Solar Coolant

Concentrated Coolant – Antifreeze for Solar Thermal Energy.

Technical Documentation.

Updated August 2016.

Carpemar

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Properties

Solar Coolant is a transparent yellow liquid. It is safe to handle as it is composed of propylene glycol.

It maintains solar circuits in perfect condition for longer periods of time than conventional products due to its antirust special hybrid organic-inorganic additives this product optimises heat transference and so enhances the performance of the installations.

Solar Coolant **meets with European quality specifications and standards.**

It does not contain Nitrite or Amine as these are products that may react to give nitrosamines which are potential carcinogen agents. Free of silicates, borates and nitrates.

Solar Coolant is miscible with water in all proportions. Its performance is not impaired by hard water and there is no danger of precipitation.

Solar Coolant and its dilutions with water have a shelf life of at least two years in airtight containers.

Its fluorescent yellow colour helps to detect leaks.

Technical Data:

Appearance	Transparent Yellow Liquid	Visual
Boiling Point	152ºC	ASTM D 1120
Freezing Point	-45ºC	ASTM D 1177
Density (20ºC)	1,04 -1,06 g/ml	ASTM D 1122
Viscosity (20ºC)	49,5 mPas	ASTM D 445
pH Concentrate Product	8,5-10,5	ASTM D 1287
pH mixed 50% v/v with distilled water	8-9,5	ASTM D 1287
Cubic Expansion Coefficient	0,00062 1/K	
Alkaline Reserve	min. 10 ml HCl 0,1N	ASTM D 1121

Attributes

- Prevents circuit damage by freezing.
- Raises boiling point, reducing overheating problems.
- Prevents corrosion of metals widely used in solar circuit.
- Prevents deposits in solar circuit.
- Biodegradable.
- Propylene glycol based, non toxic.

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Applications

Solar Coolant is a concentrated product which must be diluted before use. The minimum concentration to ensure protection from corrosion is 25% (1:4). The recommended maximum is 50% (5:10). This product performs best within the range of 30 and 50% (3:10 and 5:10).

Dilution with distilled or deionised water is recommended where mains water has high hardness or where water is not potable quality or it has more than 100 ppm of chloride content. We advise consideration of legal constraints concerning the water quality used for dilution of solar antifreeze in whichever jurisdiction your business operates.

Corrosion Table:

Mixtures of propylene glycol and water are more corrosive than pure water so additives should be used in order to ensure the integrity of the circuit.

The following table shows the effectiveness of mixtures Solar Coolant– Water in inhibiting corrosion according to ASTM D 1384. For a comparative porpoise results for water and propylene glycol alone are presented.

Material	*Solar Coolant (33% V/V)*	Propylene Glycol - Water 33% V/V	Water	ASTM-D 3306 Max.
Copper	*3*	4	2	10
Solder	*1*	1095	99	30
Brass	*4*	5	5	10
Steel	*1*	214	212	10
Cast Iron	*3*	345	450	10
Aluminium	*-2*	15	110	30

The results above are an average change in weight of coupons in mg. A negative number indicates an increase in weight due to the formation of a stable protective layer on the metal's surface.

Test description:

ASTM D 1384:

In this test method, specimens of metals typical of those present in engine cooling systems are totally immersed in aerated engine coolant solutions with corrosive water for 336 h at 88°C (190°F). The corrosion inhibitive properties of the test solution are evaluated on the basis of the weight changes incurred by the specimens. Each test is run in triplicate, and the average weight change is determined for each metal.

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Compatibility table:

Solar Coolant is compatible with the usual materials of solar circuits. The next table shows plastics, sealants and elastomers compatible with water dilutions of the product in habitual proportions. Data has been gathered in specific bibliography and proprietary tests.

Name	Abbreviation
Butyl rubber	IIR
Cloropropene	CR
Ethylene-propylene-diene rubber	EPDM
Fluorocarbon elastomers	FPM
Natural rubber up to 80ºC	NR
Nitrile Rubber	NBR
Polyacetal	POM
Polyamide up to 115ºC	PA
Polybutene	PB
Polyethylene high/low density	PE-LD/PE-HD
Polyethylene cross linked	VPE
Polypropylene	PP
Poly (tetrafluoroethylene)	PTFE
Polyvinyl chloride, rigid	PVC h
Silicone Rubber	Si
Styrene-butadiene rubber up to 100ºC	SBR
Unsaturated polyester resins	UP

Phenolic resins, plasticized PVC and polyurethane elastomers are not compatible with water mixtures of Solar Coolant.

Zinc is not compatible with propylene glycol or their mixtures with water, avoid zinc or galvanized reservoirs.

Filling the Installation:

After pressure testing, which also affords an opportunity to determine the volume of the system from the amount of water used (water meter), the system should be drained ant then filled immediately with the antifreeze. Air pockets are to eliminate immediately.

