GLYCOL SALES AUSTRALIA

GLY-PRO™ MG

ETHYLENE GLYCOL HTF

Ethylene glycol based industrial grade heat transfer fluid

ENGINEERING & OPERATING GUIDE

Made in Australia

PROUDLY AUSTRALIAN OWNED AND MADE

GLY-PRO™

MG HTF

ENGINEERING AND OPERATION GUIDE

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1. Introduction

GLY-PRO™ MG HTF is a high-performance ethylene glycol solution, renowned for its exceptional thermal conductivity and freeze protection properties. It is ideal for a wide range of industrial applications, including HVAC systems and industrial machinery. GLY-PRO™ MG is formulated to provide optimal performance, minimize corrosion, and extend the life of critical equipment.

Why Inhibited Ethylene Glycol?
GLY-PRO™ MG offers a compelling solution for heat transfer processes in industrial applications due to its:

- Robust inhibitor package. Containing organic acid technology our inhibitors will withstand the harshest conditions to continue to protect your equipment and maintain your glycol performance.
- Excellent thermal conductivity: Efficiently transfers heat, optimising energy consumption.
- Wide operating temperature range: Handles both high and low temperatures, accommodating diverse applications.
- Corrosion inhibition: Protects system components from degradation, extending equipment lifespan.
- Cost-effective solution: Inhibited ethylene glycol offers a balance of performance and affordability, providing long-term protection and reducing need for frequent replacement.

Applications for GLY-PRO™ MG:

- Industrial heat transfer.: Used in various industrial processes in both cooling and heating cycles.
- HVAC systems: Prevents freezing in heating and cooling systems. Offering low maintenance and operational costs
- Underfloor heating systems: Commonly used to protect assets from frost heave.
- Solar/Geothermal systems: Protects components from freezing and ensures efficient operation.

GLY-PRO™ MG ethylene glycol is a valuable tool for maintaining the functionality and longevity of various systems. By understanding its benefits and applications, you can make informed decisions about its use in your specific needs.

Key Considerations for Inhibited Glycol Implementation
To maximise the benefits of GLY-PRO™ MG HTF, it's essential to consider the following factors:

- Fluid selection: Choose the appropriate GLY-PRO™ MG HTF formulation based on specific application requirements, such as temperature range and system design.
- System design: Ensure proper system design, including pump selection, piping, and heat exchanger configuration, to optimise performance.
- Fluid maintenance: Implement a regular maintenance program to monitor fluid quality, filter contaminants, and add inhibitors as needed.
- Safety practices: Adhere to safety guidelines for handling and storing GLY-PRO™ MG HTF, including personal protective equipment (PPE) and spill containment procedures.

By understanding the properties, applications, and considerations of GLY-PRO™ MG HTF, you can effectively leverage this versatile heat transfer fluid to enhance the efficiency, safety, and quality of your food and beverage operations. If you would like additional information please contact GSA at 1300 459 265

2. Properties of GLY-PRO™ MG Heat Transfer Fluid

2.1. Appearance and description

GLY-PRO™ MG HTF is a clear and odourless fluid. Adding GLY-PRO™ Tracer HTF coloured dye to MG can aid in leak detection

GLY-PRO™ MG is available in a concentrate or ready-to-use, heat transfer fluid in concentration suitable for your application which does not require dilution. Glycol-based fluids should be used at 30% or higher to prevent bacterial contamination. Dilution below 30% can lead to increased chances of bacterial growth and inefficient fluid efficacy through glycol degradation.

GLY-PRO™ MG inhibitor package is also available after installation to effectively and efficiently correct any fluid degradation that might occur over the course of its life. This is only done in consultation with GSA following fluid testing. Periodic lab testing will ensure that GLY-PRO™ MG is always at optimal performance.

