of water damage.

Physical and Chemical Properties

CAS #	756-13-8
Appearance	Clear & Bright
Flash Point	None
Boiling Point	49 °C / 120.2 °F
Critical Temperature	169 °C / - 336.2 °F
Critical Pressure	1.88mPA
Freezing / pour point	-108°C

Specific Gravity	1.60g/mL@25°C
Specific heat	1103 j/kg*K@25°C
Viscosity	0.64cPs@25°C
Vapor pressure	305mmHg @25°C
Latent Heat of Vaporization	88-kJ/kg @ BP
Dielectric Constant	1.8@1kHz
Dielectric Strength	48kV liquid 15kV vapor

Data compiled from published information. Not for specification purposes.



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BestSolv™ ZULU FS



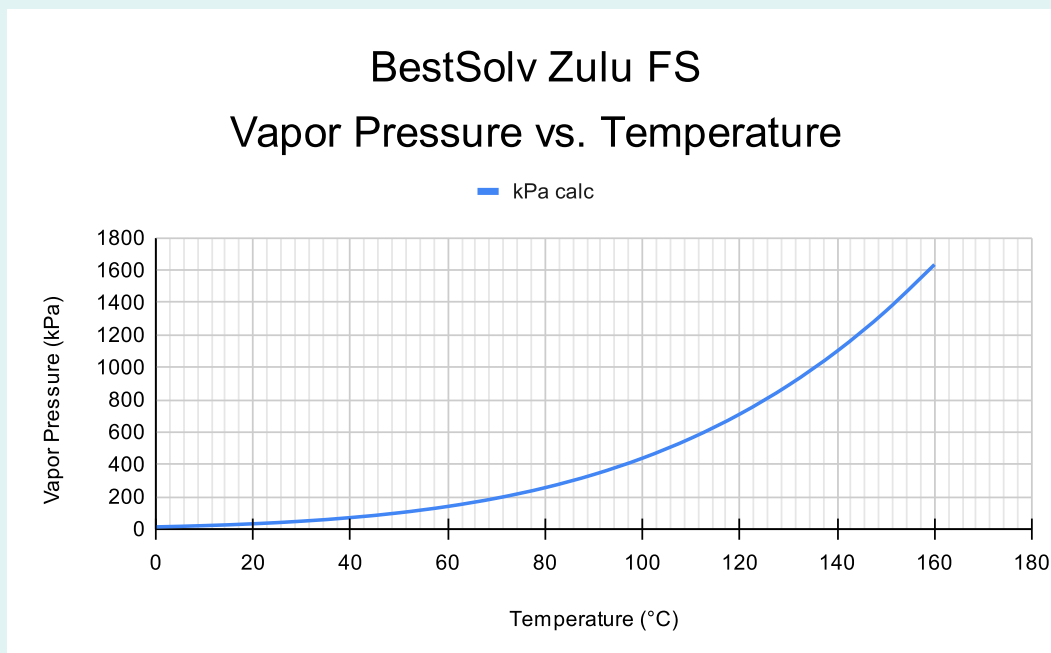
Physical and Chemical Properties Cont.

BestSolv™ Zulu FS is liquid at room temperature but applied as a gas. In both physical states, it is electrically non-conducting. Exhibiting over 2x the breakdown voltage of dry nitrogen gas, the breakdown voltage of BestSolv™ Zulu FS fluid vapor is approximately 15kV (saturated at 101 kPa - 21°C and a 2.7 mm gap). The breakdown voltage of liquid BestSolv™ Zulu FS fluid under the same conditions is 48 kV.

With a boiling point of 49°C, BestSolv™ Zulu FS has a much lower vapor pressure than other clean agents that are gases at ambient conditions. Other than being in a liquid phase at ambient temperature, BestSolv™ Zulu FS fluid shares similar properties with the first-generation halon replacements.