Before filling the systems should be flushed with water to remove traces of flux, especially when chlorine containing flux has been used.

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After draining the circuit of old antifreeze, it should be flushed with water in order to clean possible deposits and particles before filling with *Solar Coolant*. The product's useful life will be reduced if the system is already corroded. If corrosion is detected, corrective action should be taken before filling up the circuit.

Solar Coolant has to be diluted with at least 25% V/V to assure complete metals system corrosion protection. For solar systems the recommended range of dilution is 25 – 50%. Dilutions up to 60% can be achieved in special applications.

Mixtures with other kind of antifreeze should be avoided for possible incompatibilities which would reduce the useful life of the product. For specific compatibilities you can contact our technical department: please email carpemar@carpemar.com.

Long-term no-load operation of the system should be avoided because this can adversely affect the stability of the heat transfer medium and considerably reduce its service life.

Both *Solar Coolant* concentrate and its dilutions with water are stable for at least two years in regular stocks conditions in airtight containers.

Equipment must not be fitted with galvanized heat exchangers, heat reservoirs, tanks or pipes, because propylene glycol can corrode zinc.

To prepare the correct dilution, simply determine the desired freezing temperature to establish the according proportions of antifreeze and water to mix. Choose a vessel of sufficient capacity and stir until a homogenous has been achieved.

The minor surface tension of *Solar Coolant* compared with water may make minor damage due to corrosion more apparent.

Heat Resistance:

Sustained temperatures higher than 170ºC cause premature ageing of propylene glycol. For solar thermal systems with stagnation temperatures above 170ºC it is thus recommended to choose expansion vessels of sufficient size to ensure that the solar antifreeze will be taken up completely in case of stagnation.

Temperatures above 200ºC lead to slow alteration of the chemical properties of antifreeze fluid, with the result that the reliability of operation of the system may be endangered.

In the case of not-closed systems or the insert of oxygen (e.g. via valves) the maximum usage temperature is lower.

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Precautions:

Solar Coolant is a non flammable, non corrosive product, so no special precautions are required. In any case good industrial practices are recommendable.

Avoid contact with eyes, in case of splashing flush with running water for at least 10 minutes. Do not eat or drink, keep away of children.

Store in a clean and well-ventilated place. Tightly sealed containers are recommended because of the hygroscopic properties of the product.

Presentation:

Solar Coolant is supplied in 1.000 liters. IBC containers, 210 liters non-returnable plastic drums, and in 25 and 10 liters non-returnable plastics drums.

Other volumes are available upon request.

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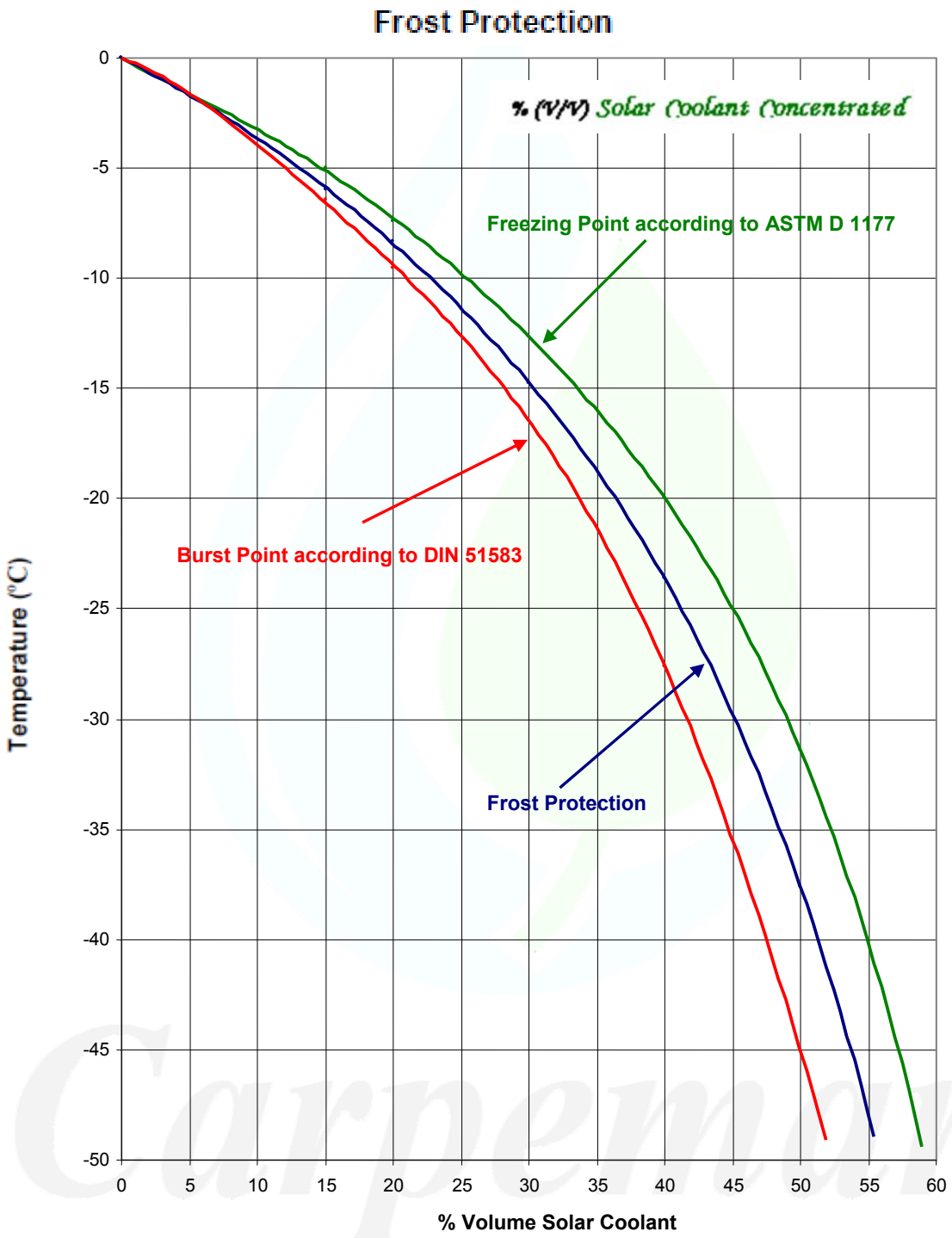