Table 1. Typical product properties[1] of GLY-PRO™ MG Heat Transfer Fluid

Typical Properties Concentrate		Typical Properties 30%	
Colour	Clear to Yellow	Colour	Clear to Yellow
pH	9.3	pH	8.8
RA (mL)	8	RA (mL)	2.5
Density (g/ml)	1.115	Density (g/ml)	1.035

1 General properties, not definitive specifications

2.2. Physical and Chemical Properties

Increasing ethylene glycol concentration in water significantly affects several physical properties beyond freezing point. These include osmotic pressure, viscosity, thermal conductivity, specific heat, and specific gravity. Refer to table 4 & table 11 for freezing point data

2.3. Quality of HTF

GLY-PRO™ MG heat transfer fluid uses industrial grade ethylene glycol. GLY-PRO™ MG also contains specialised corrosion inhibitors, pH buffers, and stabilisers formulated for industrial use.

2.4. Engineering Data

Table 2. Freeze and Burst Protection

Volume %	Freeze Protection °C	Burst Protection °C
10	-4.0	-7.0
20	-9.0	-13.0
30	-16.0	-23.0
35	-20.0	-29.0
40	-24.0	-35.0
45	-29.0	-42.0
50	-34.0	-48.0
60	-45.0	-59.0

Table 3. Electrical Conductivity

Weight %	Temp °C	Electrical Conductivity (µS/cm)
0	25	1.2
30	25	3222
40	25	3200
50	25	2960
60	25	2600
100	25	911

Table 4. Typical Freezing Point and Boiling Points

Freezing Point °C	wt %	Vol %	Boiling Point °C @ 0.96 Barr
0	0	0	100
-1.4	5	4.4	101
-3.2	10	8.9	101
-5.4	15	13.6	102
-7.8	20	18.1	102
-8.4	21	19.2	102
-8.9	22	20.1	102
-9.5	23	21	103
-10.2	24	22	103
-10.7	25	22.9	103
-11.4	26	23.9	103
-12	27	24.8	103
-12.6	28	25.8	104
-13.3	29	26.7	104
-14.1	30	27.7	104
-14.8	31	28.7	104
-15.4	32	29.6	104
-16.2	33	30.6	104
-17	34	31.6	104
-17.9	35	32.6	105
-18.6	36	33.5	105
-19.4	37	34.5	105
-20.3	38	35.5	105
-21.3	39	36.5	105
-22.3	40	37.5	106
-23.2	41	38.5	106
-24.3	42	39.5	106
-25.3	43	40.5	106
-26.4	44	41.5	106
-27.5	45	42.5	107
-28.8	46	43.5	107
-29.8	47	44.5	107
-31.1	48	45.5	107
-32.6	49	46.6	107
-33.8	50	47.6	107
-35.1	51	48.6	107
-36.4	52	49.6	107
-37.9	53	50.6	108
-39.3	54	51.6	108
-41.1	55	52.7	108
-42.6	56	53.7	108
-44.2	57	54.7	109
-45.6	58	55.7	109
-47.1	59	56.8	109
-48.3	60	57.8	110
-	65	62.8	113
-	70	68.3	117
-	75	73.6	120
-	80	78.9	124
-	85	84.3	134
-	90	89.7	141
-	95	95	158

Table 5. Density (kg/m3)

°C	30%	40%	50%	60%
-50	-	-	-	-
-45	-	-	-	-
-40	-	-	-	-
-35	-	-	-	-
-30	-	-	1109.9	1125.8
-25	-	1090.9	1107.9	1123.6
-20	-	1089.0	1105.8	1121.3
-15	1069.2	1087.0	1103.6	1119.0
-10	1067.3	1084.9	1101.3	1116.6
-5	1065.3	1082.8	1099.0	1114.1
0	1063.3	1080.5	1096.6	1111.5
5	1061.2	1078.2	1094.1	1108.9
10	1059.0	1075.8	1091.5	1106.1
15	1056.8	1073.4	1088.9	1103.3
20	1054.4	1070.8	1086.2	1100.5
25	1052.0	1068.2	1083.4	1097.5
30	1049.5	1065.5	1080.5	1094.5
35	1046.9	1062.7	1077.6	1091.4
40	1044.2	1059.9	1074.6	1088.3
45	1041.5	1057.0	1071.5	1085.0
50	1038.7	1054.0	1068.3	1081.7
55	1035.8	1050.9	1065.0	1078.3
60	1032.8	1047.7	1061.7	1074.9
65	1029.8	1044.5	1058.3	1071.3
70	1026.6	1041.2	1054.8	1067.7
75	1023.4	1037.8	1051.3	1064.0
80	1020.1	1034.3	1047.7	1060.3
85	1016.8	1030.7	1044.0	1056.4
90	1013.3	1027.1	1040.2	1052.5
95	1009.8	1023.4	1036.3	1048.6
100	1006.2	1019.6	1032.4	1044.5
105	1002.5	1015.8	1028.4	1040.4
110	998.7	1011.8	1024.3	1036.2
115	994.9	1007.8	1020.1	1031.9
120	991.0	1003.7	1015.9	1027.6
125	987.0	999.6	1011.6	1023.1
130	982.9	995.3	1007.2	1018.6
135	978.7	991.0	1002.7	1014.1
140	974.5	986.6	998.2	1009.4
145	970.2	982.1	993.6	1004.7
150	965.8	977.5	988.9	999.9
155	961.3	972.9	984.1	995.0
160	956.8	968.2	979.3	990.1

