BioPCM® Technical Data

Apollo®
Sub-zero

The Apollo® product line of commercial subzero temperatures ranges from -1°C to -75°C and can be tuned within a fraction of a degree. The chemical and physical properties listed below are also tunable within the ranges provided depending on the application and formulation

- **Environmentally friendly, derived from naturally occurring, food grade substances**
- **Non-toxic and biodegradable**
- **High thermal energy storage capacity (latent heat and specific heat)**
- **Chemically stable**
- **Long life of performance, no degradation in melting temperature or thermal energy storage after thousands of freeze/melt cycles (100+ years)**
- **Small volume changes during phase transition**

BioPCM Physical and Chemical Properties

	Phase Transition Temperature	Total Energy Storage	Specific Heat	Thermal Conductivity	Relative Density
	°C/°F	(J/g)	(J/g.K)	(W/m.K)	(g/cm3 @25-35°C)
Q(-1) BioPCM	-1 °C	200-320	2.5-4.0	0.20-0.60	0.85-1.40
Q(-2) BioPCM	-2 °C	200-320	2.5-4.0	0.20-0.60	0.85-1.40
Q(-4) BioPCM	-4 °C	200-320	2.5-4.0	0.20-0.60	0.85-1.40
Q(-5) BioPCM	-5 °C	200-320	2.5-4.0	0.20-0.60	0.85-1.40
Q(-6) BioPCM	-6 °C	200-320	2.5-4.0	0.20-0.60	0.85-1.40
Q(-8) BioPCM	-8 °C	200-320	2.5-4.0	0.20-0.60	0.85-1.40
Q(-10) BioPCM	-10 °C	200-320	2.5-4.0	0.20-0.60	0.85-1.40
Q(-15) BioPCM	-15 °C	200-320	2.5-4.0	0.20-0.60	0.85-1.40
Q(-16) BioPCM	-16 °C	200-320	2.5-4.0	0.20-0.60	0.85-1.40
Q(-17) BioPCM	-17 °C	200-320	2.5-4.0	0.20-0.60	0.85-1.40
Q(-18) BioPCM	-18 °C	200-320	2.5-4.0	0.20-0.60	0.85-1.40
Q(-20) BioPCM	-20 °C	200-320	2.5-4.0	0.20-0.60	0.85-1.40
Q(-22) BioPCM	-22 °C	200-320	2.5-4.0	0.20-0.60	0.85-1.40
Q(-23) BioPCM	-23 °C	200-320	2.5-4.0	0.20-0.60	0.85-1.40
Q(-25) BioPCM	-25 °C	200-320	2.5-4.0	0.20-0.60	0.85-1.40
Q(-31) BioPCM	-31 °C	170-220	2.5-4.0	0.20-0.60	0.85-1.40
Q(-33) BioPCM	-33 °C	170-220	2.5-4.0	0.20-0.60	0.85-1.40
Q(-36) BioPCM	-36 °C	170-220	2.5-4.0	0.20-0.60	0.85-1.40
Q(-40) BioPCM	-40 °C	170-220	2.5-4.0	0.20-0.60	0.85-1.40
Q(-50) BioPCM	-50 °C	150-200	2.5-4.0	0.20-0.60	0.85-1.40
Q(-65) BioPCM	-65 °C	150-200	2.5-4.0	0.20-0.60	0.85-1.40
Q(-70) BioPCM	-70 °C	125-150	2.5-4.0	0.20-0.60	0.85-1.40
Q(-75) BioPCM	-75 °C	125-150	2.5-4.0	0.20-0.60	0.85-1.40

NOTE: Physical/Chemical properties are tunable and vary depending on the type of finished product or formulation

Phase Change Energy Solutions is a global leader in the development and deployment of next generation energy efficiency and thermal storage solutions that harness the power of BioPCM®, the company's proprietary phase change material. Phase Change Energy Solution's BioPCM® products are used to improve whole-building energy efficiency in retail, commercial, hospitality and industrial applications; enable safe transport of sensitive food and pharmaceutical products; and provide enhanced thermal storage capabilities for industrial processes. Fortune 100 banking, telecom, hospitality and technology companies, as well as the U.S. government, have installed millions of square feet of BioPCM® products to reduce operating expenses and environmental impact.

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