



Dynamic Energy Solutions



# Speciality Fluids Division

Cooltrans<sup>CT</sup> | Cooltrans Plus<sup>CTP</sup> | Cooltrans Sustain<sup>CTS</sup>

## Technical Support Guide

2012



## User guidelines for Cooltrans products

### Storage

All Cooltrans products should be stored;

- Indoors
- At an ambient temperature
- Away from direct sunlight and heat
- In sealed original containers

### Handling

Please refer to product MSDS for handling and safety information.

### Installation

Please refer to manufacturer's recommendation on dilution rates.

Water hardness should not exceed 25ppm chlorides and 250ppm total hardness.

Clean/sterilise your system and rinse prior to adding Cooltrans products.

All Cooltrans fluids are miscible with other manufacturers' fluids of the same base chemistry. Incompatibility within certain mixtures of fluids may occur and could affect the resulting corrosion protection performance. In such cases, liability cannot be accepted.

A sterilising fluid is available, for more information please contact Kilfrost.

Kilfrost fluids should not be diluted at less than 20% v/v.

### Maintenance

It is recommended that Cooltrans fluids are checked every six months. Kilfrost offers a fluid testing service, details of which can be provided upon request.

Cooltrans fluids have a shelf life of two years.

### Technical support

For technical assistance regarding these products please contact Kilfrost.

---

### Disclaimer:

**All information in this guide is for informational purposes and should be used in conjunction with statutory regulation and manufacturer's guidelines before commencing operations. Kilfrost will not be held responsible for any damages resulting from any error, inaccuracy or omission contained in this publication.**

## Contents

Introduction	4
Metal Protection / Corrosion	6
Elastomer Protection	10
Biodegradability	11
Product Dilution	12
Product Density	14
Dynamic and Kinematic Viscosity	16
Specific Heat	20
Thermal Conductivity	22
Thermal Expansion	24
Refractive Index	26



## Introduction to Kilfrost Speciality Fluids Division

Established over 75 years ago the Kilfrost brand is synonymous with innovation and technical excellence and continues to lead the way in safety critical markets worldwide.

The Kilfrost Speciality Fluids Division offers a broad spectrum of dynamic heat transfer fluids which are used in a wide variety of heating and cooling applications.

The Cooltrans range is designed specifically for secondary refrigerant applications and industrial cooling.

**Table 1: Cooltrans Product Matrix**

Product/Application	Industrial cooling	Secondary refrigerant	Indirect food and beverage applications
Cooltrans <sup>CT</sup>	•		
Cooltrans Plus <sup>CTP</sup>	•	•	•
Cooltrans <sup>Sustain CTS</sup>	•	•	•

**Table 2: Cooltrans Temperature Range Comparison Chart**

Product/Temperature Range	Minimum Operating Temperature °C	Maximum Operating Temperature °C
Cooltrans <sup>CT</sup>	-40	130
Cooltrans Plus <sup>CTP</sup>	-35	120
Cooltrans <sup>Sustain CTS</sup>	-50	150*

\* For temperatures higher than 150°C, please contact Kilfrost.

**Table 3: Cooltrans<sup>CT</sup>**

Density at 20°C	1.12 g/cm <sup>3</sup>
Reserve alkalinity	8 ml
Glycol content	93 %
pH- 50% vol in water at 20°C	8.5
Freezing point 50% vol in water	- 34 °C
Flashpoint (PMCC)	118 °C
Boiling point at 1013 mbar	149 °C
Dynamic viscosity at 20°C	19 mPa.s
Refractive index 20°C	1.43
Specific heat at 20°C	2.4 kJ/kg K
Thermal conductivity at 20°C	0.28 W/(m-K)
Pour point	< -25 °C
Appearance	Orange liquid

**Table 5: Cooltrans<sup>Sustain CTS</sup>**

Density at 20°C	1.06 g/cm <sup>3</sup>
Reserve alkalinity	5 ml
Glycol content	92 %
pH- 50% vol in water at 20°C	8.5
Freezing point at 50% vol in water	- 25 °C
Flashpoint (PMCC)	> 180 °C
Boiling point at 1013 mbar	154 °C
Dynamic viscosity at 20°C	54 mPa.s
Refractive index 20°C	1.44
Specific heat at 20°C	2.3 kJ/kg K
Thermal conductivity at 20°C	0.24 W/(m-K)
Pour point	< -25 °C
Appearance	Green liquid

**Table 4: Cooltrans Plus<sup>CTP</sup>**

Density at 20°C	1.05 g/cm <sup>3</sup>
Reserve alkalinity	8 ml
Glycol content	93 %
pH- 50% vol in water at 20°C	8.5
Freezing point 50% vol in water	-30 °C
Flashpoint (PMCC)	108 °C
Boiling point at 1013 mbar	122 °C
Dynamic viscosity at 20°C	49 mPa.s
Refractive index 20°C	1.43
Specific heat at 20°C	2.2 kJ/kg K
Thermal conductivity at 20°C	0.22 W/(m-K)
Pour point	< -25 °C
Appearance	Blue liquid

All figures are for undiluted product, unless otherwise stated.



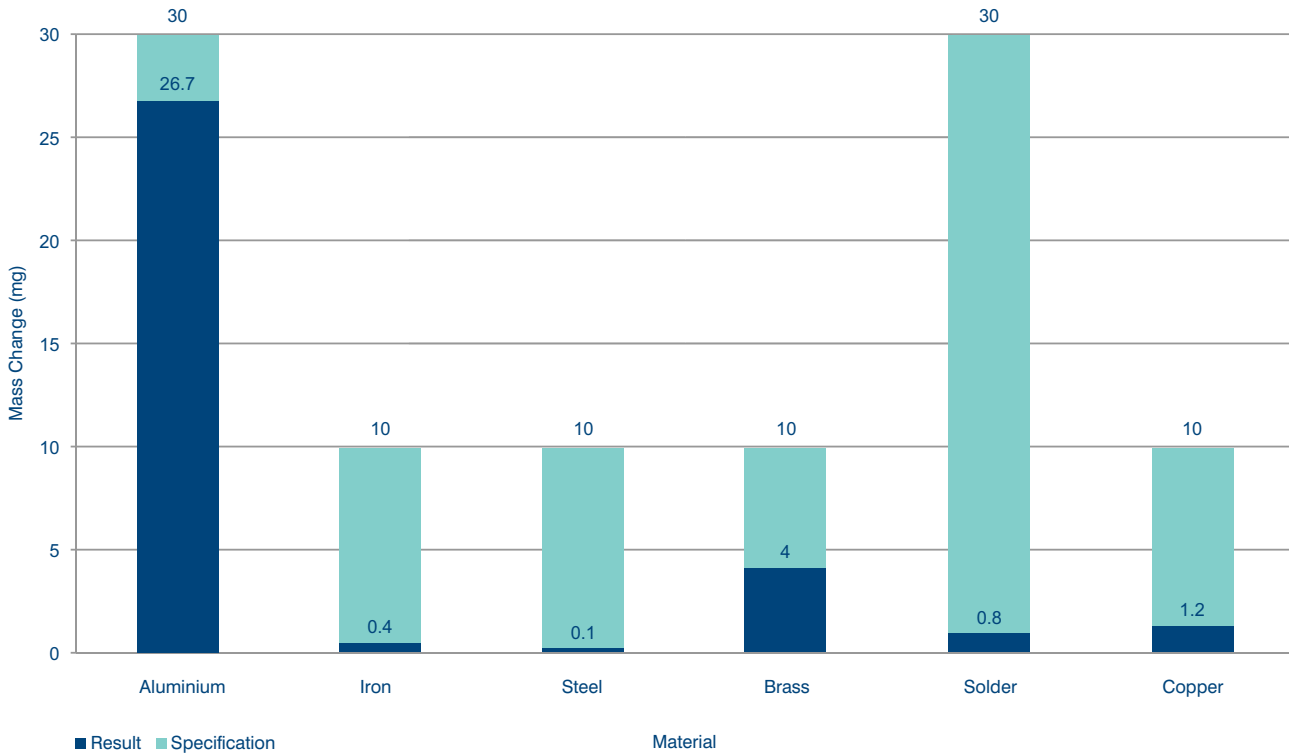
## Metal Protection/Corrosion

All Cooltrans fluids contain highly efficient additives which inhibit the corrosion of metals commonly used in secondary refrigerant applications.

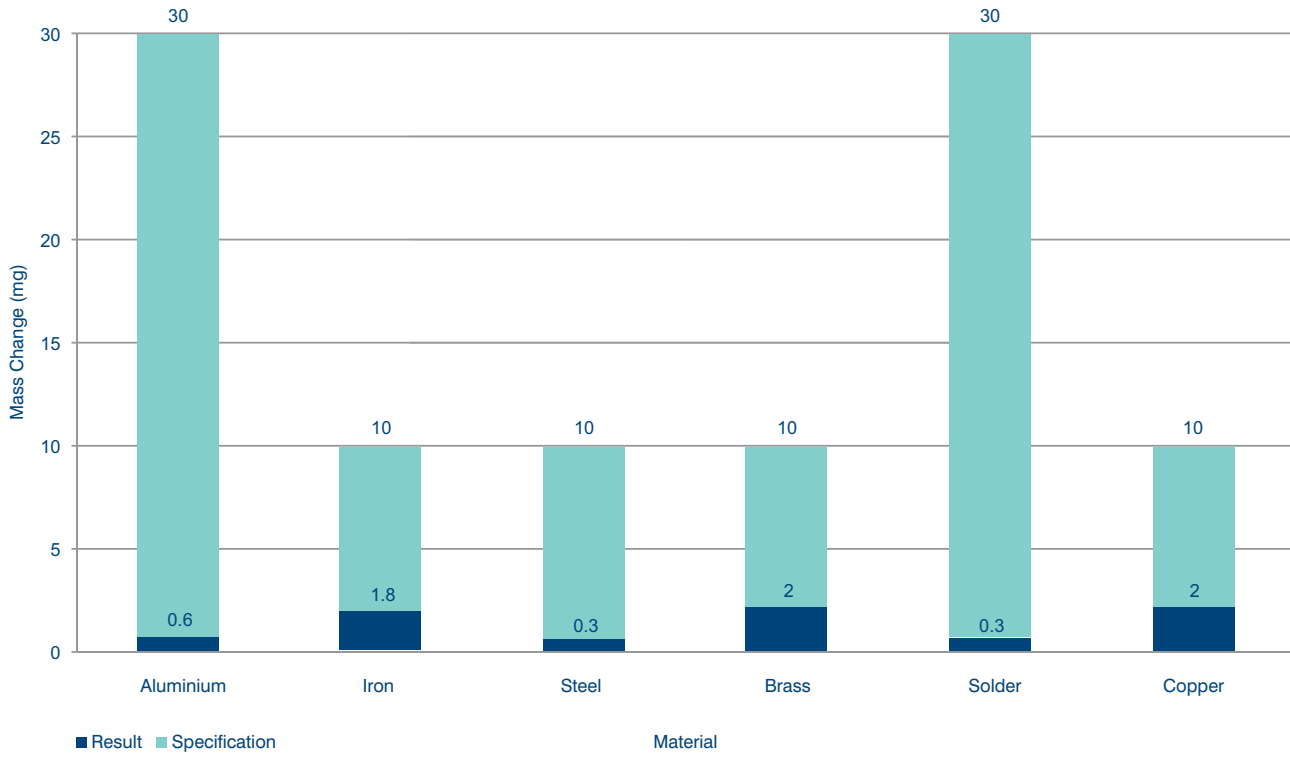
All our products pass the ASTM D1384-05 Corrosion Test Standard at 88°C.

The test is a performance specification for corrosion inhibiting coolant concentrates for use in cooling and heating systems. The Cooltrans range has been specially designed to minimise damage to systems compared to just water alone or when using uninhibited water/glycol mixtures.

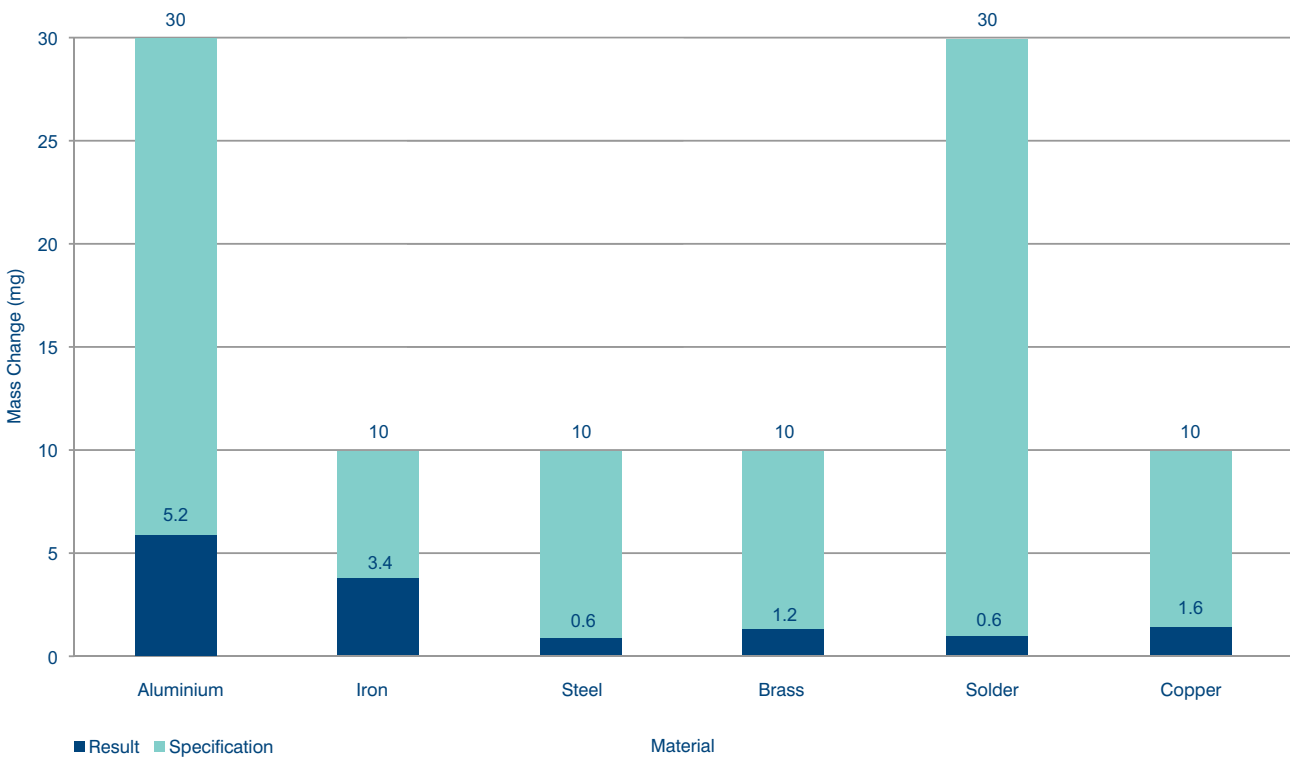
Graph 1: Metal mass change for Cooltrans<sup>CT</sup> according to ASTM D1384-05