Freezing point according to ASTM D 1177 is the temperature for the first ice crystal formation.

DIN 51583 normative establishes the temperature from the product does not flow and there is danger for the circuit integrity.

Between both temperatures exists a mixture of ice crystals and not-frozen fluid that flows without volume increase, thus, without bursting problems.

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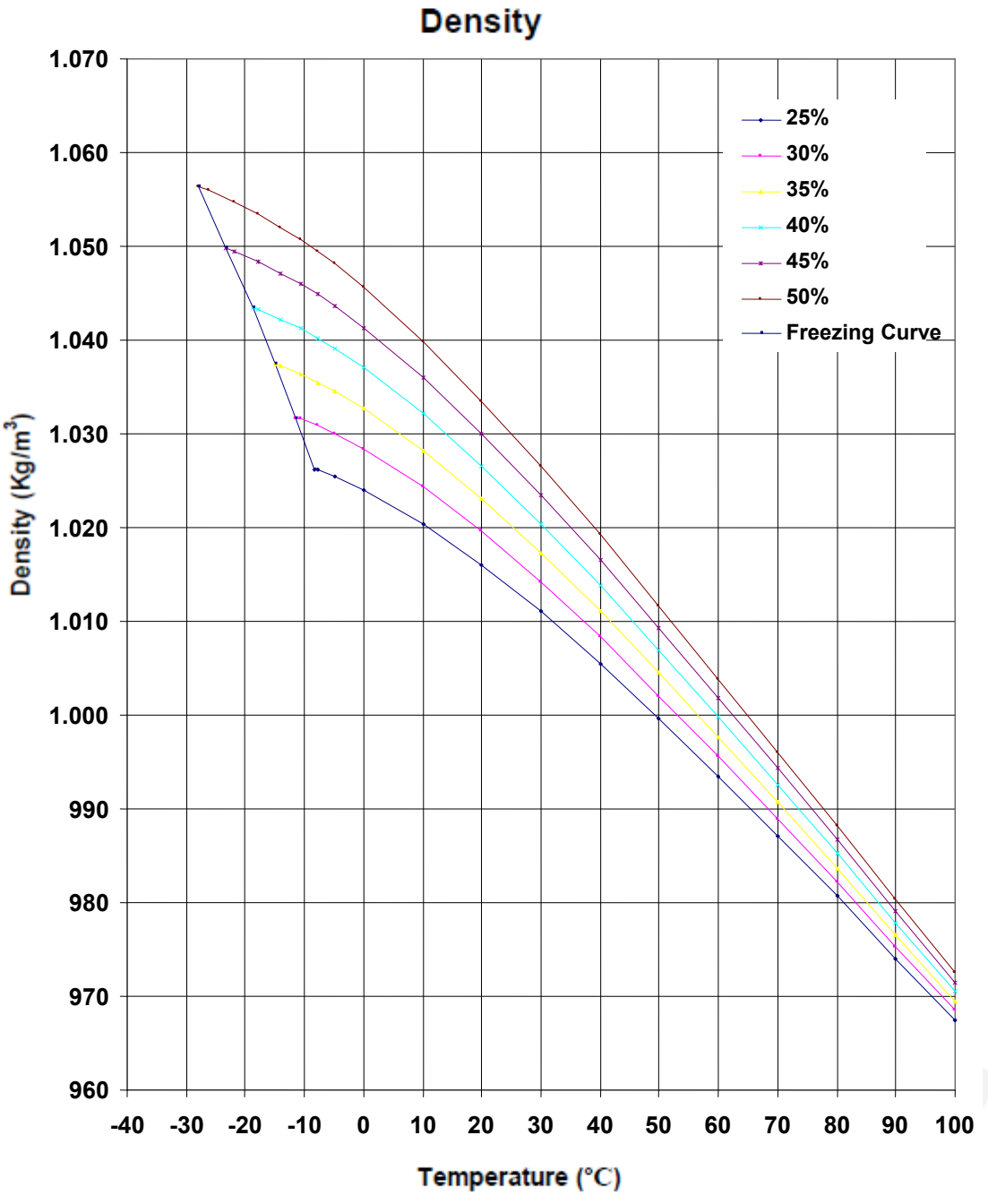

