



# TECHNICAL DATA SHEET OF savE® HS01

savE® Phase Change Materials (PCM) are organic or inorganic chemical compounds that have large amount of heat energy stored in the form of Latent Heat which is absorbed or released when the materials change state from solid to liquid or liquid to solid. The PCM retains its latent heat without any change in physical or chemical properties over thousands of cycles. Various specific temperature savE® PCM's are commercially available (-33°C to +89°C) depending upon the applications..

## Applications

**PCM provides energy efficient solutions for many industries including:**

- Insulation for Building and Piping Products
- Biopharmaceutical Transportation
- Telecommunications and Heat Sinks
- Hot and Cold Storage
- Food / Poultry / Milk Products Transportation
- Boiler and Hot Water Systems Industry looking to exploit Off-Peak Electricity Tariffs / Reducing Chilling Equipment Costs by Storing Energy at Off-Peak Hours

However there is no limit as to who can apply PCM technology to their operation, to improve thermal management, cost and energy efficiencies.

## PLUSS® Encapsulation

Pluss® pioneered the use of HDPE panels as encapsulation for PCMs in India. Our calculations for total heat transfer across thin membranes show that HDPE/ PP is as good as aluminum, stainless steel, etc. Pluss® encapsulations are thin enough to give good overall heat transfer coefficient and provide good mechanical strength.

## savE® HS01

Frost™ is an inorganic chemical based PCM having nominal freezing temp. of 0°C. It stores thermal energy as latent heat in its crystalline form. On changing phase this latent heat is released or absorbed, allowing the ambient temperature within the system to be maintained. Frost™ is constituted of the right mix of various salts, additives and nucleating agents allowing equilibrium between solid and liquid phases to be attained at the melting point. The savE® HS01 is free flowing in molten state and can be encapsulated in various forms.

## Why savE® HS01?

Frost™ has a nominal freezing temperature of 0°C, a temperature that makes it ideal for many cold storage & cold chain applications. Some of its salient features include:

- The PCM is chemically and thermally stable by using PLUSS® proprietary additives
- Mixture of inorganic salts.

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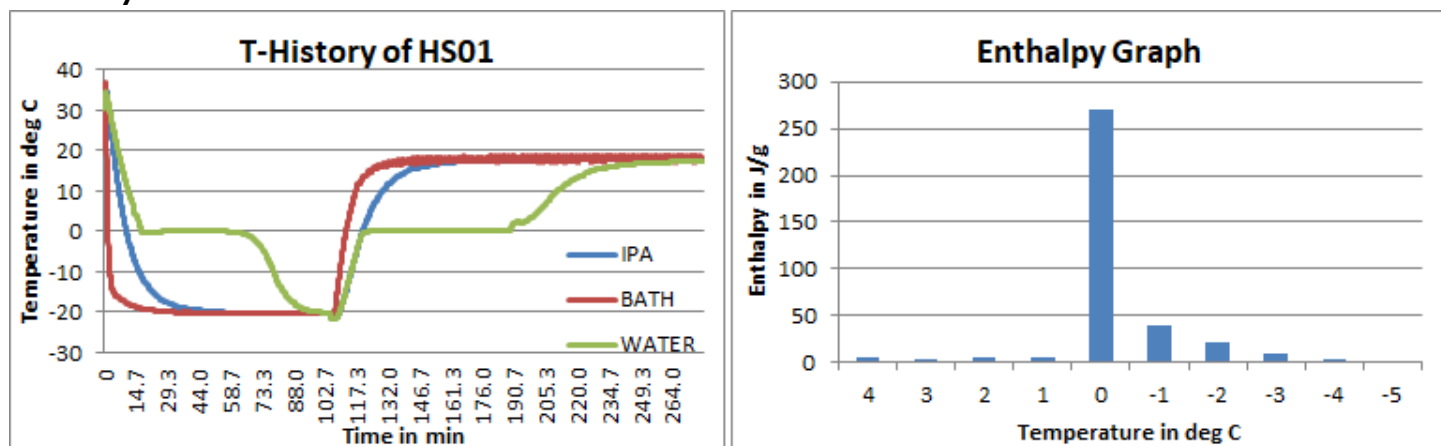
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**Technical Specification:**

Product : savE®  
 Series : HS01  
 Description : Mixture of Inorganic additives  
 Appearance : Light Blue to Dark blue colored liquid

**T-History Test**



**Fig 1: T-History graph of HS01 in air bath**

A 26g sample is taken in a test tube in molten condition and placed in a temperature controlled bath. A temperature sensor is placed in the test tube and bath to record the temperatures using a data logger. The bath is maintained at -20°C during the freezing cycle and at around 20°C (maximum) during the melting cycle.

| Property                           | Value*    | Test Method      | Test Conditions (if any) |
|------------------------------------|-----------|------------------|--------------------------|
| Melting Temp (°C)                  | 1.0       | PLUSS® T-History | @ 21°C Liquid Bath       |
| Freezing Temp (°C)                 | 1.0       | PLUSS® T-History | @ -20°C Liquid Bath      |
| Latent Heat (kJ/kg)                | 350       | PLUSS® T-History | @ 4 to -5°C              |
| Liquid Density (kg/m³)             | 1010      | ASTM D891-95     | @ 30°C                   |
| Solid Density (kg/m³)              | 924       | ASTM D792-08     | @ -20°C                  |
| Liquid Specific Heat (kJ/kgK)      | 3.9       | PLUSS® T-History | @ 30°C                   |
| Solid Specific Heat (kJ/kgK)       | 2.0       | PLUSS® T-History | @ -10°C                  |
| Liquid Thermal Conductivity (W/mK) | 0.55      | KD2Pro           | @ 30°C                   |
| Solid Thermal Conductivity (W/mK)  | 2.2       | KD2Pro           | @ -10°C                  |
| Base Material                      | Inorganic |                  |                          |
| Congruent Melting                  | Yes       |                  |                          |
| Flammability                       | No        |                  |                          |
| Thermal Stability (Cycles)         | ~3000     | PLUSS® Internal  |                          |
| Maximum Operating Temperature (°C) | ~80       |                  |                          |
| Flash Point (°C)                   | NA        |                  |                          |

\* Nominal Values. Actual values mentioned in Test Certificate

The information given here is meant as a guide to determining suitability of our products for the stated applications. It is based on trials carried out by our laboratories and data selected from literature and shall in no event be held to constitute or imply any warranty. The products are intended for use in industrial applications. The users should test the materials before use and satisfy themselves with regard to contents and suitability in the desired application. Our formal specifications define the limits of our commitment. Recommendation herein may not be construed as freedom to infringe/operate under any third party patents. In the event of a proven claim, our liability is limited only to replacement of our material and in no case shall we be liable for special, incidental or consequential damages arising out of usage of our material. This datasheet is subject to change without notice.