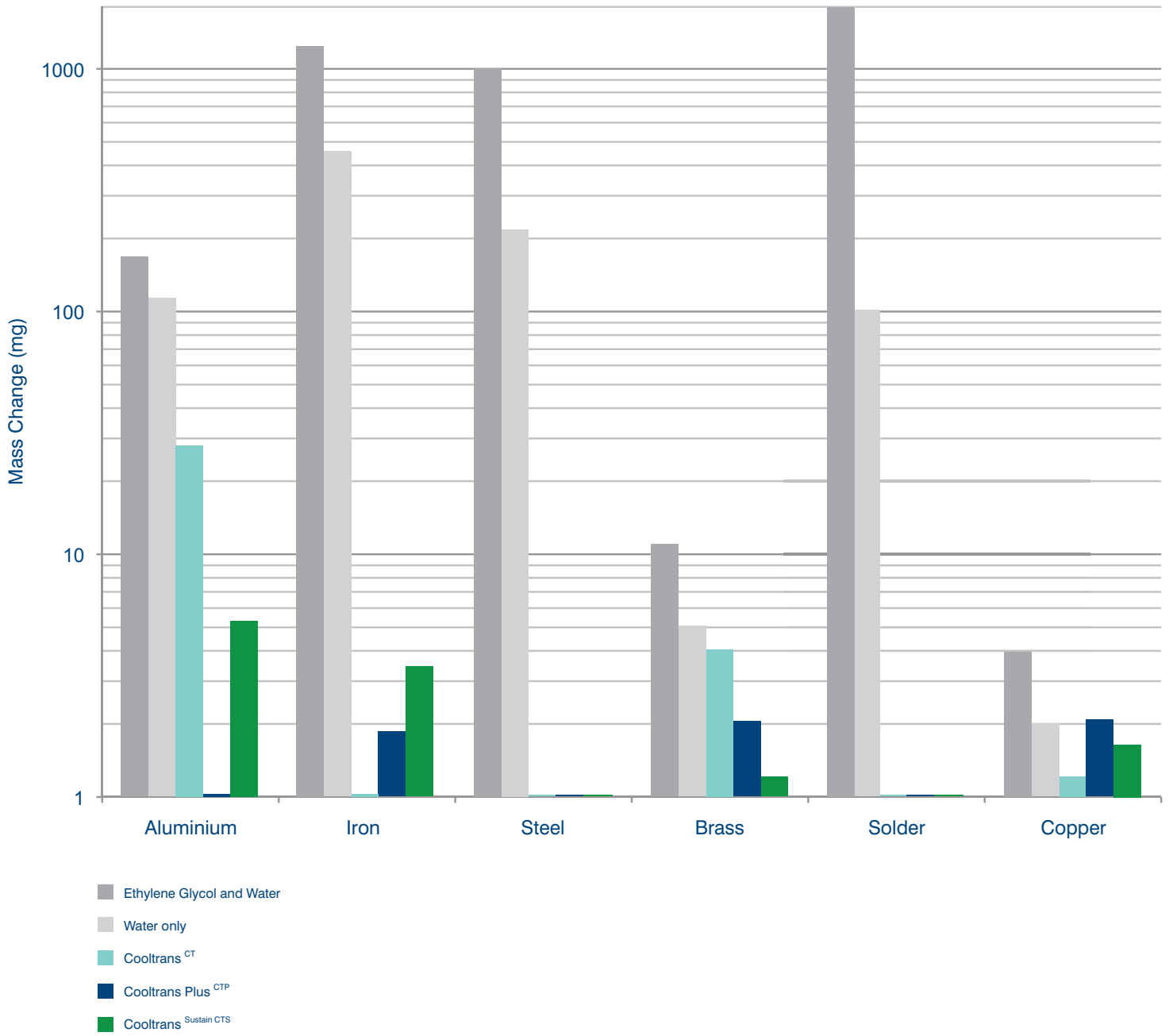
Graph 2: Metal mass change for Cooltrans Plus<sup>CTP</sup> according to ASTM D1384-05



Graph 3: Metal mass change for Cooltrans Sustain<sup>CTS</sup> according to ASTM D1384-05



Graph 4: Mass change of Cooltrans products compared to water/glycol according to ASTM D1384-05





**Table 6: Mass change of Cooltrans products compared to water/glycol according to ASTM D1384-05**

<b>Mass Change (mg)</b>	<b>Cooltrans<sup>CT</sup></b>	<b>Cooltrans Plus<sup>CTP</sup></b>	<b>Cooltrans Sustain<sup>CTS</sup></b>	<b>Water Only</b>	<b>Ethylene Glycol and Water</b>
Aluminium	26.7	0.6	5.2	110	165
Grey Cast Iron	0.4	1.8	3.4	450	1190
Steel	0.1	0.3	0.6	212	974
Brass	4.0	2	1.2	5	11
Solder	0.8	0.3	0.6	99	1780
Copper	1.2	2	1.6	2	4



## Elastomer Protection

All cooling systems contain components that are made from various non-metallic materials. The stability of these components is critical to the efficiency and working life cycle of equipment. All Cooltrans products are safe to use with the following non-metallic materials:

**Table 7: Compatible non-metals**

Butyl Rubber	IIR
Ethylene/Propylene/Diene Rubber	EPDM
Fluorocarbon Rubber	FPM
Natural Rubber (max temp 80°C)	NR
Nitrile Butadiene Rubber (max temp 40°C)	NBR
Polyamides	PA
Polychlorobutadiene	CR
Polyester cross-linked	UP
Polyethylene (soft/hard)	LDPE/HDPE
Polypropylene	PP
Polytetrafluoroethylene	PTFE
Polyvinylchloride (hard)	PVC
Styrene Butadiene Rubber (max temp 100°C)	SBR

Kilfrosts are happy to evaluate other material compatibilities, if required. Please contact the Kilfrosts technical team for further details.



## Biodegradability

Biological Oxygen Demand (BOD) is a biochemical procedure for characterising the amount of dissolved oxygen needed by aerobic biological organisms to break down organic material. This is measured over a specified time, in this case five days at 20°C. The resulting value is used to quantify the biodegradation process of Cooltrans products.

Chemical Oxygen Demand (COD) is a procedure for chemically determining oxygen required to decompose the organic compounds of Cooltrans product range solutions.

**Table 8: Biodegradability of Cooltrans products**

	Cooltrans <sup>CT</sup>	Cooltrans Plus <sup>CTP</sup>	Cooltrans <sup>Sustain CTS</sup>
BOD <sub>5</sub> - BS EN 1899-1:1998	2.02 mg/l	2.12 mg/l	1.2 mg/l
COD - BS ISO 15705:2002	1.4 kg/l	1.48 kg/l	1.2 kg/l

The Cooltrans product range does not contain amines thus preventing the formation of harmful by-products.

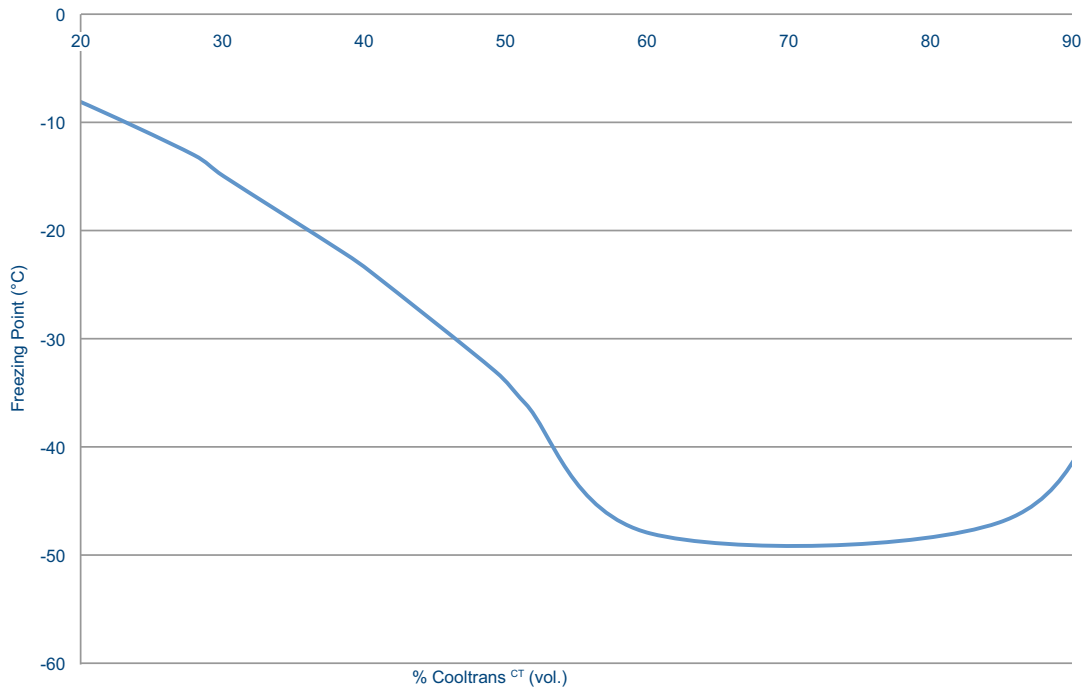
**Note: Biochemical testing may be subject to variation and should be used as an indicative guide for the biodegradation process.**



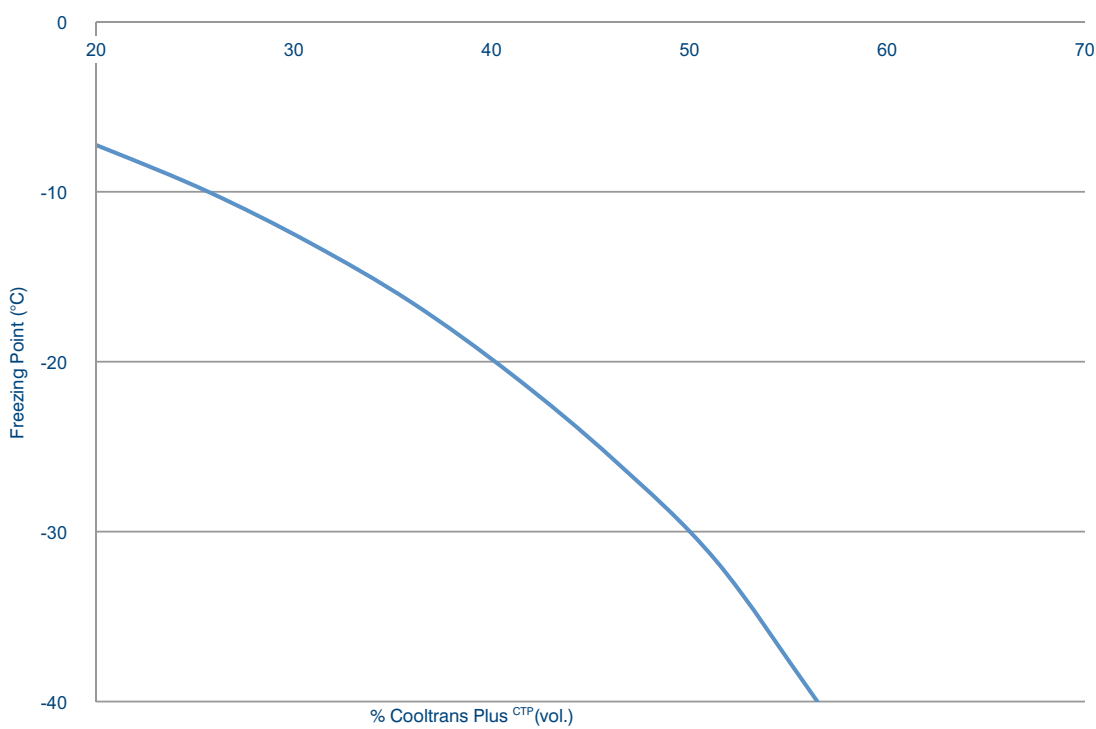
## Product Dilution

The graphs below illustrate the freezing points of Cooltrans fluids at various dilution rates.