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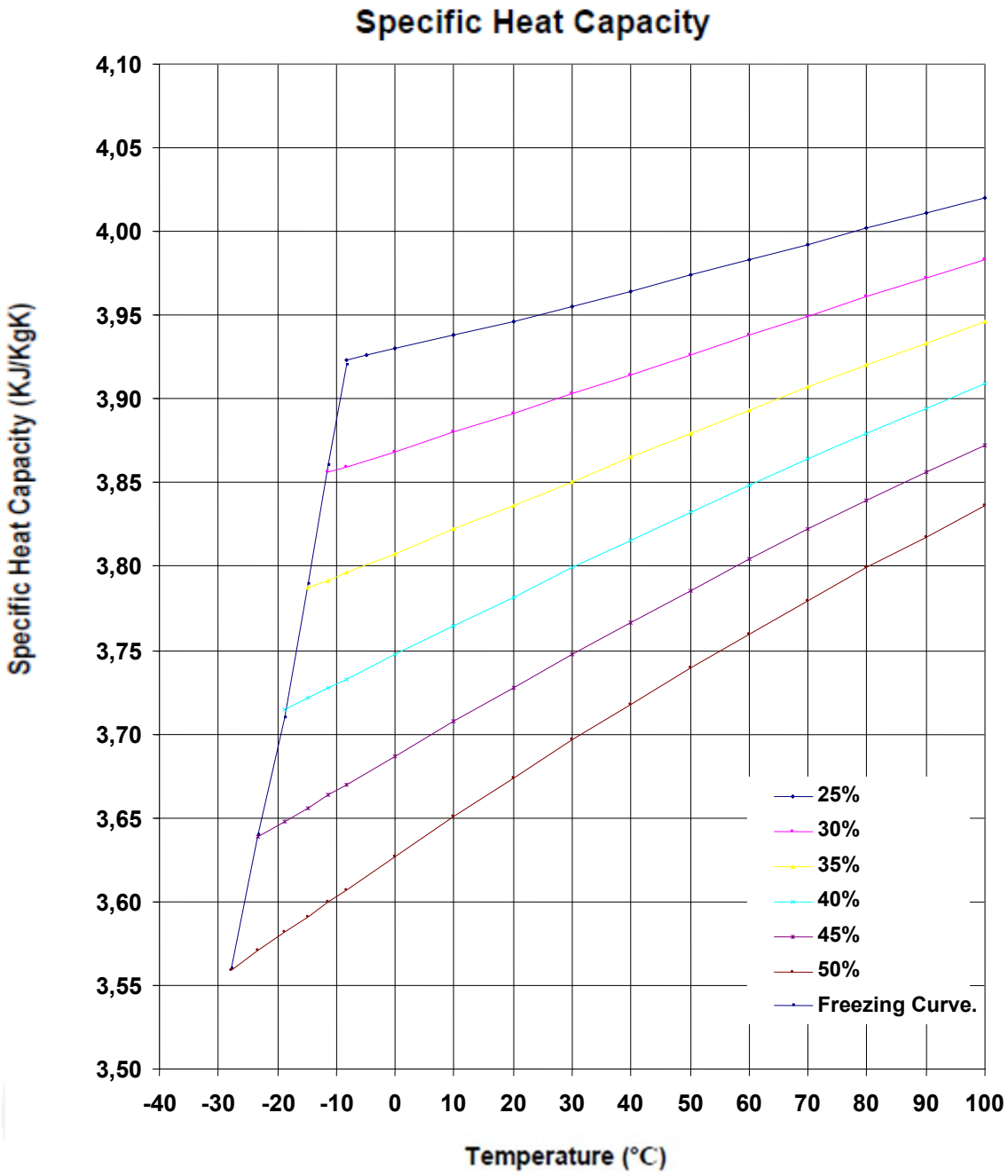

