

# Honeywell Solstice® Performance Fluid 2A



**Technical Bulletin**

**Honeywell**

# Solstice® Performance Fluid 2A

## Introduction

Solstice Performance Fluid 2A (PF-2A) is a highly effective cleaning solution that is non-flammable per ASTM E681 testing, has favorable toxicity properties and a low global warming potential. It effectively combines the cleaning power of Solstice PF with methanol, which yields an azeotropic fluid that can solubilize ionic contaminants in hydrocarbon-based oils and water soluble soils. Solstice PF-2A is an azeotropic mixture of Solstice PF (98 weight percent) and methanol (2 weight percent). Solstice PF-2A also balances cleaning performance with environmental and safety performance. It has VOC content of <25 grams per liter, can be used in California's South Coast Air Quality Management District (SCAQMD), and is non-flammable as determined by ASTM E-681. Solstice PF-2A has been shown to have good compatibility with many common metals, plastics and elastomers, and can completely remove a wide range of contaminants.

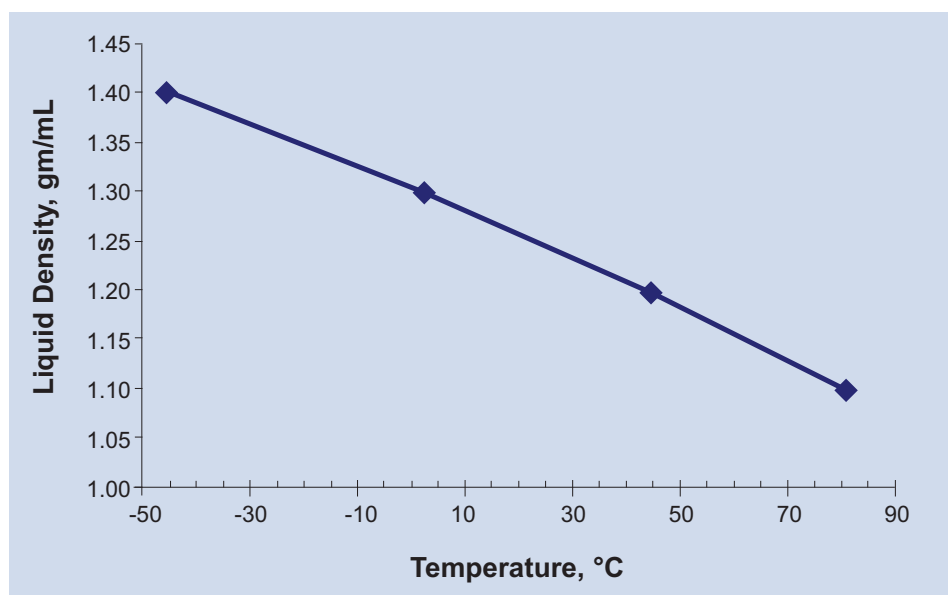
While Solstice PF-2A can be used as a standalone cleaning solution, it can also be used effectively as the rinse agent in the KYZEN DuoSolvent™ process. The DuoSolvent process is proven to remove fluxes, buffing compounds, waxes, lacquers and other high-temperature soils.

| Property                                  | Solstice PF-2A  |
|---|---|
| Chemical Name                             | Trans-1-chloro-3,3,3-trifluoropropene: 98wt%<br>Methanol: 2wt%                      |
| Molecular Weight                          | Solstice PF: 130.5 gm/mol<br>Methanol : 32.0 gm/mol<br>Solstice PF-2A: 122.9 gm/mol |
| Boiling Point                             | 63°F<br>17.4°C  |
| Heat of Vaporization at the Boiling Point | 90.3 BTU/lb<br>210 kJ/kg  |
| Liquid Density at the Boiling Point       | 10.6 lb/gal<br>1.26 gm/mL   |
| KB Value                                  | 26  |

**Table 1. Physical Properties of Solstice PF-2A**

## Physical Properties

The primary physical properties of Solstice PF-2A are given in Table 1. As an azeotropic blend, Solstice PF-2A will not segregate by distillation in a standard vapor and solvent degreaser process. The solvent has been shown to provide excellent cleaning performance in appropriate degreasing equipment with low loss rates.



**Figure 1. Liquid Density of Solstice PF-2A**

## Environmental and Safety

Solstice PF-2A has no flash point or vapor flame limits at room temperature when measured according to ASTM E681. The VOC content of Solstice PF-2A is <25 grams per liter, which allows for its use in many regions, including those covered by California's South Coast Air Quality Management District (SCAQMD).