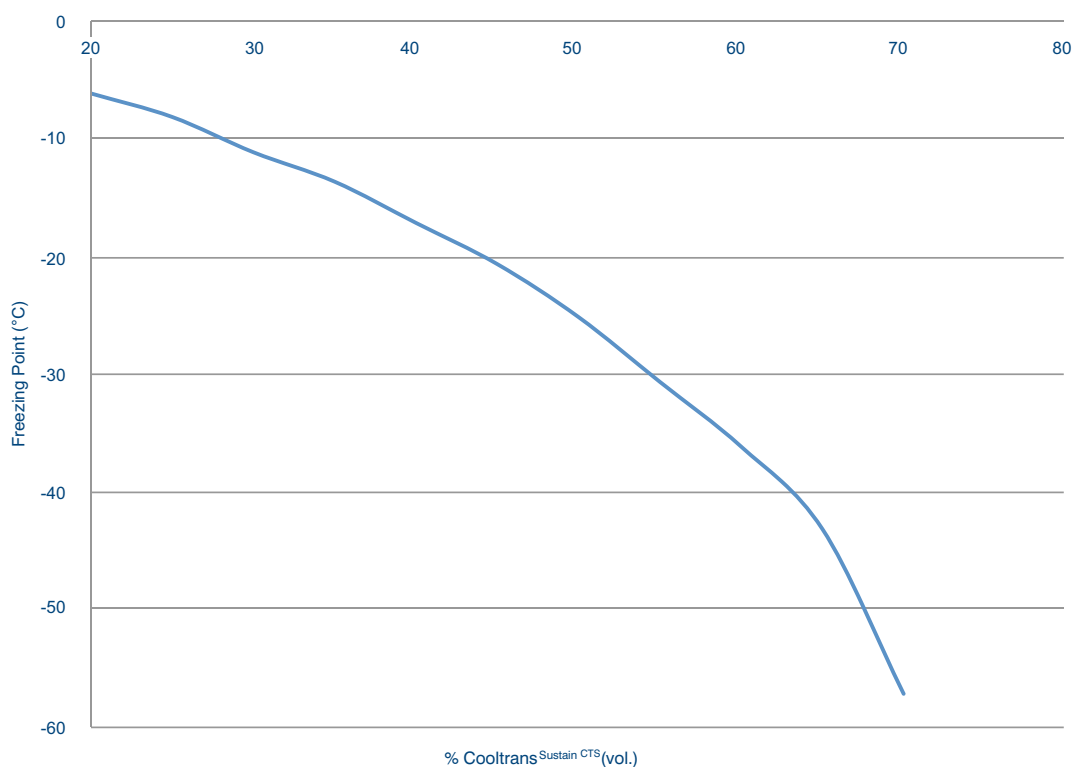
**Graph 5: Freezing Points of Aqueous Dilutions of Cooltrans<sup>CT</sup>**



**Graph 6: Freezing Points of Aqueous Dilutions of Cooltrans Plus<sup>CTP</sup>**



**Graph 7: Freezing Points of Aqueous Dilutions of Cooltrans<sup>Sustain CTS</sup>**



**Table 9: Freezing Points of Aqueous Dilutions of Cooltrans**

For specific freezing points please see the table below:

Freeze Point (°C)	Cooltrans <sup>CT</sup>		Cooltrans Plus <sup>CTP</sup>		Cooltrans <sup>Sustain CTS</sup>	
	% Volume	RI	% Volume	RI	% Volume	RI
-10	23	1.3570	26	1.3610	28.5	1.3675
-11	24.5	1.3590	28	1.3620	30	1.3690
-12	26.5	1.3610	29	1.3640	32	1.3715
-13	28	1.3620	31	1.3660	34	1.3735
-14	29	1.3635	32.5	1.3680	36	1.3755
-15	30	1.3645	34	1.3695	37.5	1.3775
-16	31.5	1.3660	35.5	1.3710	38.5	1.3790
-17	32.5	1.3670	36.5	1.3720	40	1.3800
-18	34	1.3680	38	1.3740	41.5	1.3815
-19	35	1.3690	39	1.3750	43	1.3835
-20	36	1.3700	40	1.3760	44.5	1.3845
-25	41.5	1.3760	45.5	1.3810	50	1.3900
-30	46.5	1.3800	50	1.3855	54.5	1.3940
-35	50.5	1.3840	53.5	1.3890	59	1.3990
-40	53.5	1.3860	-	-	63.5	1.4030
-45	-	-	-	-	66	1.4050
-50	-	-	-	-	67.5	1.4075

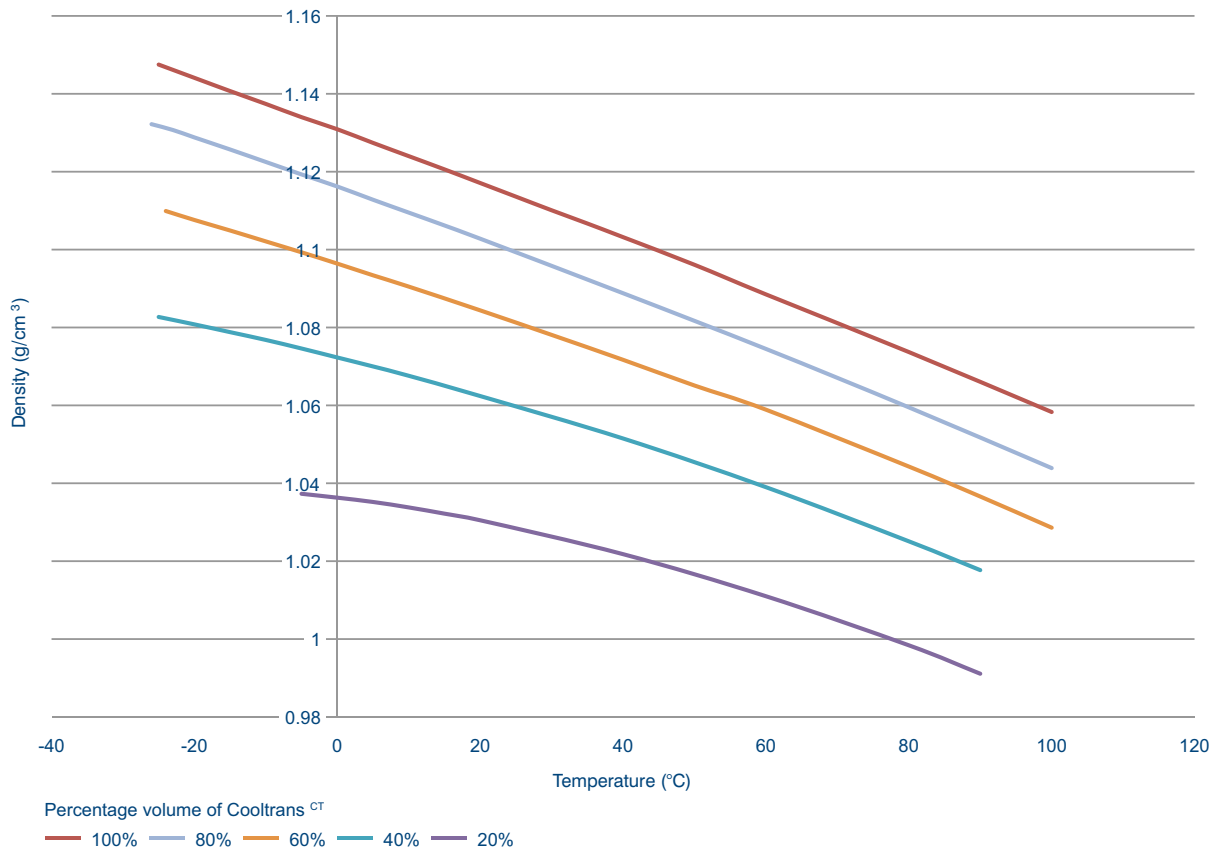
\*The freeze points indicated refer to the temperatures at which crystallisation starts to occur



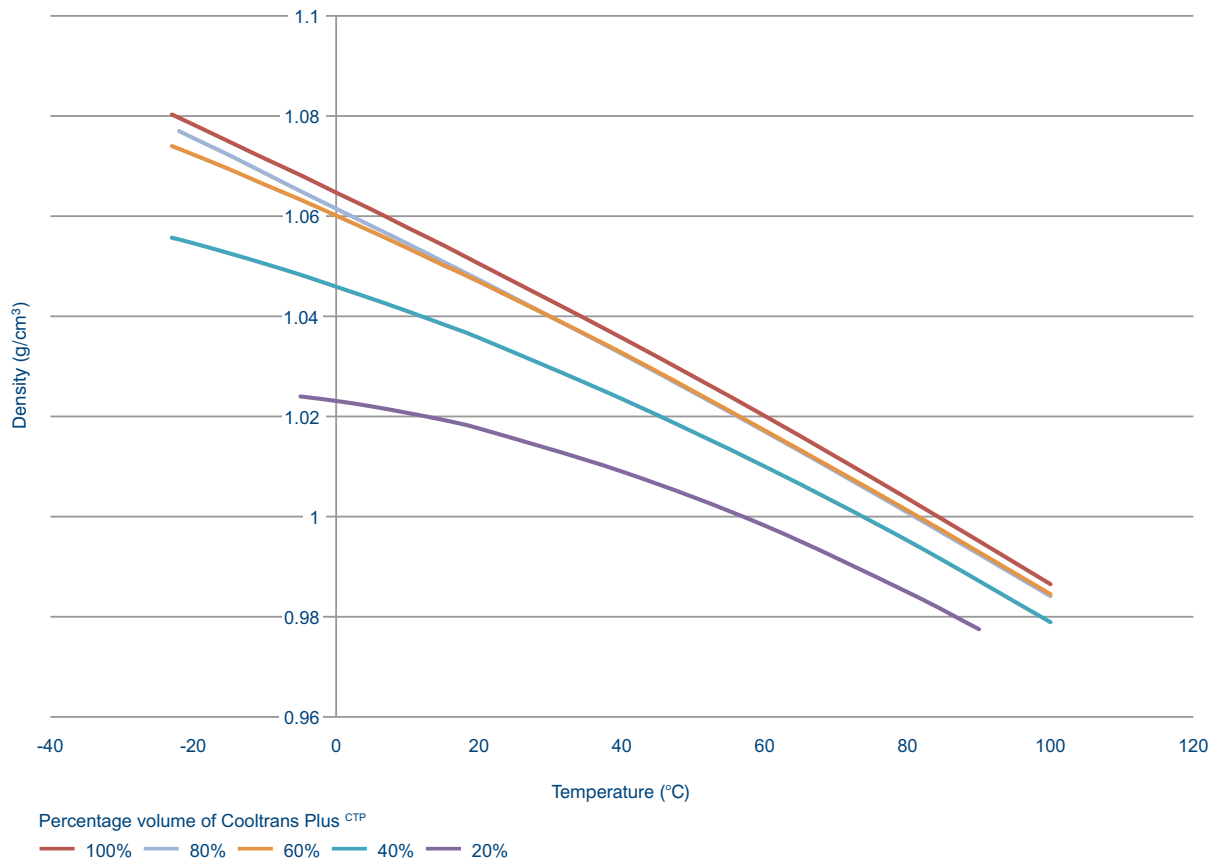
## Product Density

The product density is the mass of a unit of volume and is typically measured in  $\text{g}/\text{cm}^3$ . The charts below show the relationship between the densities of aqueous dilutions of Cooltrans fluids and temperature.

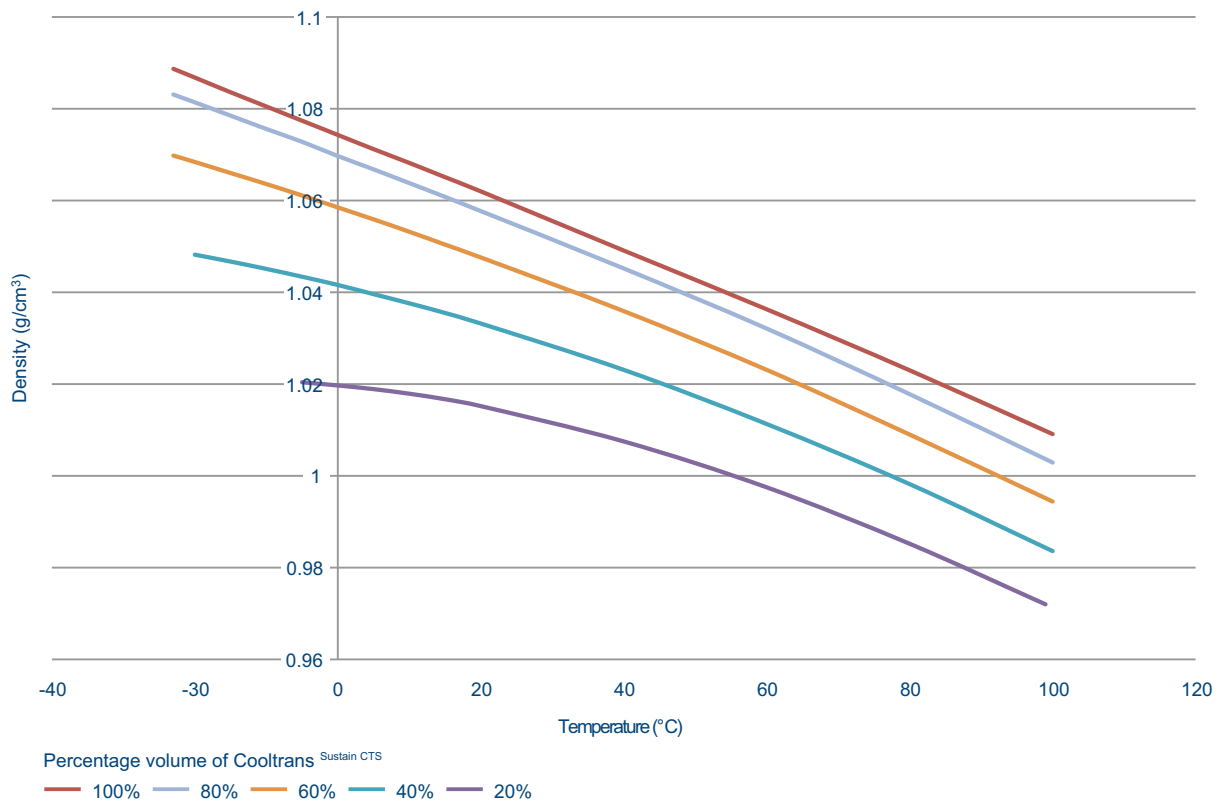
**Graph 8: Density of Aqueous Dilutions of Cooltrans<sup>CT</sup>**