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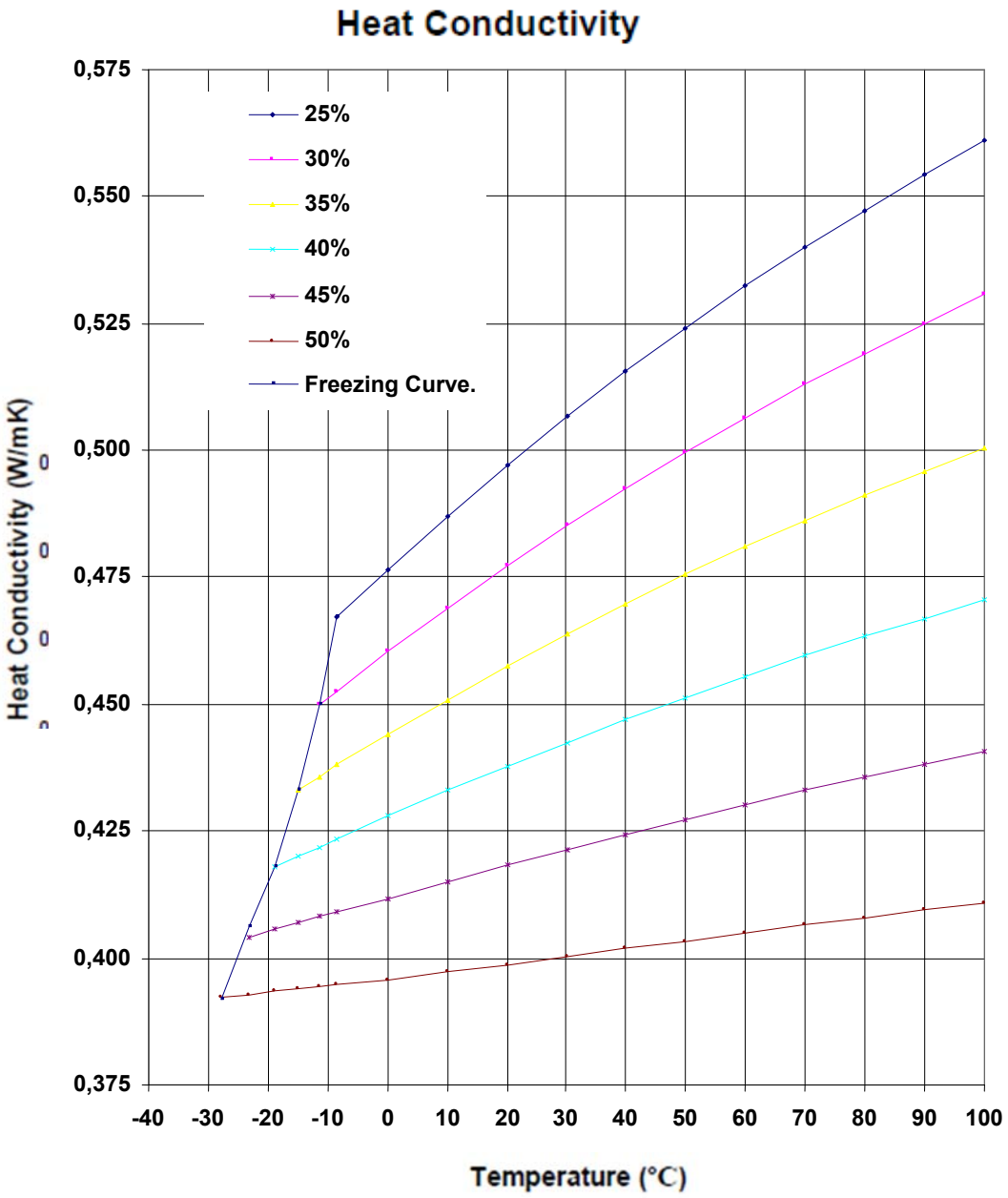