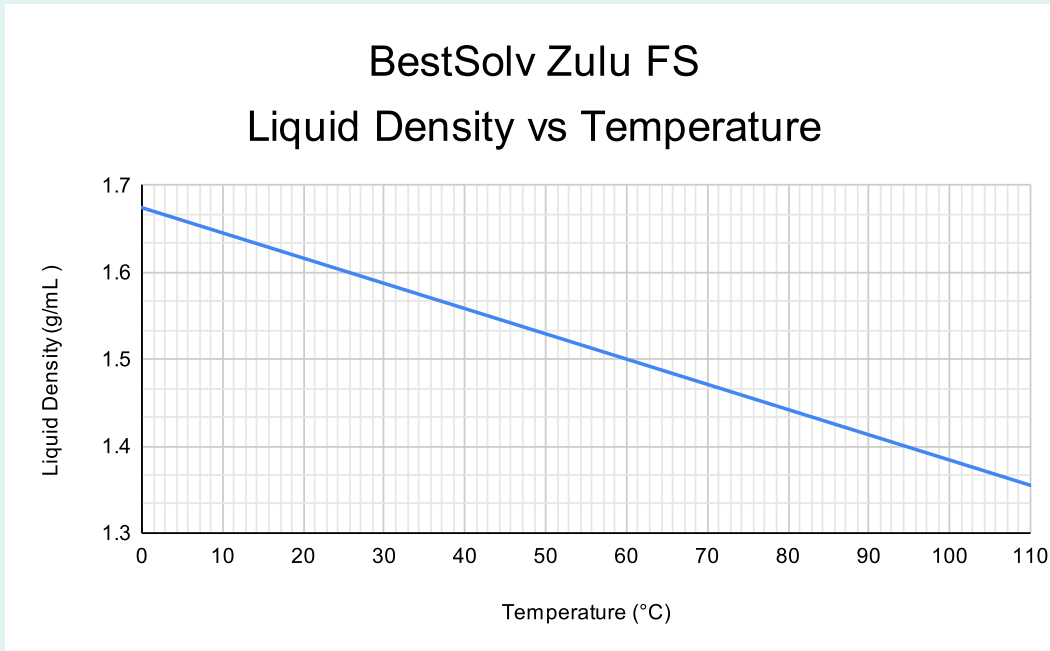
The heat of vaporization of BestSolv™ Zulu FS fluid is nearly 25 times less than water. This very low heat of vaporization in combination of a vapor pressure 12 times higher than water allows BestSolv™ Zulu FS fluid to evaporate more than 50 times faster than water. When discharged from a properly designed system nozzle, BestSolv™ Zulu FS fluid will immediately vaporize and evenly cover a protected space.

Due to its vapor pressure characteristics, the agent can easily achieve vapor extinguishing concentrations in air up to 39 percent volume before reaching saturation. Typical fire suppression design concentrations for most applications are in the range of 4.5 to 6 percent by volume of the protected space. This large difference between saturation and design concentrations ensure vapor condensation will not occur.





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How BestSolv™ Zulu FS works

Similar to other halocarbon halon alternatives, BestSolv™ Zulu FS extinguishes principally by removing heat from the fire resulting in a gaseous mixture with air with a much higher heat capacity than air alone. Meaning this gas mixture will absorb more heat energy over every degree of temperature change experienced. At the proper system design concentration, the agent/air mixture absorbs sufficient heat energy to extinguish the conditions required for combustion to occur. In fact, BestSolv™ Zulu FS fluid has the highest heat capacity of commercially available halon alternatives resulting in the lowest extinguishing concentrations for a given fuel thus saving fluid costs/volumes and discharge to the environment.