**Graph 9: Density of Aqueous Dilutions of Cooltrans Plus<sup>CTP</sup>**



**Graph 10: Density of Aqueous Dilutions of Cooltrans<sup>Sustain CTS</sup>**





## Dynamic and Kinematic Viscosity

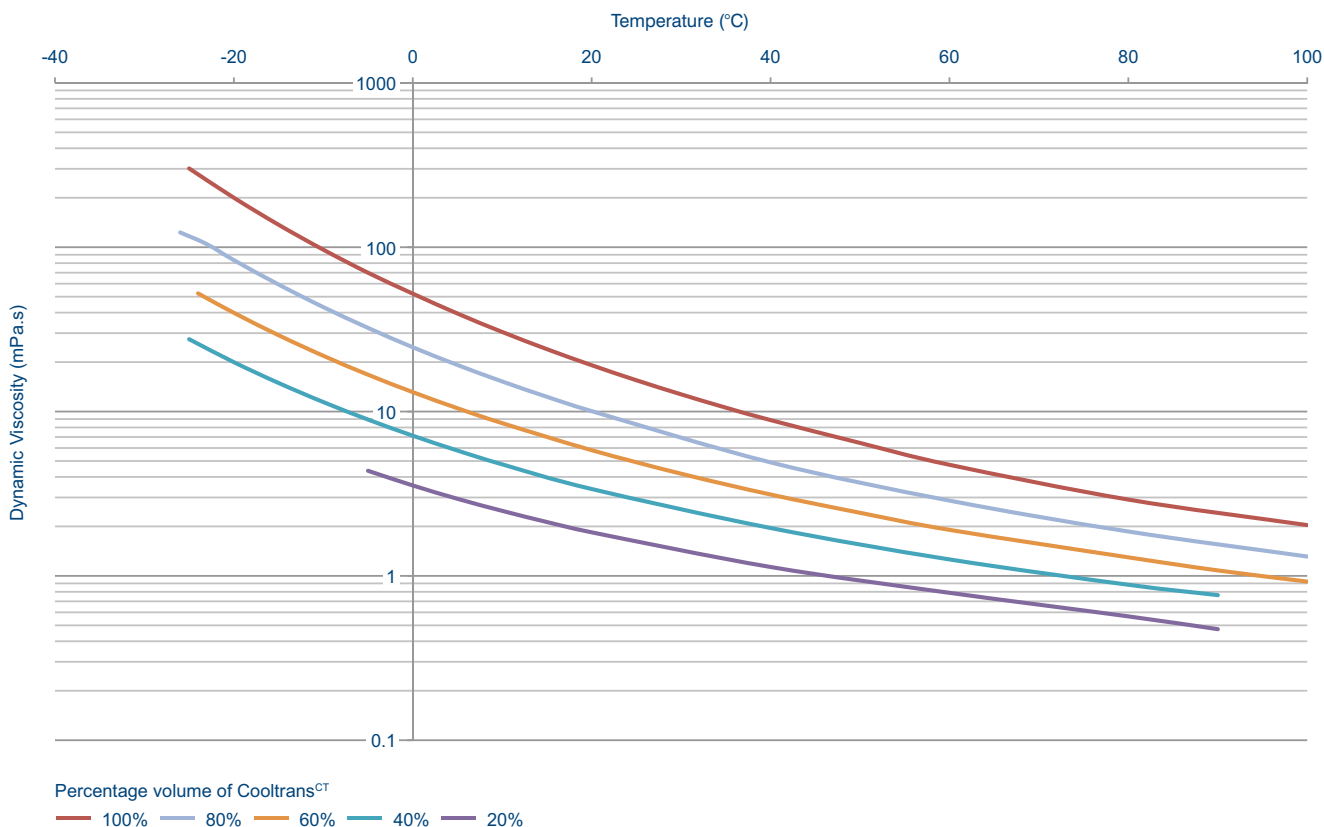
Dynamic viscosity is a measure of a fluid's resistance to flow and is measured in mPa.S. Temperature can affect a fluid's viscosity. As the Cooltrans range of fluids are Newtonian, they show a reduction in viscosity with an increase in temperature.

Kinematic viscosity is the ratio of dynamic viscosity to density and can be obtained by dividing the dynamic viscosity of a fluid by its density:  $\nu = \mu / \rho$

Kinematic viscosity is measured in mm<sup>2</sup>/s.

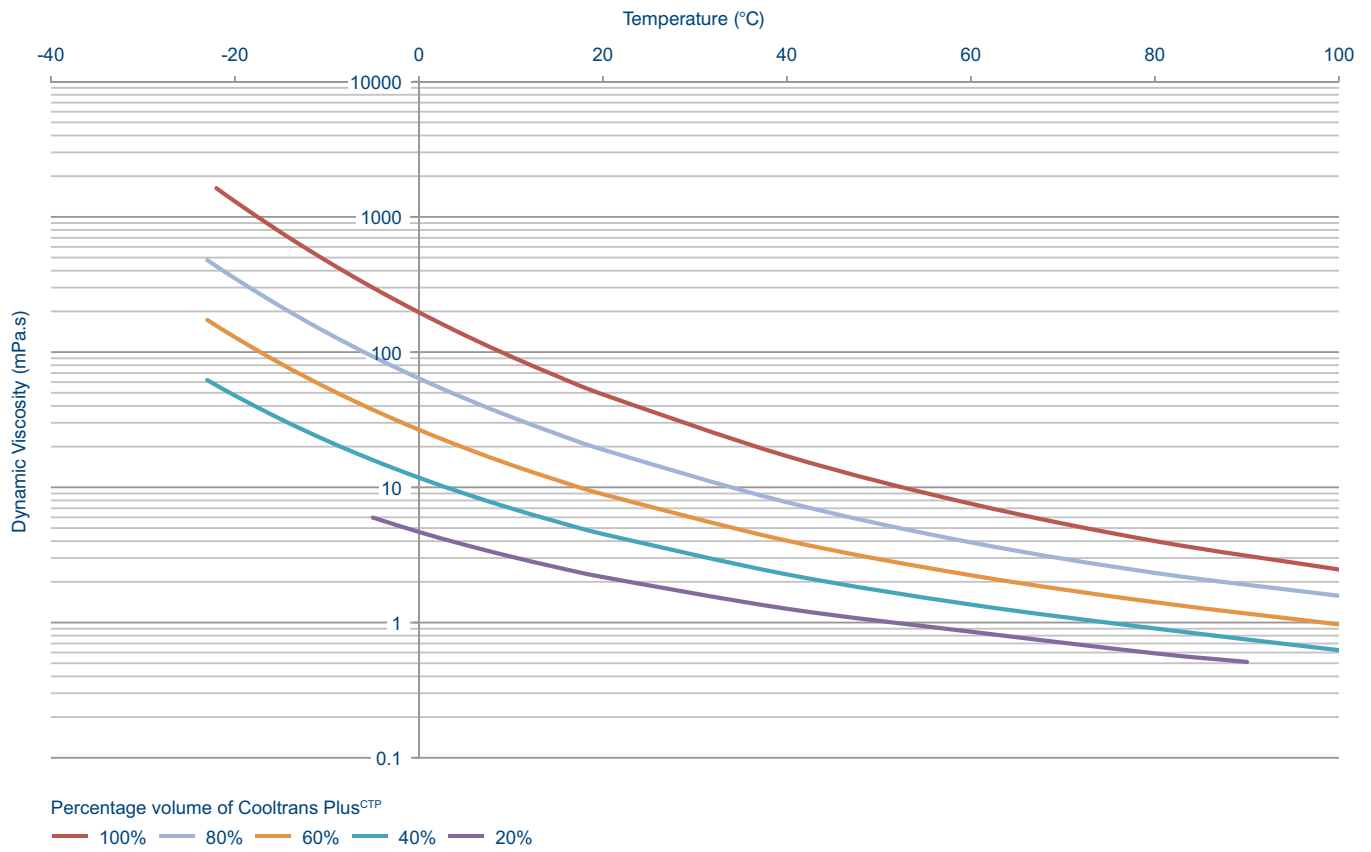
The viscosities of the Cooltrans fluids are illustrated in the graphs below.

**Graph 11: Dynamic Viscosity of Aqueous Dilutions of Cooltrans<sup>CT</sup>**

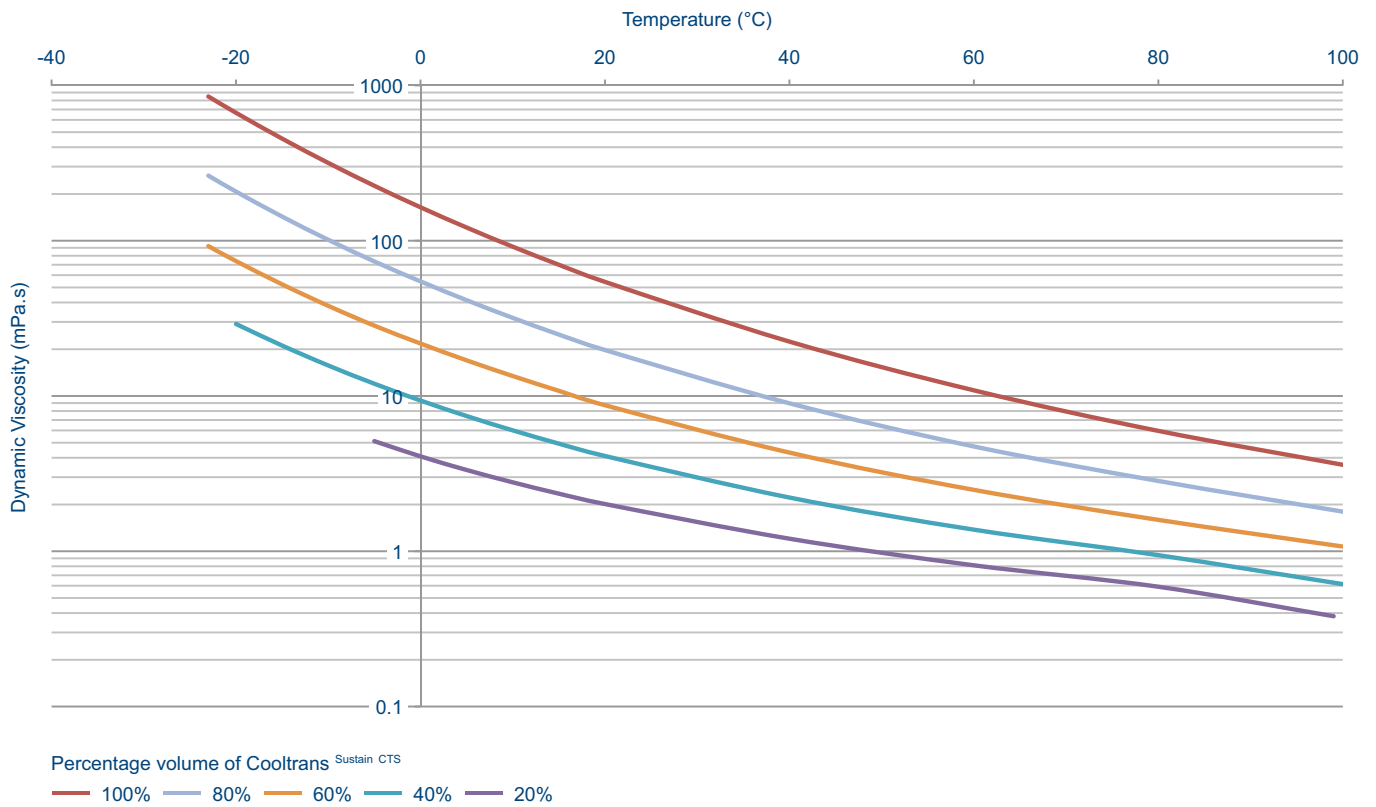




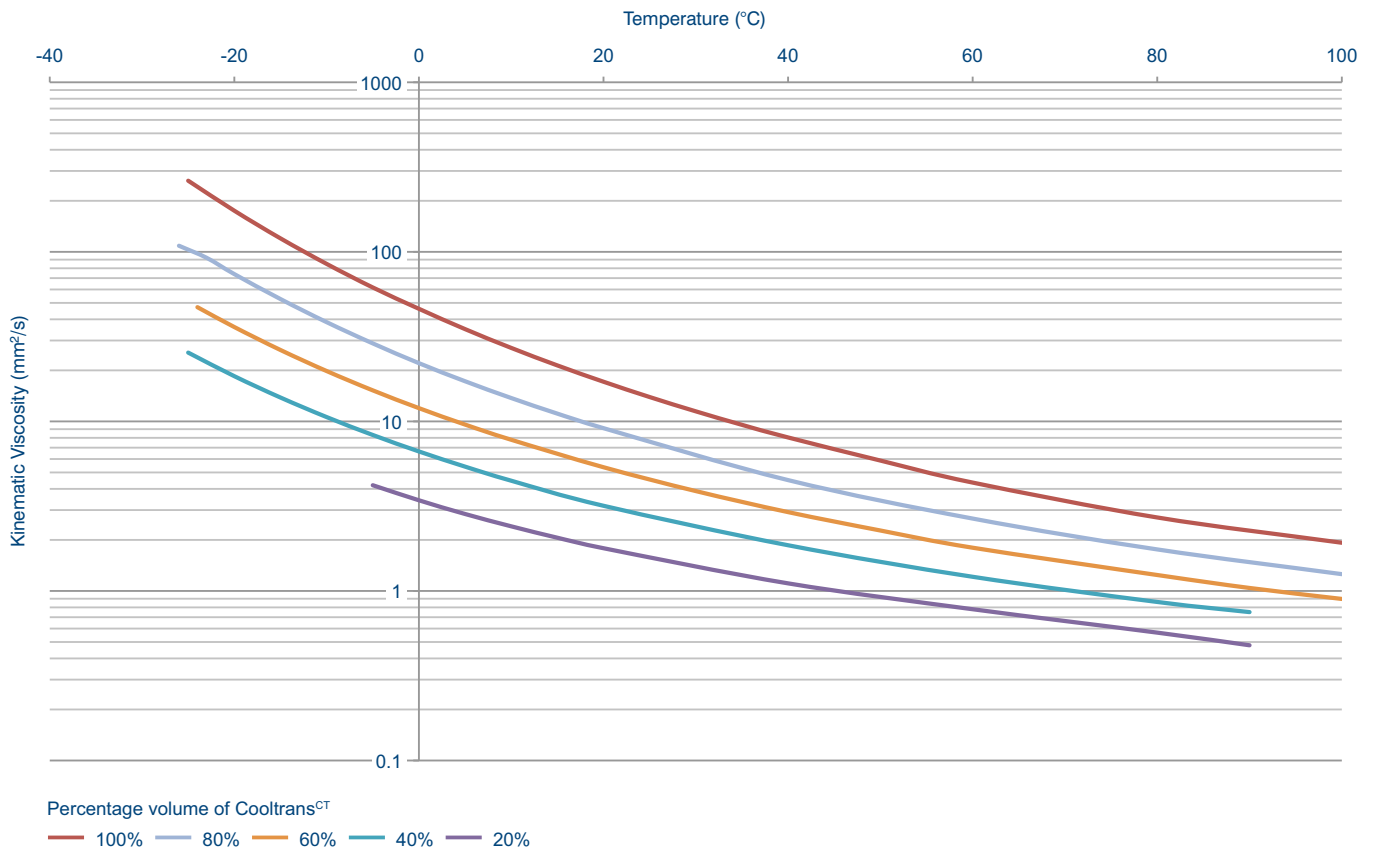
Graph 12: Dynamic Viscosity of Aqueous Dilutions of Cooltrans Plus<sup>CTP</sup>