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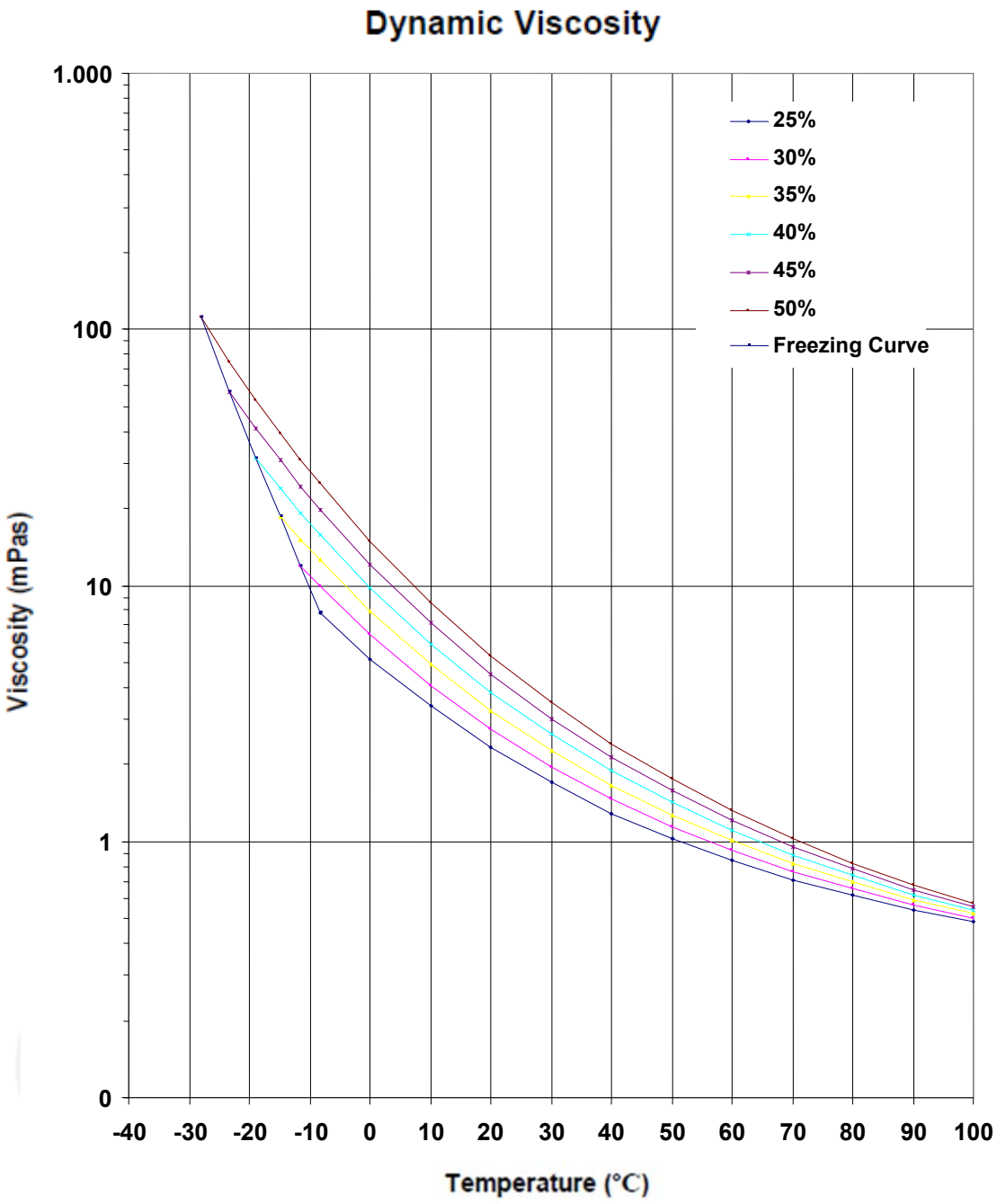

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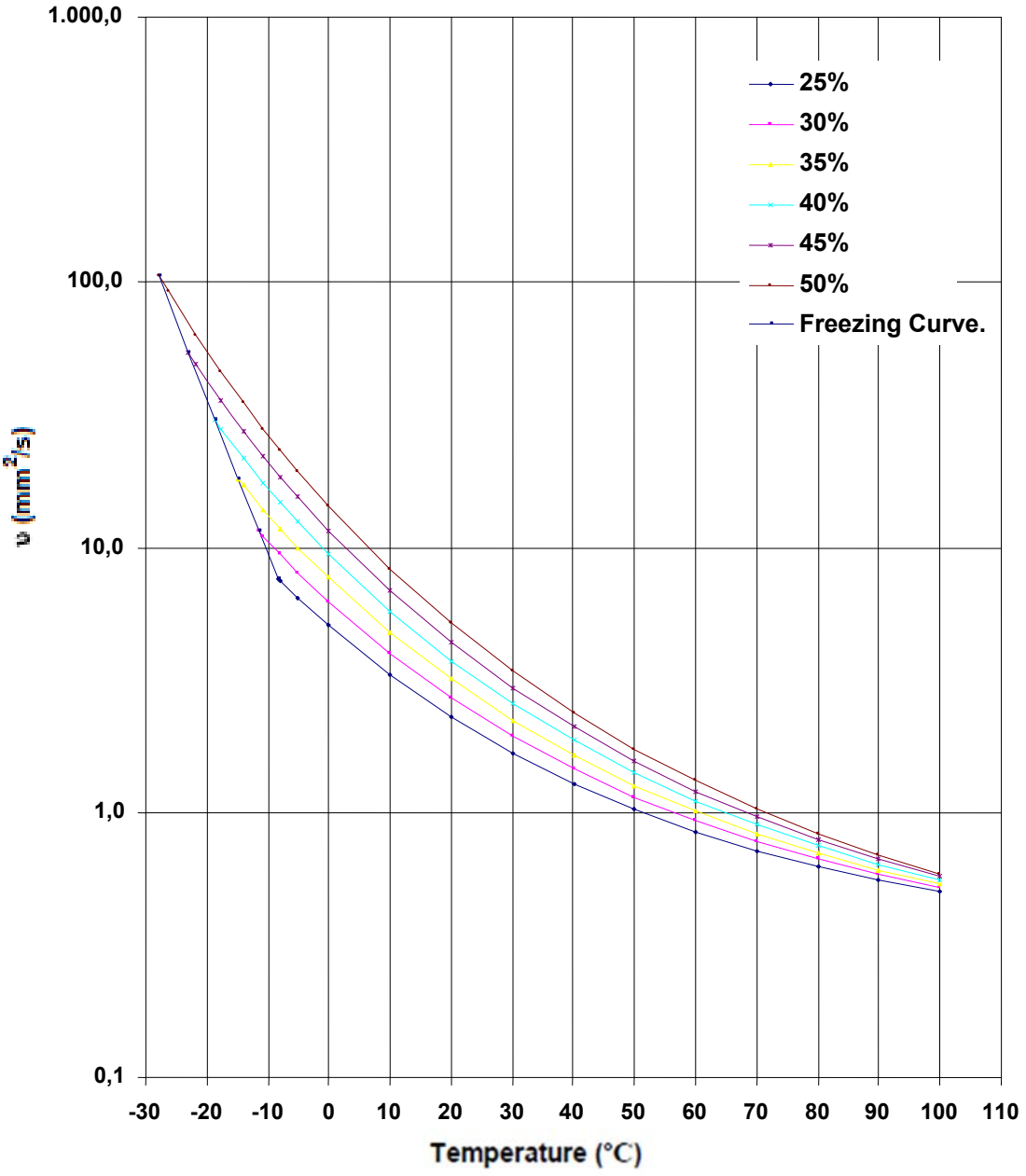
Cinematic Viscosity