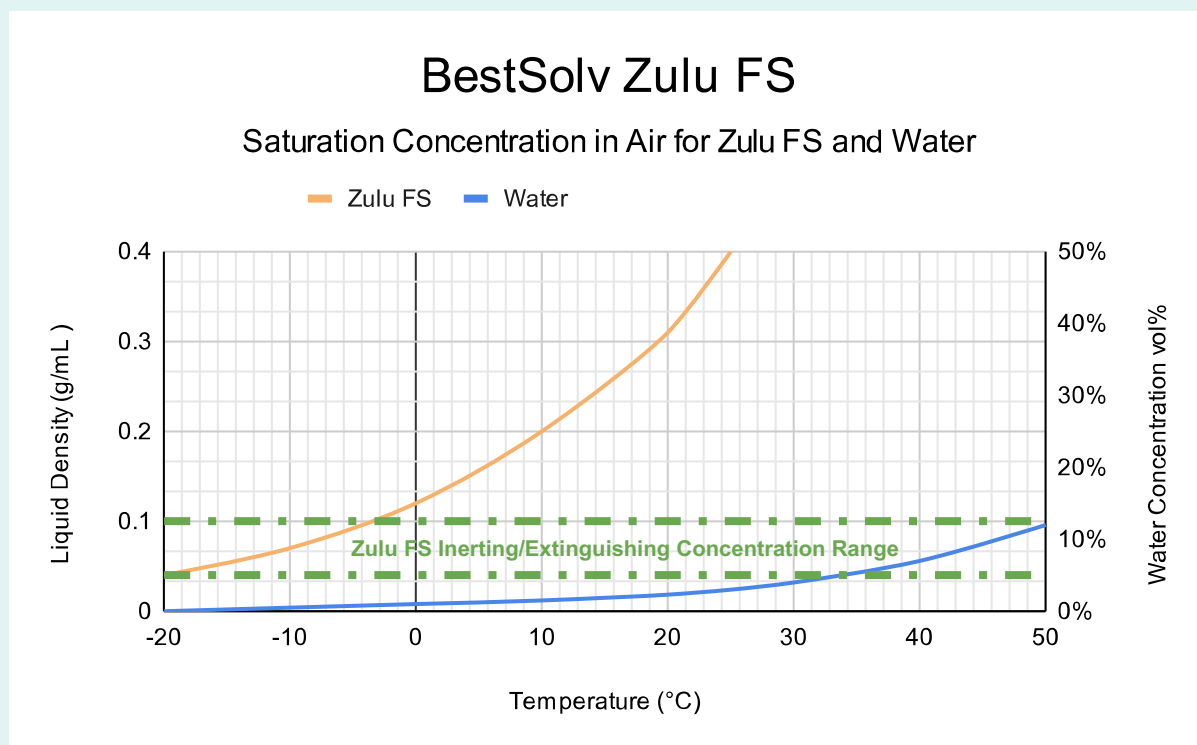
BestSolv™ ZULU FS



Phase state change of liquid to gas:

BestSolv™ Zulu FS fluid is able to effectively vaporize over the expected range of design concentrations as shown in the chart below. For ease of comparison, water is shown for comparison because the evaporative rate is more readily witnessed / understood. The vapor pressure of the pure liquids in atmospheres is shown on the left axis. The right axis shows the gas-phase concentration of BestSolv™ Zulu FS fluid or water assuming ideal solution and ideal gas behavior of a mixture with air at 1 atm total pressure (the liquid is considered a pure phase).

For ease of visual description, boundary lines are drawn to represent a typical 4.5-10 vol % BestSolv™ Zulu FS fluid concentration range for extinguishing or inerting applications. At ambient room temperature, liquid BestSolv™ Zulu FS will evaporate quickly to create a 32% by vol vapor, well above that of typical extinguishing concentrations of 4.5-10 vol %. Interestingly, the high vapor pressure of BestSolv™ Zulu FS fluid allows it to exhibit extinguishing conditions of 5 vol % at a temperature as low as nearly -20°C where as water does not support a 5 vol % concentration in air until the temperature exceeds over 30°C.