Table 6. Specific Heat (kJ/kg)

°C	30%	40%	50%	60%
-50	-	-	-	-
-45	-	-	-	-
-40	-	-	-	-
-35	-	-	-	-
-30	-	-	3.050	2.818
-25	-	3.289	3.069	2.840
-20	-	3.306	3.089	2.862
-15	3.527	3.323	3.109	2.885
-10	3.542	3.341	3.129	2.907
-5	3.556	3.358	3.149	2.929
0	3.571	3.375	3.168	2.952
5	3.585	3.392	3.188	2.974
10	3.600	3.409	3.208	2.997
15	3.614	3.426	3.228	3.019
20	3.629	3.443	3.247	3.041
25	3.643	3.461	3.267	3.064
30	3.658	3.478	3.287	3.086
35	3.672	3.495	3.307	3.108
40	3.686	3.512	3.326	3.131
45	3.701	3.529	3.346	3.153
50	3.715	3.546	3.366	3.175
55	3.730	3.563	3.386	3.198
60	3.744	3.581	3.406	3.220
65	3.759	3.598	3.425	3.242
70	3.773	3.615	3.445	3.265
75	3.788	3.632	3.465	3.287
80	3.802	3.649	3.485	3.309
85	3.817	3.666	3.504	3.332
90	3.831	3.683	3.524	3.354
95	3.846	3.701	3.544	3.376
100	3.860	3.718	3.564	3.399
105	3.875	3.735	3.583	3.421
110	3.889	3.752	3.603	3.443
115	3.903	3.769	3.623	3.466
120	3.918	3.786	3.643	3.488
125	3.932	3.803	3.662	3.510
130	3.947	3.821	3.682	3.533
135	3.961	3.838	3.702	3.555
140	3.976	3.855	3.722	3.577
145	3.990	3.872	3.742	3.600
150	4.005	3.889	3.761	3.622
155	4.019	3.906	3.781	3.644
160	4.034	3.923	3.801	3.667

Table 7. Thermal conductivity (W/mK)

°C	30%	40%	50%	60%
-50	-	-	-	-
-45	-	-	-	-
-40	-	-	-	-
-35	-	-	-	-
-30	-	-	0.328	0.303
-25	-	0.361	0.332	0.306
-20	-	0.366	0.336	0.31
-15	0.405	0.371	0.340	0.313
-10	0.411	0.376	0.344	0.316
-5	0.417	0.381	0.348	0.319
0	0.423	0.386	0.352	0.322
5	0.429	0.391	0.356	0.325
10	0.435	0.395	0.360	0.328
15	0.440	0.400	0.363	0.331
20	0.445	0.404	0.367	0.334
25	0.450	0.408	0.370	0.336
30	0.455	0.412	0.373	0.338
35	0.459	0.415	0.376	0.341
40	0.463	0.419	0.378	0.343
45	0.467	0.422	0.381	0.345
50	0.471	0.425	0.383	0.347
55	0.474	0.427	0.385	0.348
60	0.477	0.430	0.387	0.35
65	0.480	0.432	0.389	0.351
70	0.483	0.434	0.391	0.352
75	0.485	0.436	0.392	0.354
80	0.487	0.438	0.394	0.355
85	0.489	0.439	0.395	0.355
90	0.490	0.440	0.396	0.356
95	0.491	0.441	0.396	0.357
100	0.493	0.442	0.397	0.357
105	0.493	0.443	0.398	0.358
110	0.494	0.443	0.398	0.358
115	0.495	0.444	0.398	0.358
120	0.495	0.444	0.398	0.358
125	0.495	0.444	0.398	0.358
130	0.495	0.444	0.398	0.358
135	0.495	0.444	0.398	0.357
140	0.494	0.443	0.397	0.357
145	0.494	0.443	0.397	0.356
150	0.493	0.442	0.396	0.356
155	0.492	0.441	0.395	0.355
160	0.491	0.440	0.395	0.354