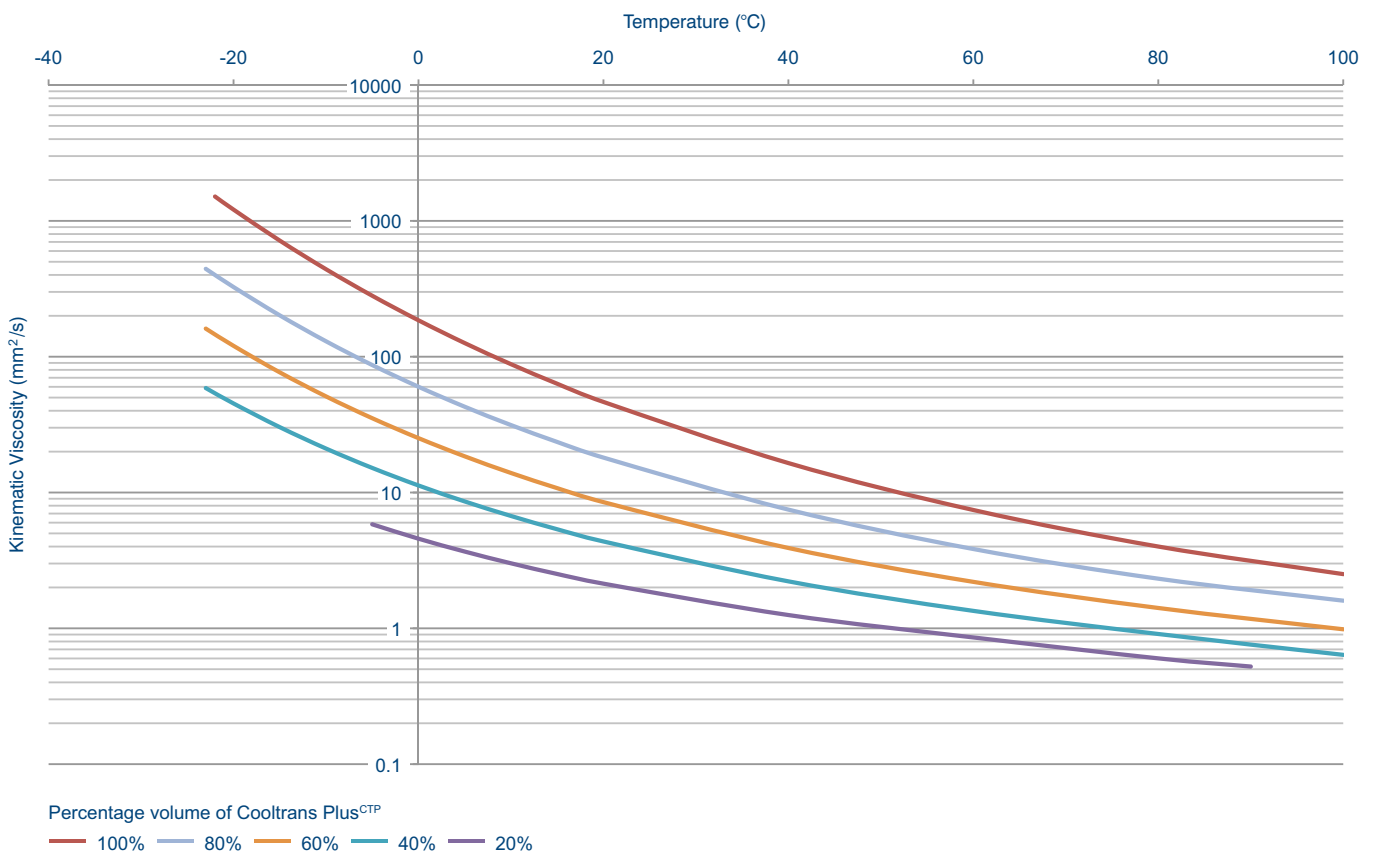
Graph 13: Dynamic Viscosity of Aqueous Dilutions of Cooltrans<sup>Sustain CTS</sup>



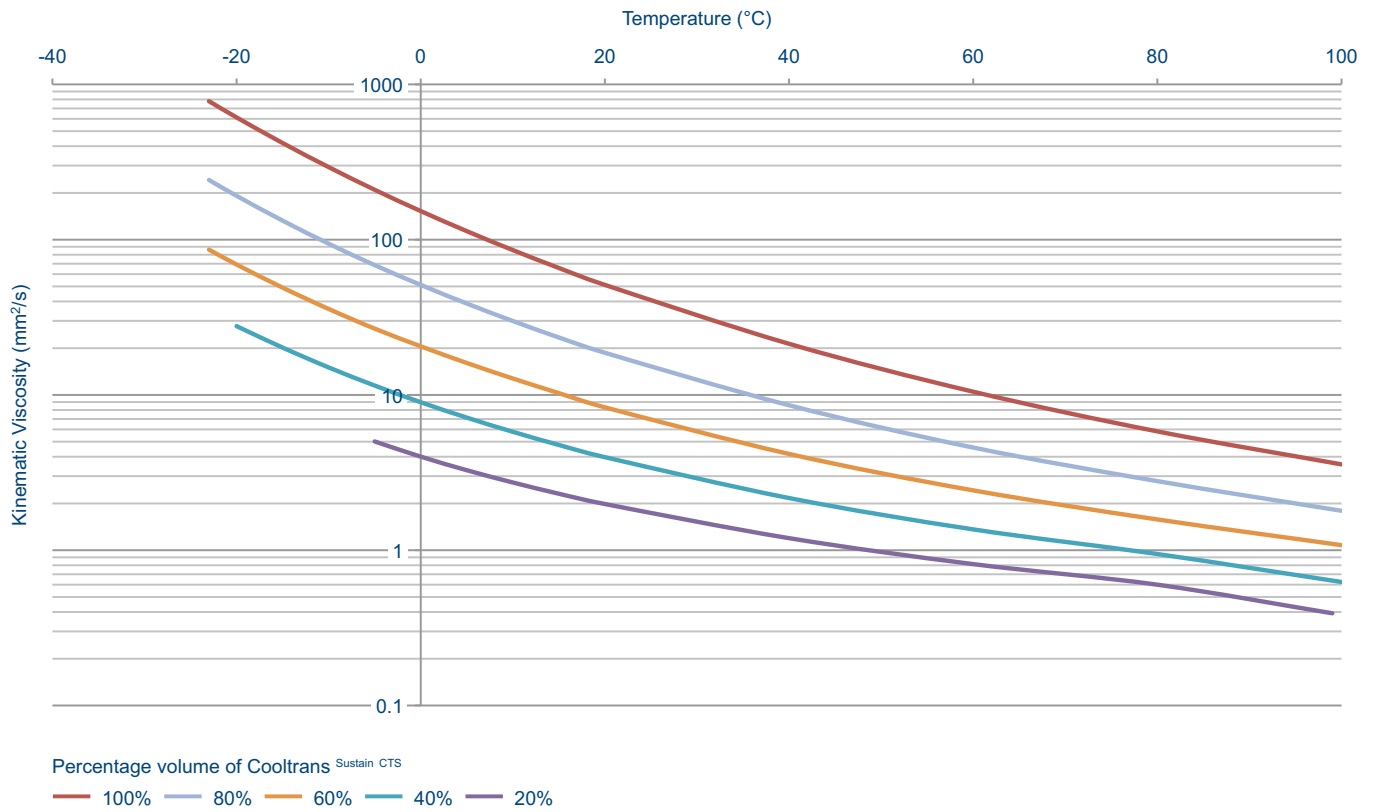
Graph 14: Kinematic Viscosity of Aqueous Dilutions of Cooltrans<sup>CT</sup>



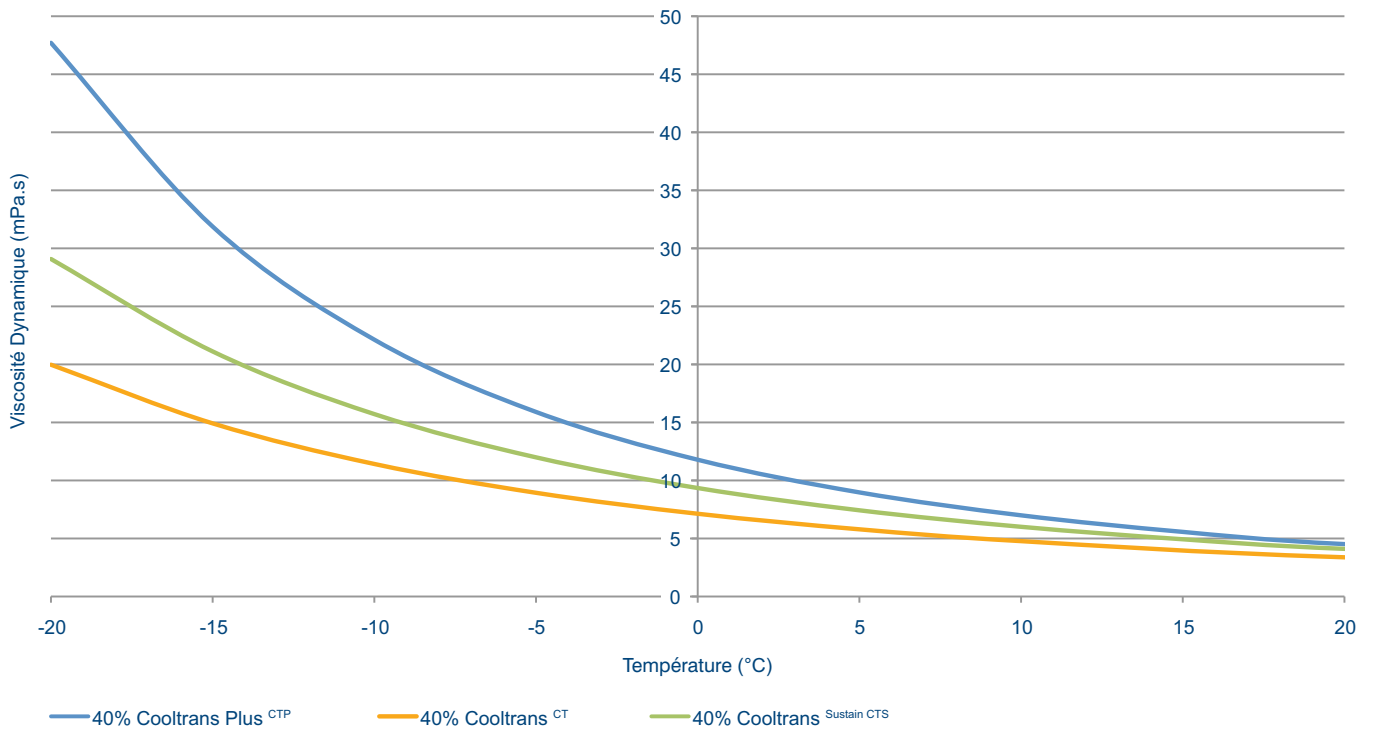
Graph 15: Kinematic Viscosity of Aqueous Dilutions of Cooltrans Plus<sup>CTP</sup>



Graph 16: Kinematic Viscosity of Aqueous Dilutions of Cooltrans <sup>Sustain CTS</sup>



Graph 17: Comparison of Dynamic Viscosity of Aqueous Dilutions of Kilfrost Speciality Fluids