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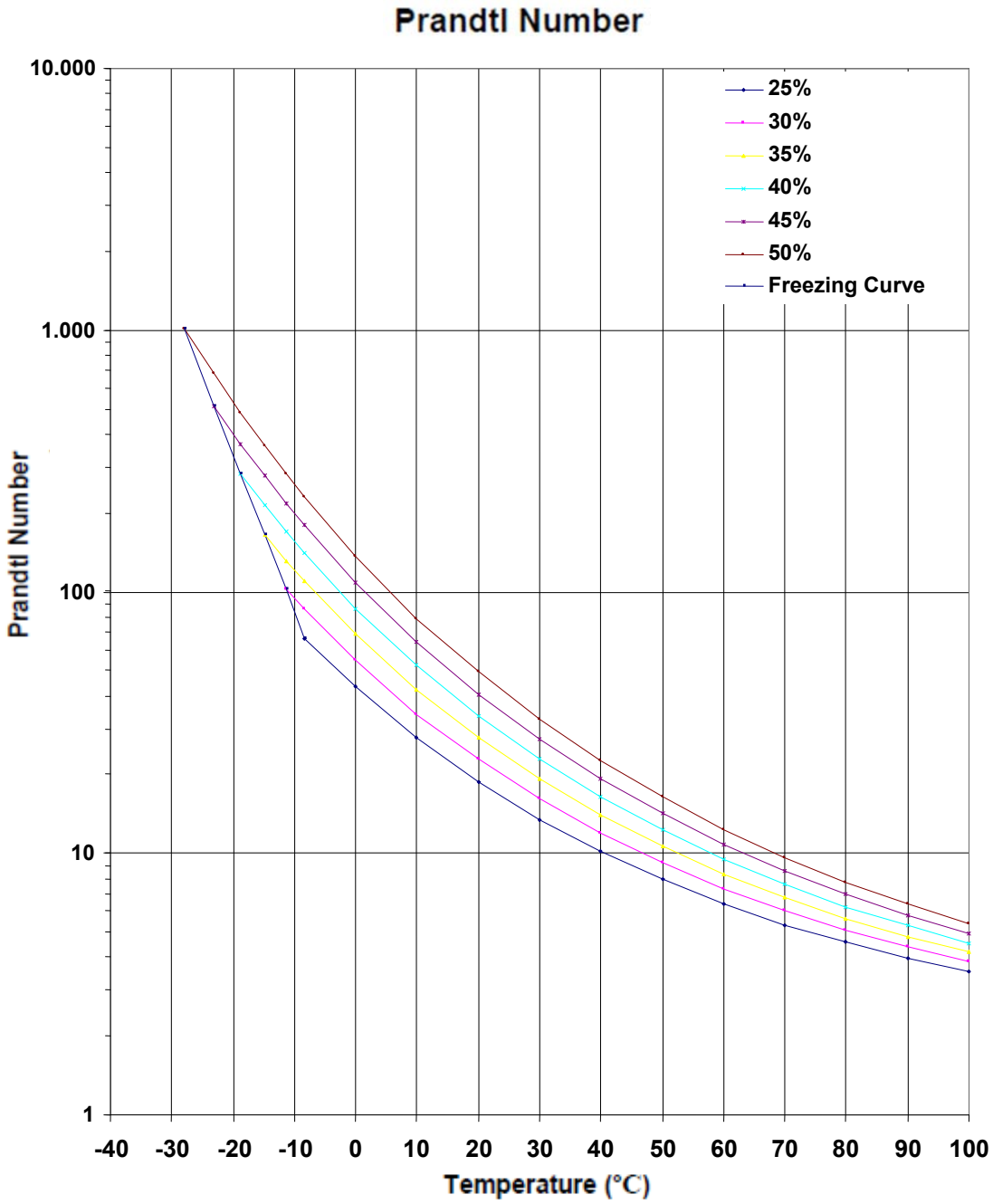

