

The logo features the word "PLUSS" in a bold, red, sans-serif font. A registered trademark symbol (®) is positioned at the top right of the "S". The text is centered within a white diamond-shaped area that is part of a larger geometric design consisting of overlapping triangles in red, white, and blue.

PLUSS[®]

TECHNOLOGY FOR
A BETTER WORLD

Phase Change Materials
For Pharmaceutical Application

WHY PCMs IN PHARMA

- Stringent Standards of Monitoring temperature during transit.
- Service Quality.
- Ever Increasing Customer Expectation.
- Minimize the effect of external conditions on the quality and stability of the product.

WHY PCMs

Different PCM to maintain different temperatures without external source.

- **33°C** to **+89°C**

Conventional solutions

- Ice or water based gels
- Glycol based solutions
- Dry Ice



**Only two temperatures,
0°C and -80°C**

WHY PCMs

- Dry Ice causes shrinkage of rubber stoppered vials.
- Dry Ice has been declared as hazardous material by International Air Transport Authority.
- Dry Ice sublimation in a sealed container can cause explosion and CO₂ rich atmosphere affects many product's quality.
- Temperatures of eutectic solution such as glycol + water mixture vary between a large bandwidth.

WHY PCMs

- Recyclable - Upto 3000 cycles - Reusability
- Maintains constant temperature throughout melting cycle - Precision
- High thermal energy storage capacity - More Energy per Weight of PCM
- Longer Shelf Life than traditional coolants - Cost Effective

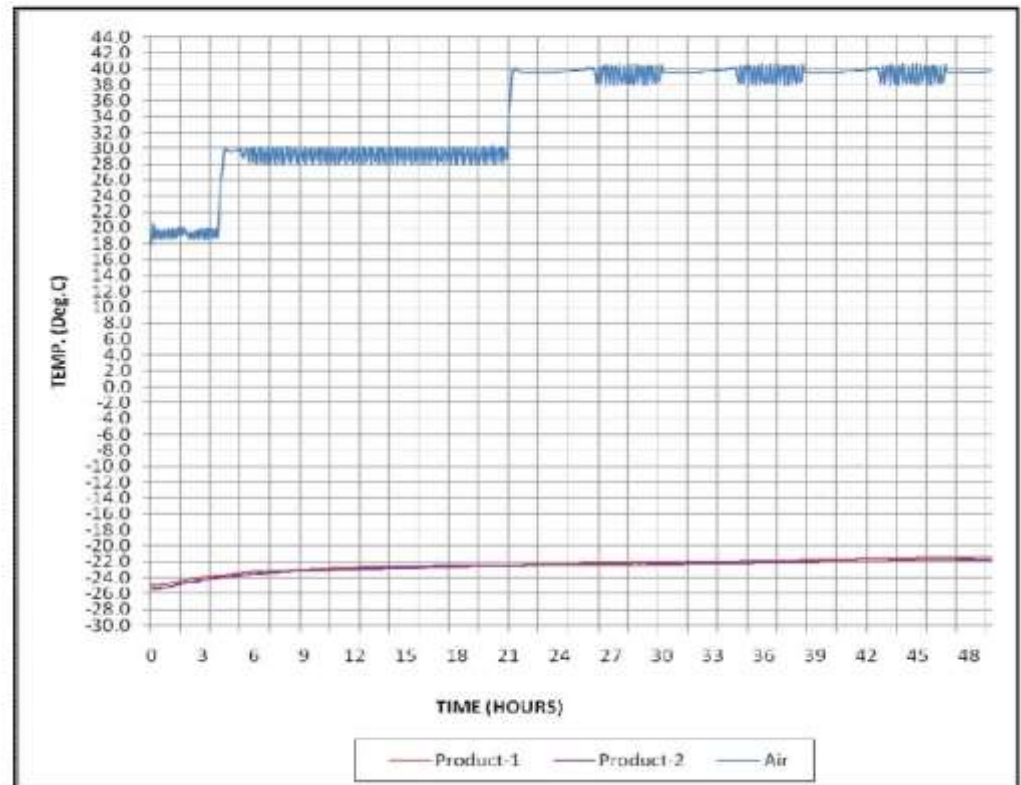
HOW IS PCM APPLIED

Identifying the right temperature PCM

Example: A -23°C PCM can be used in application requiring temperature control in the range of -20°C - 22°C consistently for 48 hours.

Data Summary: Test Result = Temperature maintain for NLT 48 Hrs.

AS 013: AS-SAFE-7L/ -20°C / Summer Profile



HOW IS PCM APPLIED

List of PCM relevant to Pharma application.

Product	Operating Temperature (°C)	Latent Heat (KJ/Kg)	Application
HS 26N	-26	205	Fresh Frozen Plasma
HS 23N	-23	200	Blood serum, protein, Plasmids, DNA, RNA, Anti Sera samples
HS 10N	-10	220	Tissues on slides
HS 7N	-7	230	Tissues on slides
Frost	0	290	Vaccine, Insulin, Blood Products.
HS 22	22	185	Blood platelets

* Other temperatures are also available

HOW IS PCM APPLIED

Heat load is calculated to establish the amount of PCM required factoring,

- Ambient temperature
- Infiltration
- Specification of insulation
- Duration of backup required

