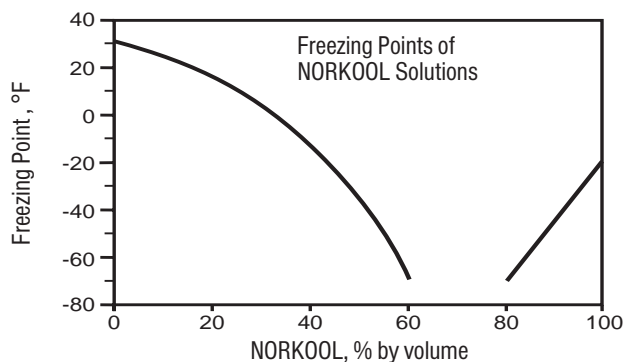




Burst Protection Versus Freeze Protection

Ethylene glycol-based fluids, such as NORKOOL® and NORKOOL® SLH Coolants, are the fluids of choice for freeze protection in many heating and cooling applications. Ethylene glycol is a very efficient freeze point depressant; its water solutions provide freezing points ranging from 32°F to -70°F. In addition to providing freeze point depression, ethylene glycol-based fluids give added protection against system damage from bursting. When choosing your fluid concentration, it is important to distinguish between freeze protection and burst protection.

Freeze Protection: The freezing point of a solution is defined as the temperature at which the first ice crystal is formed. Below this temperature, the fluid becomes thick and slushy; however, it may not freeze solid until significantly lower temperatures are achieved. Due to the high viscosity and poor heat transfer of these slushy fluids, your system should not operate when the heat transfer fluid is at a temperature below its freezing point. Thus, systems that anticipate cold weather operation should choose a fluid having a freezing point below the coldest expected winter temperature.



Burst Protection: For systems that do not operate during the winter months, protecting your heating or cooling system against bursting

may be adequate. Bursting of piping results when a fluid undergoes expansion upon freezing. Water, for example, will expand about 9% when its temperature is maintained below 32°F. This nine percent increase in volume may rupture piping and cause catastrophic system failure. The addition of ethylene glycol to the water significantly reduces the amount of expansion the fluid undergoes upon freezing: a 25% solution of ethylene glycol and water will expand 1.5% when the fluid is cooled to -4°F, or 14° below its freezing point; a 40% solution undergoes less than 1% expansion at -31°F, or 22° below its freezing point. (More concentrated glycol solutions (>50% glycol) may not see any expansion upon freezing.) It is the differential between the freezing point and the temperature at which the expansion occurs that enables the fluid to provide burst protection. In this temperature range, the fluid contains ice crystals and is slushy, but does not increase in volume. The slushiness of the fluid is not harmful if the system is not operating. If the system is operating, the ice crystals will circulate in the fluid and be very abrasive and detrimental to the metal surfaces in the system.

F-ICD40

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The following table gives the concentration of the NORKOOL® Coolant required to provide freeze protection and burst protection at various temperatures.

Concentration needed for:	Temperature, °F									
	20	10	0	-10	-20	-30	-40	-50	-60	-100
Freeze Protection	16	25	32	39	44	48	52	55	58	NA
Burst Protection	11	16	21	26	31	36	37	38	40	43

Product Safety: Always read and understand the material safety data sheet for this product prior to use.