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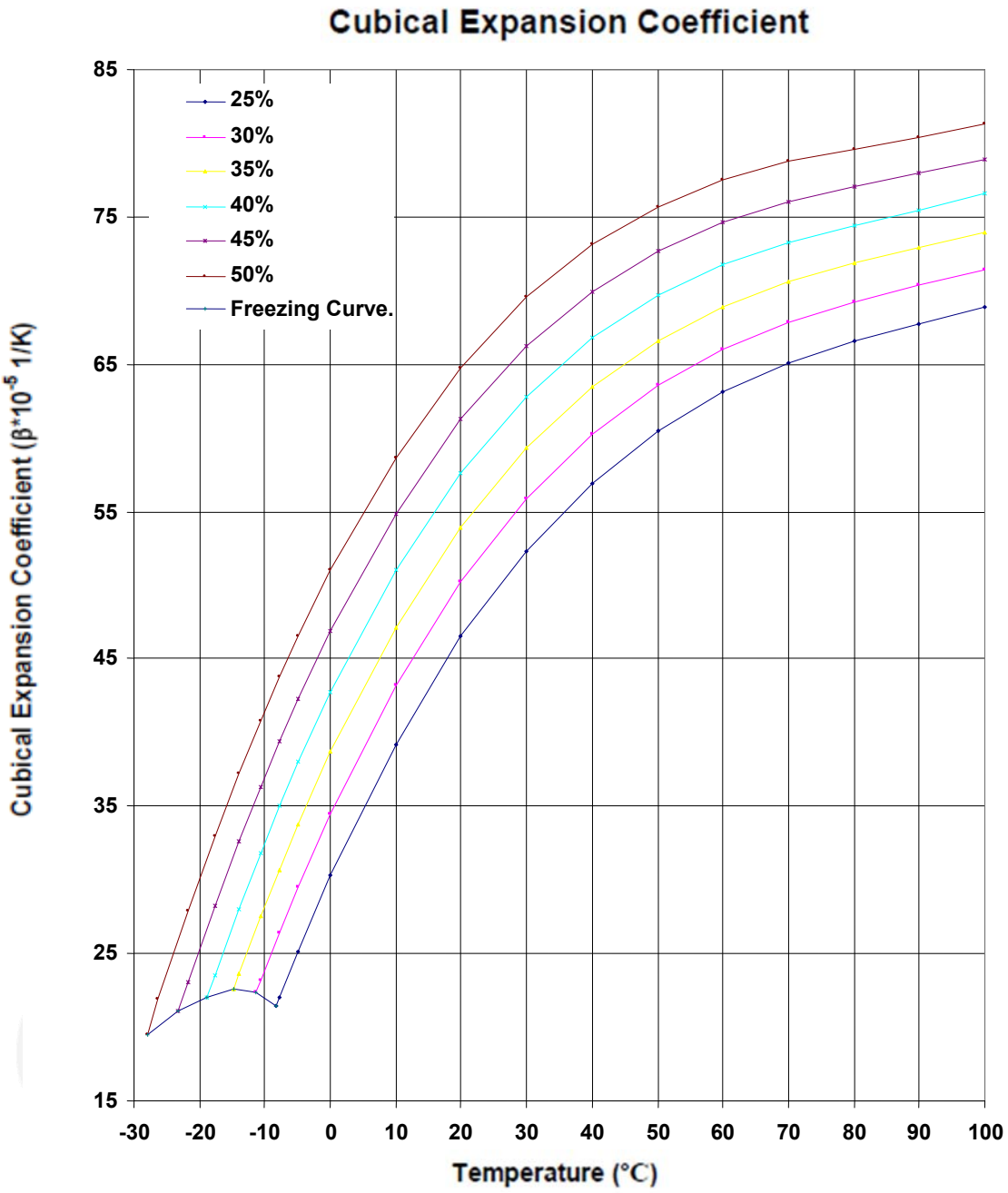

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Boiling point versus pressure and % *Solar Coolant*