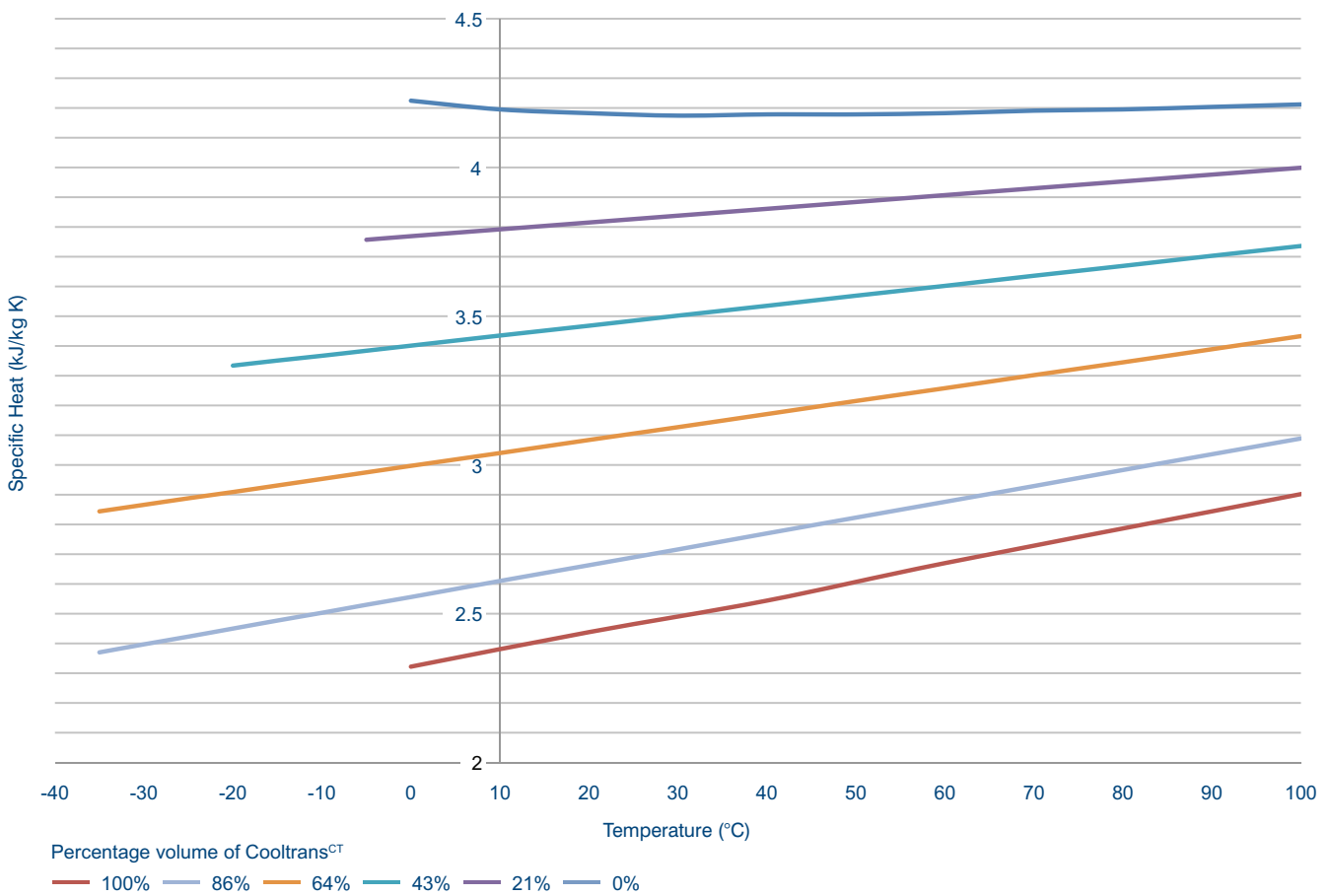


## Specific Heat

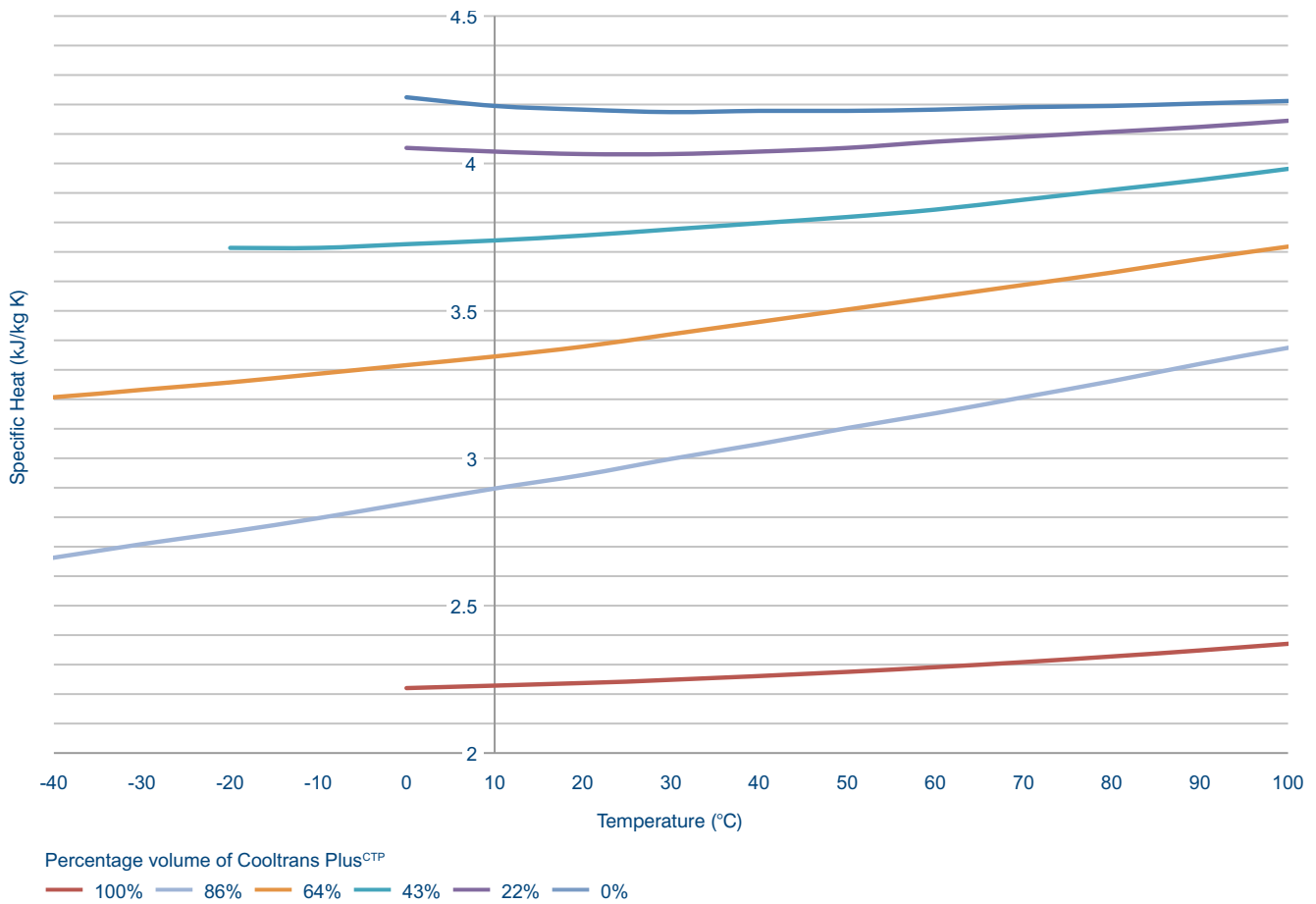
Specific heat is the amount of heat required to change temperature of one kilogram of a substance by one degree centigrade and may be measured in kJ/kg K. Adding water to Cooltrans fluids will increase the specific heat, however this will reduce the operational temperature range and increase the corrosivity of the fluid.

The graphs below indicate how the specific heat of Cooltrans fluids are affected at different aqueous dilutions.

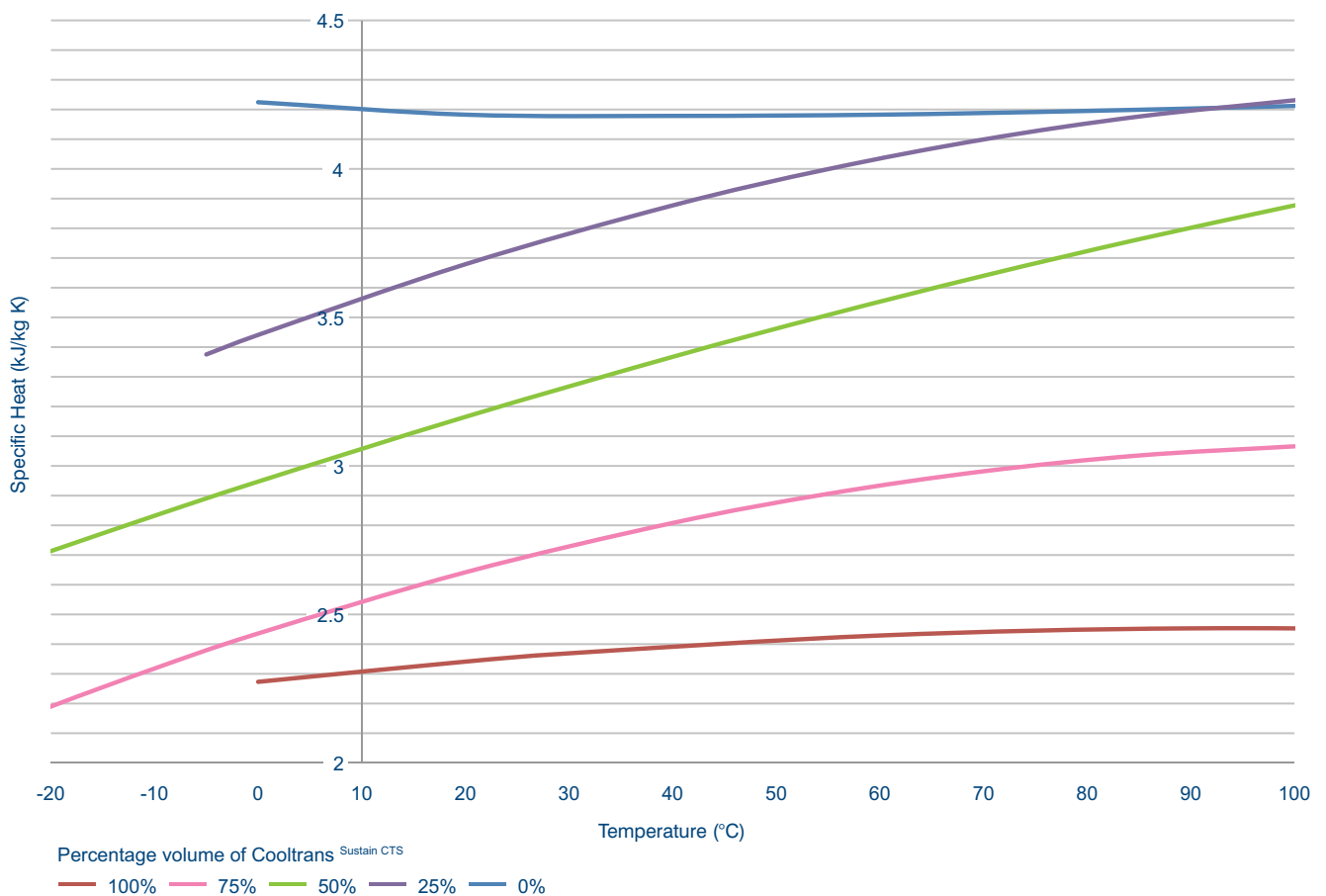
Graph 18: Specific Heat of Aqueous Dilutions of Cooltrans<sup>CT</sup>



Graph 19: Specific Heat of Aqueous Dilutions of Cooltrans Plus<sup>CTP</sup>



Graph 20: Specific Heat of Aqueous Dilutions of Cooltrans<sup>Sustain CTS</sup>

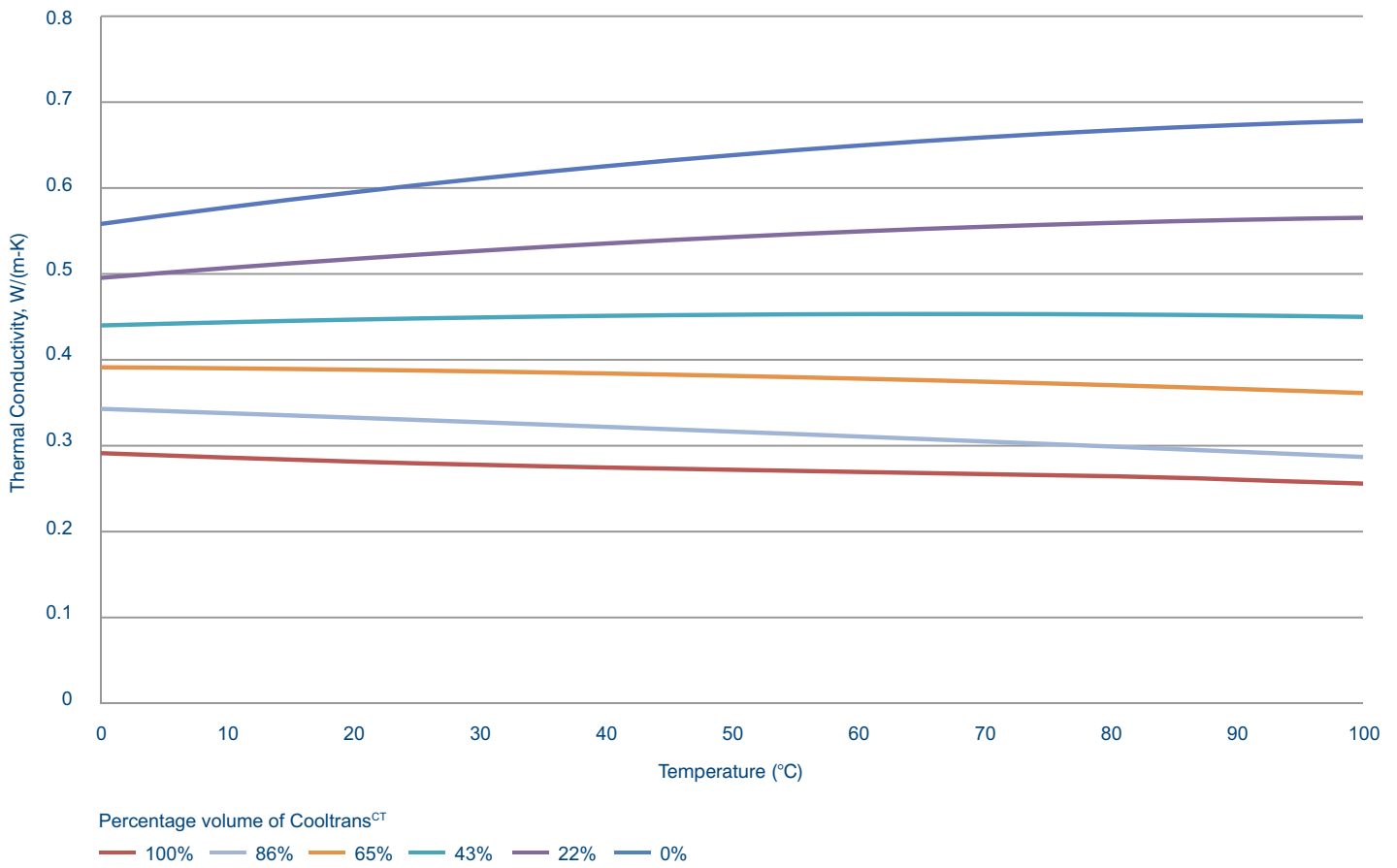




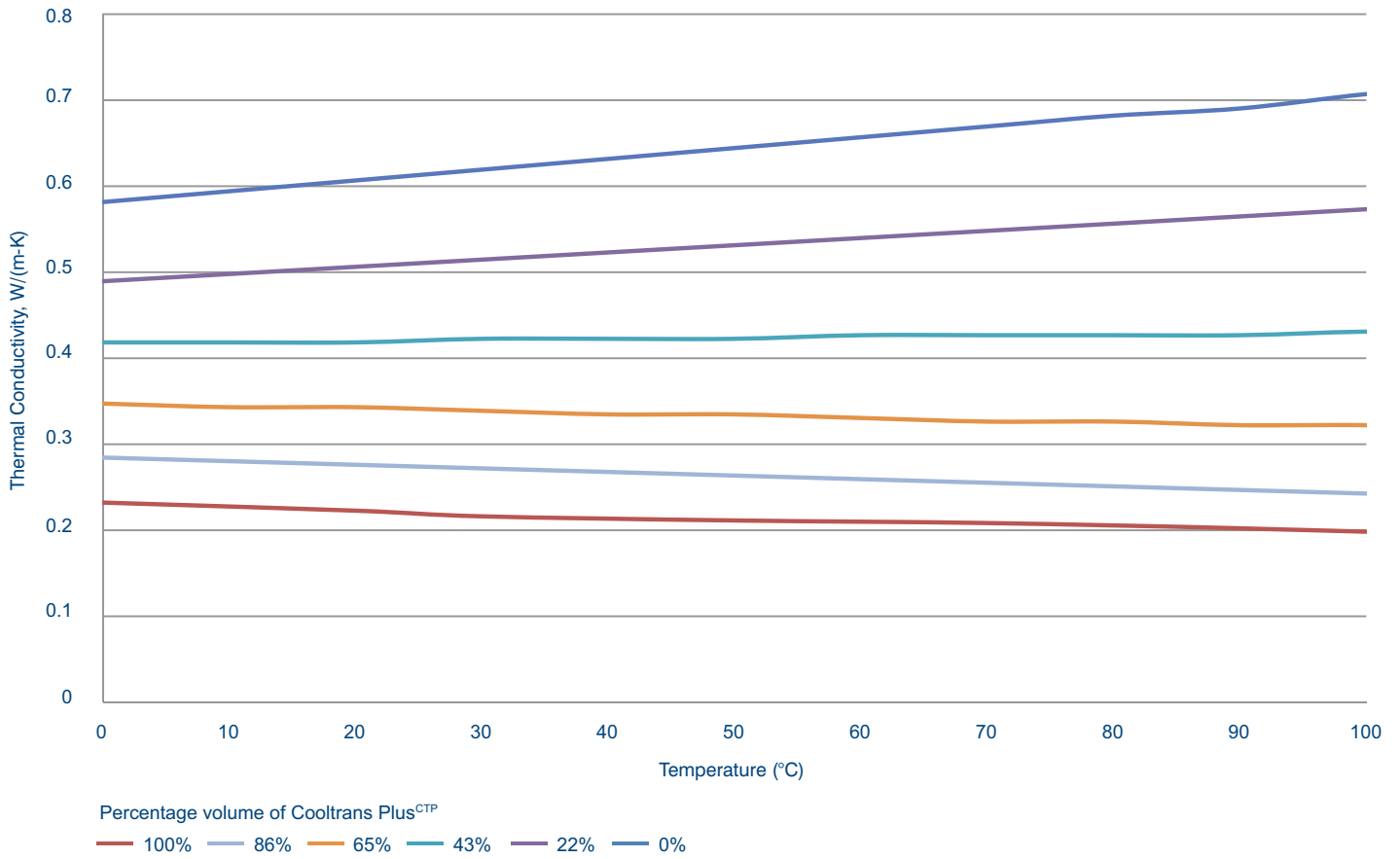
## Thermal Conductivity

Thermal conductivity is a unit of measurement of heat transference within a fluid, and is measured in W/(m-K). The thermal conductivities of Cooltrans fluids are shown in the graphs below.