## Cleaning Performance

Solstice PF-2A is specifically formulated to remove polar soils, such as emulsified oils and inks. It is recommended that molecular sieves are used to remove water from PF-2A in a solvent degreasing system.

| Water Insoluble | Water Soluble      |
|-----------------|--------------------|
| Cutting oil     | Emulsified oils    |
| Silicone oil    | Ionic contaminants |
| Mineral oil     | Fingerprints       |
| Grease          |                    |

**Table 3. Soils Removed with Solstice PF-2A**

## Metal Compatibility

Solstice PF-2A is compatible with stainless steel, cold rolled steel, galvanized steel, copper, iron and aluminum, with or without excess water. The tests to determine this were conducted by refluxing the solvent for two weeks in the presence of the metal and water. At the conclusion of the test, no chemical breakdown of the solvent was observed. Solstice PF-2A was tested for compatibility according to the

| Property                                  | Solstice PF-2A   |
|---|--|
| Flash point                               | None   |
| Vapor Flame Limits                        | None   |
| VOC Content                               | < 25 gm/L  |
| Occupational Exposure Limits – 8-Hour TWA | Solstice PF: 800 ppm (WEEL)<br>Methanol: 200 ppm (ACGIH) |

**Table 2. Safety and Environmental Properties of Solstice PF-2A**

| Plastic Substrate     | % Wt Change | % Vol. Change | Comment   |
|-----------------------|-------------|---------------|---|
| ULTEM® Polyetherimide | 0.2%        | -0.2%         | No visual effects                                 |
| Kynar® PVDF           | 0.2%        | -0.3%         | No visual effects                                 |
| PVC Type 1            | 0.2%        | -0.3%         | No visual effects                                 |
| PET                   | 0.2%        | -0.3%         | No visual effects                                 |
| Delrin®               | 1.0%        | 0.2 %         | No visual effects                                 |
| Nylon 66              | 1.0%        | 0.9%          | No visual effects                                 |
| HDPE                  | 1.7%        | 0.8%          | No visual effects                                 |
| Teflon®               | 2.0%        | 1.3%          | No visual effects                                 |
| Polypropylene         | 4.2%        | 2.3%          | No visual effects                                 |
| Polycarbonate         | 9.0%        | 6.4%          | Uneven surface bubbling                           |
| ABS                   | 17.6%       | 74.2%         | Completely dissolved                              |
| HIPS                  | 27.6%       | 67.9%         | Malleable gum-like consistency sitting on solvent |

**Table 4. Solstice PF-2A Compatibility with Plastics and Elastomers**

| Uncoated Panels   |  |  |
|---|--|--|
| AMS 4037 Aluminium<br>AMS 4375 Magnesium<br>AMS 4442 Magnesium<br>AMS 4507 Copper<br>AMS 4544 Nickel<br>AMS 4640 Aluminum Bronze<br>AMS 4911 Titanium | AMS 5040 Steel<br>AMS 5382 Cobalt<br>AMS 5504 Corrosion Resistant Steel<br>AMS 5508 Corrosion Resistant Steel<br>AMS 5524 Corrosion Resistant Steel<br>AMS 5525 Corrosion Resistant Steel<br>AMS 5536 Nickel | AMS 5537 Cobalt<br>AMS 5596 Nickel<br>AMS 5661 Nickel<br>AMS 6431 Steel<br>AMS 4434 (AZ92) Magnesium<br>MAR-M-002<br>IMI 685 |
| Electroplated Panels  |  |  |
| AMS 4037/AMS 2470<br>Anodic Treatment<br>AMS 5504/AMS 2400<br>Cadmium Plated<br>AMS 5504/AMS 2406<br>Chromium Plating                                 | AMS 5504/AMS 2410 Silver Plating<br>AMS 5504/AMS 2416 Ni - Cad Plating<br>AMS 5504/AMS 2418 Copper Plating   | AMS 5504/AMS 2424<br>Nickel Plating  |
| Plasma Coated Panels  |  |  |
| AMS 4911/AMS 2437-3<br>AMS 5504/AMS 2437-2  | AMS 5504/AMS 2437-3<br>AMS 5504/AMS 2437-5   | AMS 5504/AMS 2437-6<br>AMS 5504/AMS 2437-7   |
| Uncoated Panels (Intergranular End Grain Pitting/ASTM F2111 Testing)  |  |  |
| AMS 4037 Aluminum<br>AMS 4375 Magnesium   | AMS 4911 Titanium<br>AMS 5382 Cobalt   | AMS 5504 Corrosion Resistant Steel<br>AMS 5536 Nickel  |

**Table 5. Additional Metal Compatibility of Solstice PF-2A with SAE Aerospace Recommended Practices (ARP) 1755B.**

| <b>Alloy Uncoated Panels<br/>(per 2"x4" panels)</b> |
|---|
| AMS 4037 Aluminum                                   |
| AMS 4375 Magnesium                                  |
| AMS 4911 Titanium                                   |
| AMS 5382 Cobalt                                     |
| AMS 5504 Corrosion Resistant Steel                  |
| AMS 5536 Nickel                                     |

**Table 6. Alloy Uncoated Panels (per 2"x4" panels)**

SAE Aerospace Recommended Practice (ARP) 1755 Revision B test method. This was designed to evaluate if any intergranular attack or end-grain pitting was observed at 400x magnification according to ASTM F2111 for the metals listed in Table 5 and Table 6. Solstice PF-2A was found to conform to ARP 1755 B, and no intergranular attack or end-grain pitting was observed on the metals tested.

### **Recycling and Solvent Recovery**

Solstice PF-2A is an azeotrope and can be recovered or recycled by simple flash distillation. Although it is a mixture of Solstice PF and methanol, it does not require a stabilizer.

### **Storage and Handling**

Solstice PF-2A is non-flammable and is resistant to thermal and hydrolytic breakdown. Ensure that all containers are rated for the storage of Solstice PF-2A when transferring. The solvent is shipped in cylinders.

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