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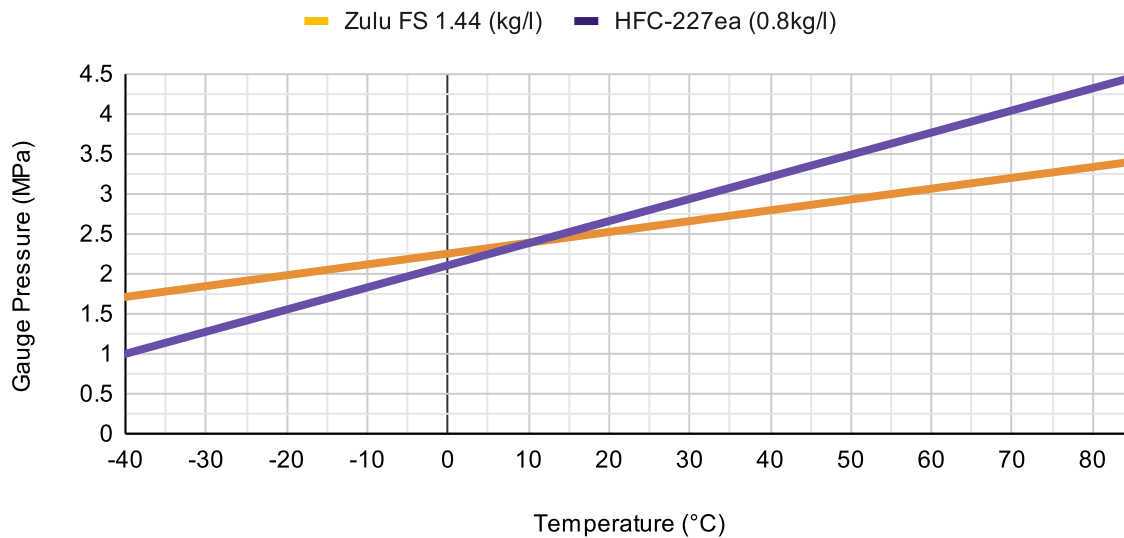


Cylinder Fill Density

When superpressurized with nitrogen in a cylinder over a large range of cylinder storage/operating temperatures, a high boiling point material like BestSolv™ Zulu FS fluid, does not vary significantly in storage pressure like the lower boiling gases such as HFC-227ea/FM-200®. This narrow band of storage pressure vs. temperature allows the maximum fill density of BestSolv™ Zulu FS to be 1.8 times greater than lower boiling gases over the -40°C to 80°C range. This is very important in applications of expected wide range of temperatures, such as military/aerospace aircraft, oil exploration rigs or shipping vessels that may travel through extremes of tropical and arctic waters.

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Pressure Cylinder Superpressurization at (2.5MPa) vs Temperature





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Storage and Handling

BestSolv™ Zulu FS is thermally stable and will not oxidize or degrade during storage under normal conditions. It is recommended to store the product inside a clean, dry area and out of direct sunlight or other heat sources. Do not freeze or store below 32°F (0°C) nor above 90°F (32°C) to prevent leakage or potential rupture of container due to contraction/expansion and pressure changes. Drum pumps are recommended to dispense the solvent from its container. Refer to the Safety Data Sheet for more information or contact Best Technology for further assistance

Based on Pensky-Martens Closed Cup (ASTM D93) or Tag Closed Cup (ASTM D56) methods, BestSolv™ Zulu FS exhibits no flash point and is not classified as flammable by OSHA. BestSolv™ Zulu FS is not classified as flammable or hazardous for transport by DOT.

Environmental Properties

- SNAP EPA accepted substitute for ozone depleting substances
- Not subject to SARA Title III (EPCRA) reporting regulation
- Non hazardous air pollutant (HAP) / Not regulated under NESHAP
- ODP is 0.
- BestSolv™ Zulu FS is not considered hazardous waste in the US as long as a hazardous material is not deposited into the solvent during the cleaning process.

Health and Safety

Reference the SDS for details on:

- Individual chemical components
- Disposal
- Transportation
- PPE
- Other information

Materials Compatibility

BestSolv™ Zulu FS is compatible with most materials used in modern industrial facilities.

The solvent is also compatible with stainless steel, aluminum, iron, and every other metal commonly used in precision parts manufacturing. This product is compatible with most plastics and elastomers.

Exposure Time: 1 Week @ 25°C, 100°C Gaskets and O-rings should be made of chemical resistant elastomers such as, nitrile, EPDM, silicone and butyl rubber.

Fluoroelastomers and heavily plasticized rubbers should be avoided

Product Use / Warranty

All information contained in this document is based on data believed to be reliable but the accuracy or completeness thereof is not guaranteed and are made without representation or warranty. Many factors can affect the use, performance, time and environmental conditions in a particular application. User is responsible for evaluation to determine whether it is fit for a particular purpose and application and products discussed are sold without warranty, expressed or implied, in law or fact.

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