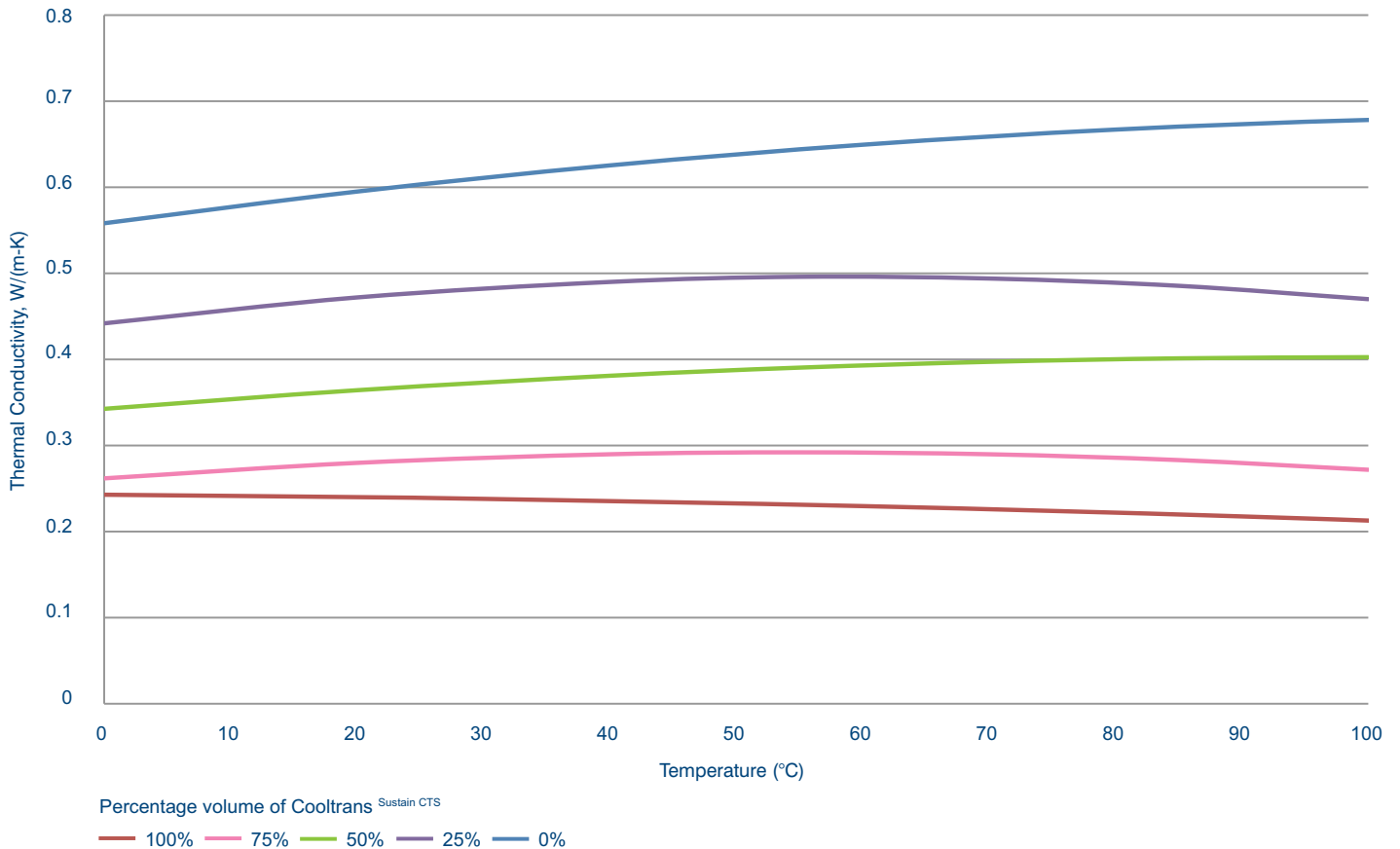
Graph 21: Thermal Conductivity of Aqueous Dilutions of Cooltrans<sup>CT</sup>



Graph 22: Thermal Conductivity of Aqueous Dilutions of Cooltrans Plus<sup>CTP</sup>



Graph 23: Thermal Conductivity of Aqueous Dilutions of Cooltrans<sup>Sustain CTS</sup>

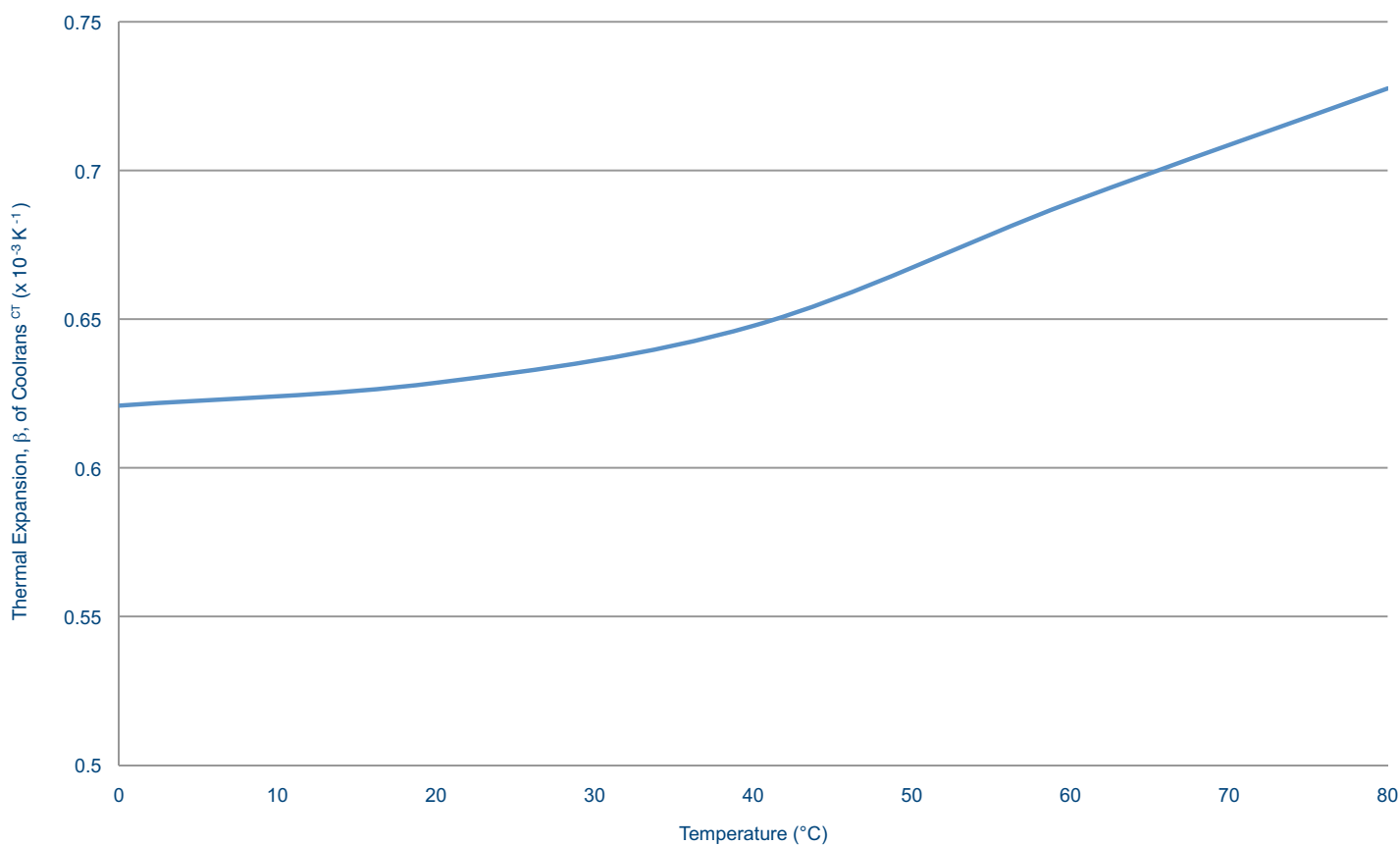




## Thermal Expansion

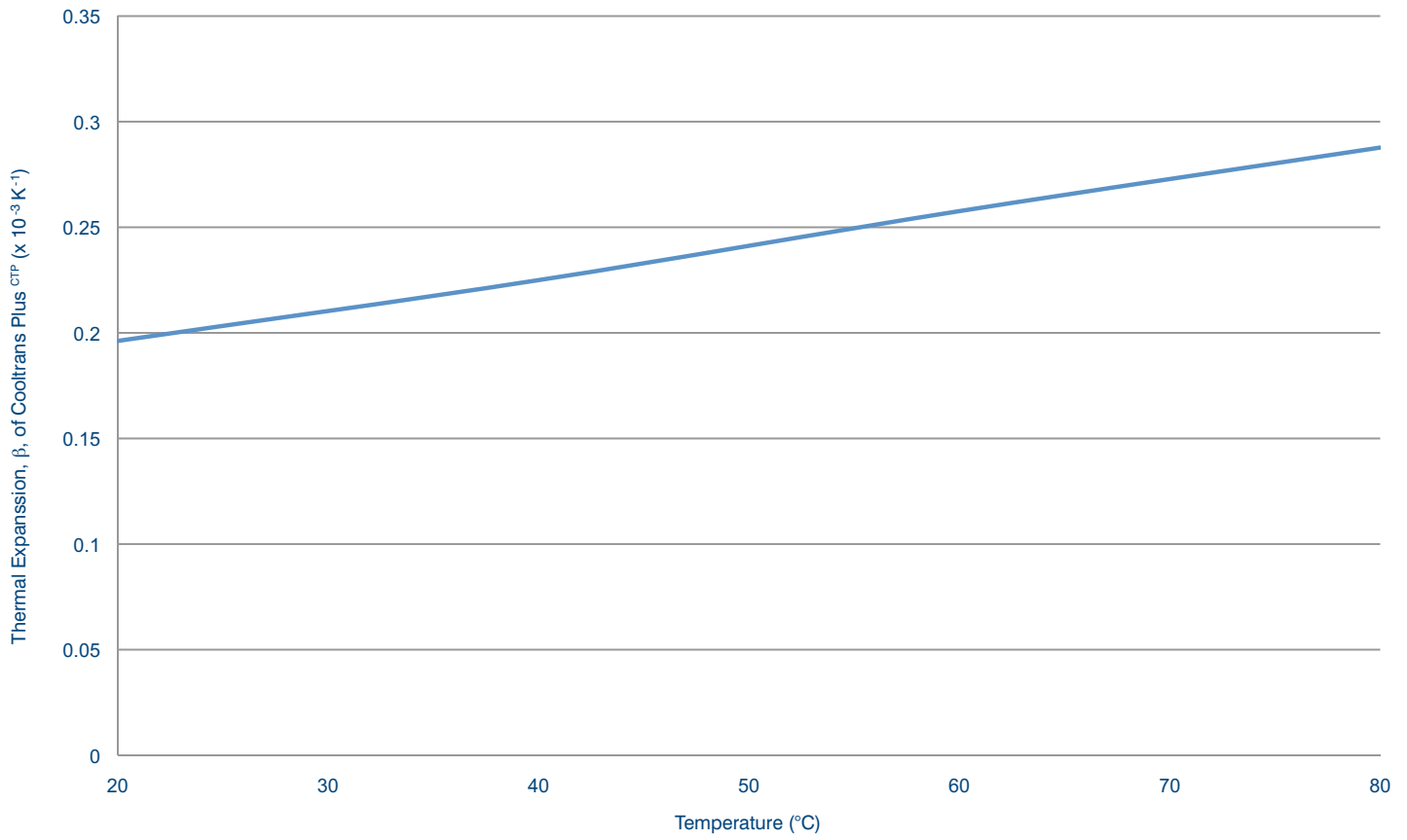
Thermal expansion is the rate at which a liquid changes in volume in relation to a change in temperature. The rates of thermal expansion for Cooltrans fluids are shown in the graphs below.

Graph 24: Cubic Thermal Expansion of Cooltrans<sup>CT</sup>

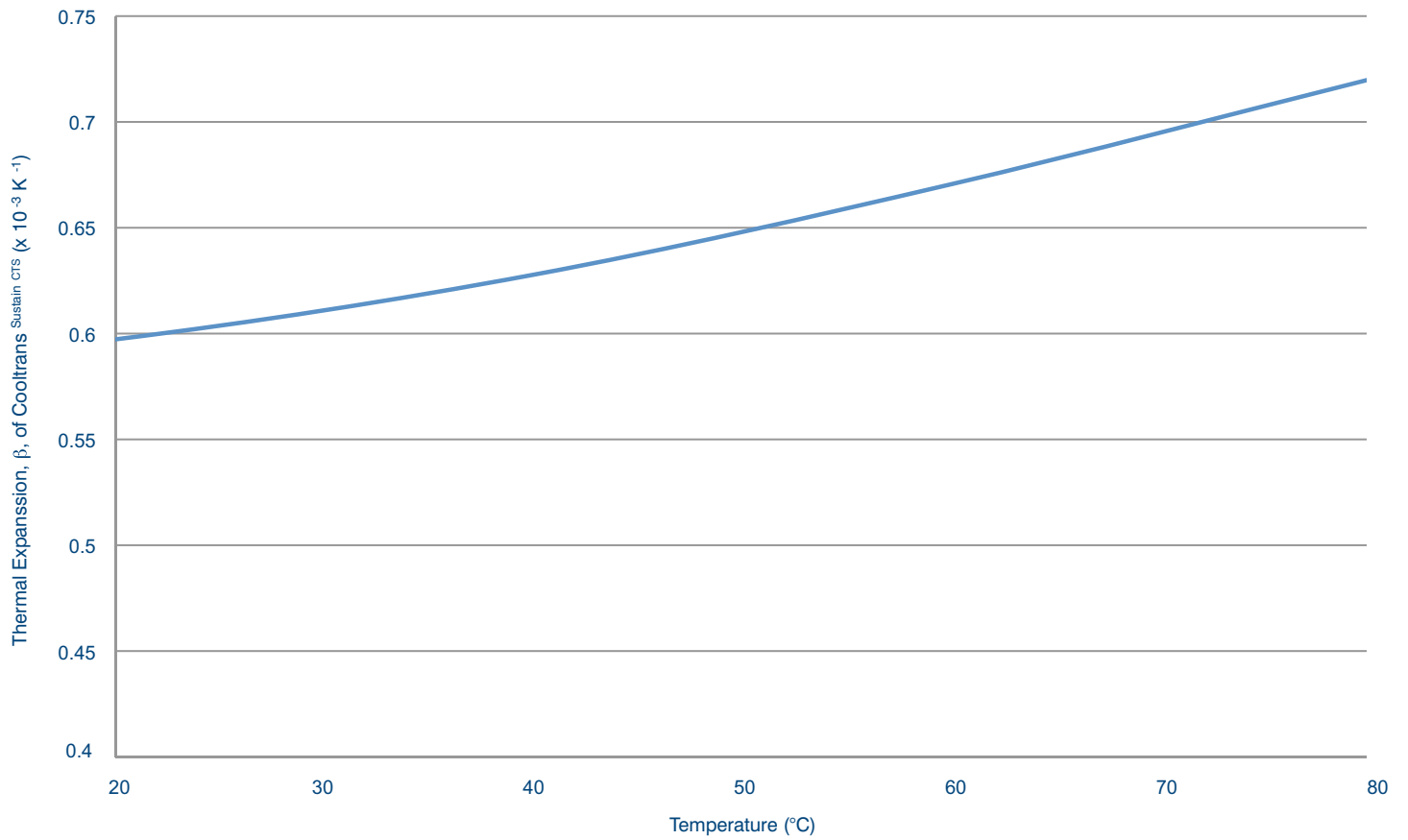




Graph 25: Cubic Thermal Expansion of Cooltrans Plus<sup>CTP</sup>



Graph 26: Cubic Thermal Expansion of Cooltrans<sup>Sustain CTS</sup>





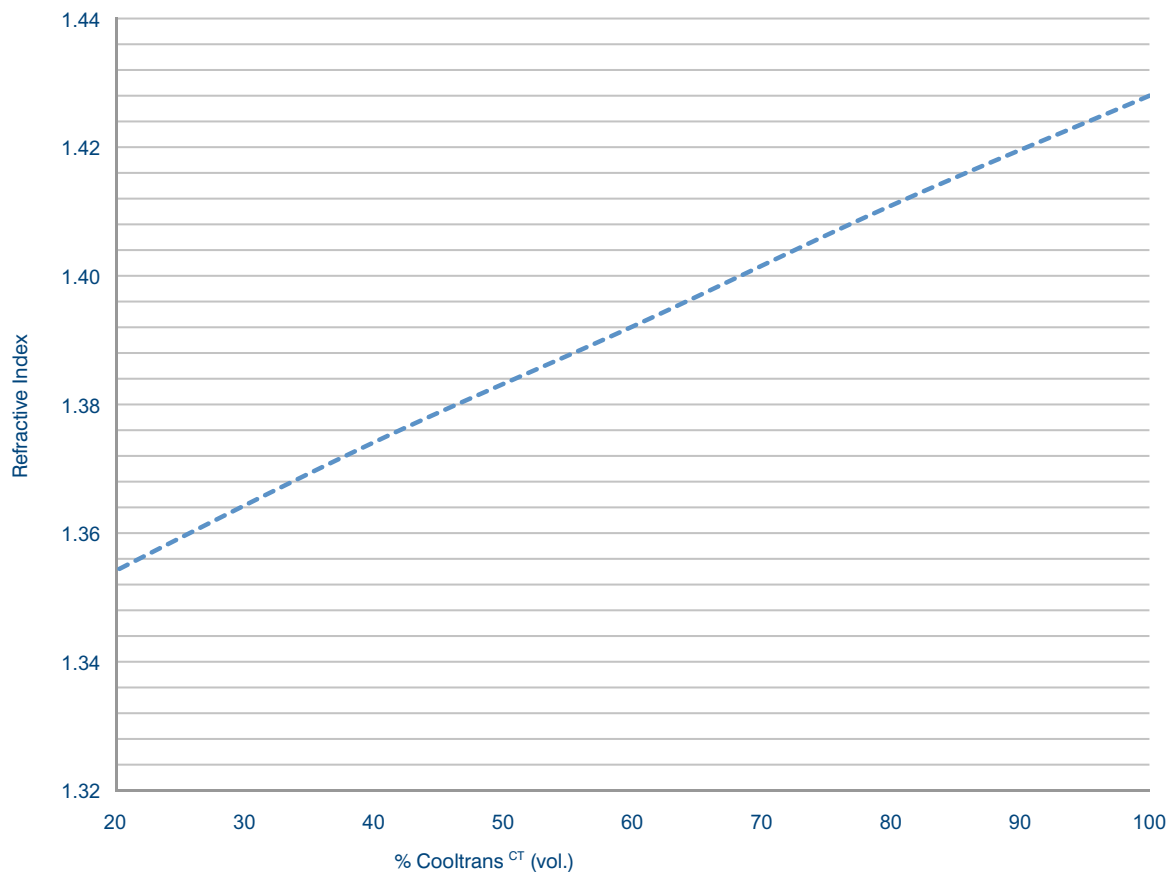
## Refractive Index

The refractive index measures the extent at which light is distorted within a fluid.

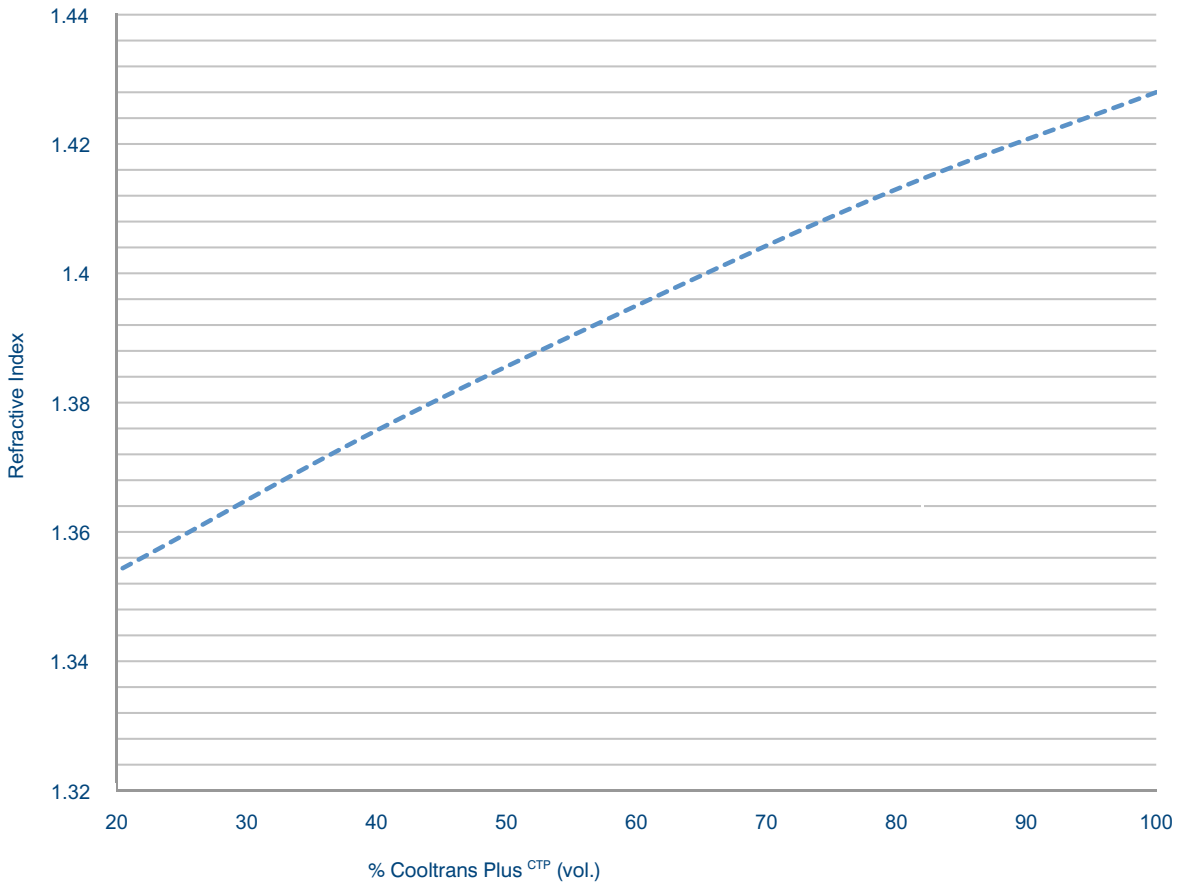
The refractive index is a method that can be used to determine how much Cooltrans fluid is present in an aqueous dilution.

The refractive indices of aqueous solutions of Cooltrans range at 20°C are illustrated in the graphs below. Refractometers are available from Kilfrost, please contact for details.

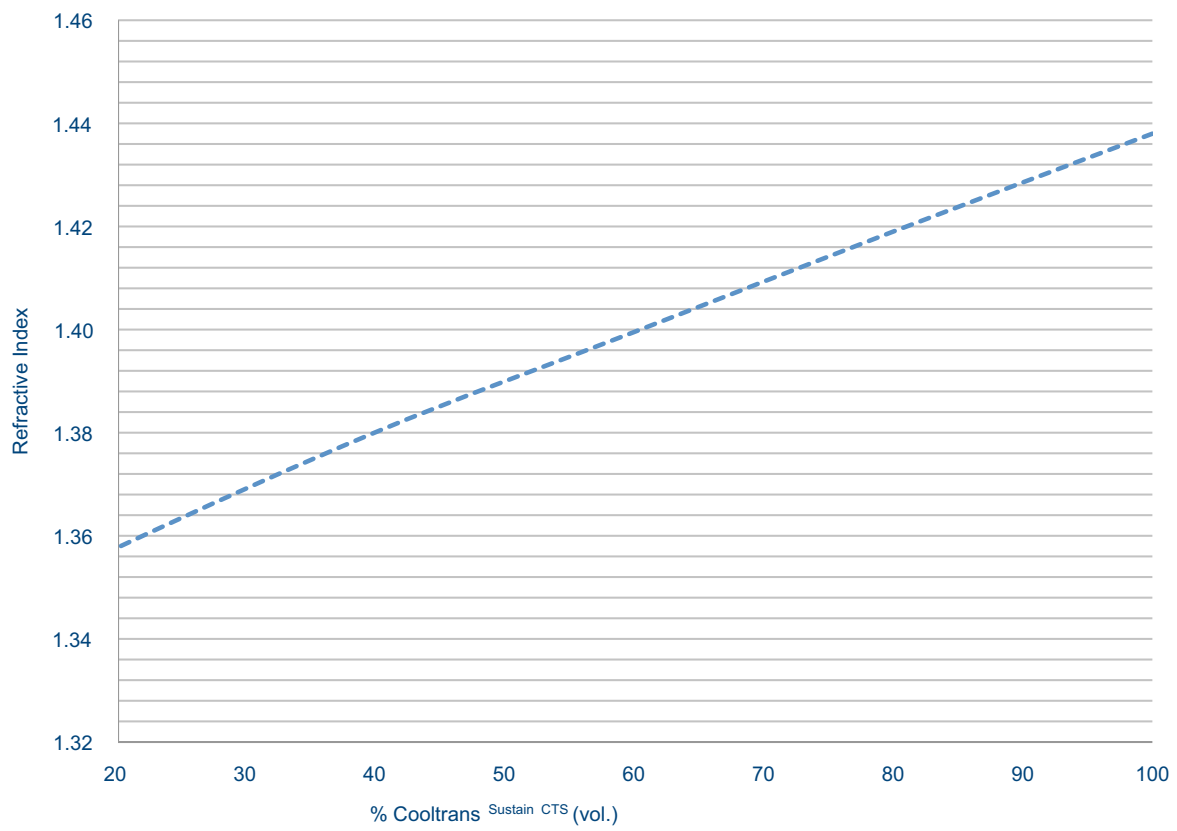
**Graph 27: Refractive Indices of Aqueous Dilutions of Cooltrans<sup>CT</sup>**



Graph 28: Refractive Indices of Aqueous Dilutions of Cooltrans Plus<sup>CTP</sup>



Graph 29: Refractive Indices of Aqueous Dilutions of Cooltrans<sup>Sustain CTS</sup>





## Dynamic Energy Solutions

**Kilfroast Limited** 4th Floor, Time Central 32 Gallowgate,  
Newcastle upon Tyne NE1 4SN UK T +44 (0)1434 320 332 E info@kilfroast.com

**Kilfroast, Inc.** 6250 Coral Ridge Drive, Suite 130, Coral Springs,  
Florida 33076 USA T +1 954-282-5050

[www.kilfroast.com](http://www.kilfroast.com)

**Kilfroast (Beijing) Trading Co., Ltd**  
2709, China World Office 1, No. 1 Jian Guo Men Wai Avenue,  
Beijing, 100004, China. T +86 10 6535 4020

[www.kilfroast.cn](http://www.kilfroast.cn)