Table 8. Viscosity (mPa sec)

°C	30%	40%	50%	60%
-50	-	-	-	-
-45	-	-	-	-
-40	-	-	-	-
-35	-	-	-	-
-30	-	-	43.98	65.25
-25	-	22.01	30.50	46.75
-20		15.75	22.07	34.28
-15	7.77	11.74	16.53	25.69
-10	6.19	9.06	12.74	19.62
-5	5.03	7.18	10.05	15.25
0	4.15	5.83	8.09	12.05
5	3.48	4.82	6.63	9.66
10	2.95	4.04	5.50	7.85
15	2.53	3.44	4.63	6.46
20	2.20	2.96	3.94	5.38
25	1.92	2.57	3.39	4.52
30	1.69	2.26	2.94	3.84
35	1.50	1.99	2.56	3.29
40	1.34	1.77	2.26	2.84
45	1.21	1.59	2.00	2.47
50	1.09	1.43	1.78	2.16
55	0.99	1.29	1.59	1.91
60	0.90	1.17	1.43	1.69
65	0.83	1.06	1.29	1.51
70	0.76	0.97	1.17	1.35
75	0.70	0.89	1.07	1.22
80	0.65	0.82	0.98	1.10
85	0.60	0.76	0.89	1.00
90	0.56	0.70	0.82	0.92
95	0.52	0.65	0.76	0.84
100	0.49	0.60	0.70	0.77
105	0.46	0.56	0.65	0.71
110	0.43	0.53	0.60	0.66
115	0.41	0.49	0.56	0.61
120	0.38	0.46	0.53	0.57
125	0.36	0.43	0.49	0.53
130	0.35	0.41	0.46	0.50
135	0.33	0.38	0.43	0.46
140	0.31	0.36	0.41	0.44
145	0.30	0.34	0.38	0.41
150	0.28	0.32	0.36	0.39
155	0.27	0.31	0.34	0.37
160	0.26	0.29	0.32	0.35

Table 9. Vapour pressure (kPa)

°C	30%	40%	50%	60%
50	12.0	11.4	10.8	10.1
55	14.6	13.8	12.9	11.9
60	18.5	17.5	16.4	15.1
65	22.1	20.7	19.1	17.2
70	27.6	25.8	23.9	21.6
75	34.2	32.1	29.7	26.9
80	42.0	39.5	36.6	33.2
85	51.3	48.3	44.8	40.7
90	62.3	58.7	54.4	49.6
95	75.2	70.8	65.8	60.0
100	90.2	85.0	79.0	72.1
105	107.6	101.4	94.3	86.2
110	127.7	120.4	111.9	102.4
115	150.7	142.1	132.2	121.1
120	177.0	166.9	155.3	142.4
125	206.9	195.2	181.6	166.6
130	240.8	227.2	211.4	194.0
135	279.1	263.3	245.0	224.9
140	322.1	303.8	282.7	259.6
145	370.3	349.2	324.9	298.5
150	424.1	399.9	372.0	341.8
155	484.0	456.3	424.3	389.9
160	550.4	518.7	482.3	443.2

Chart 1 - Density (kg/m3) at 30%, 40% and 50%

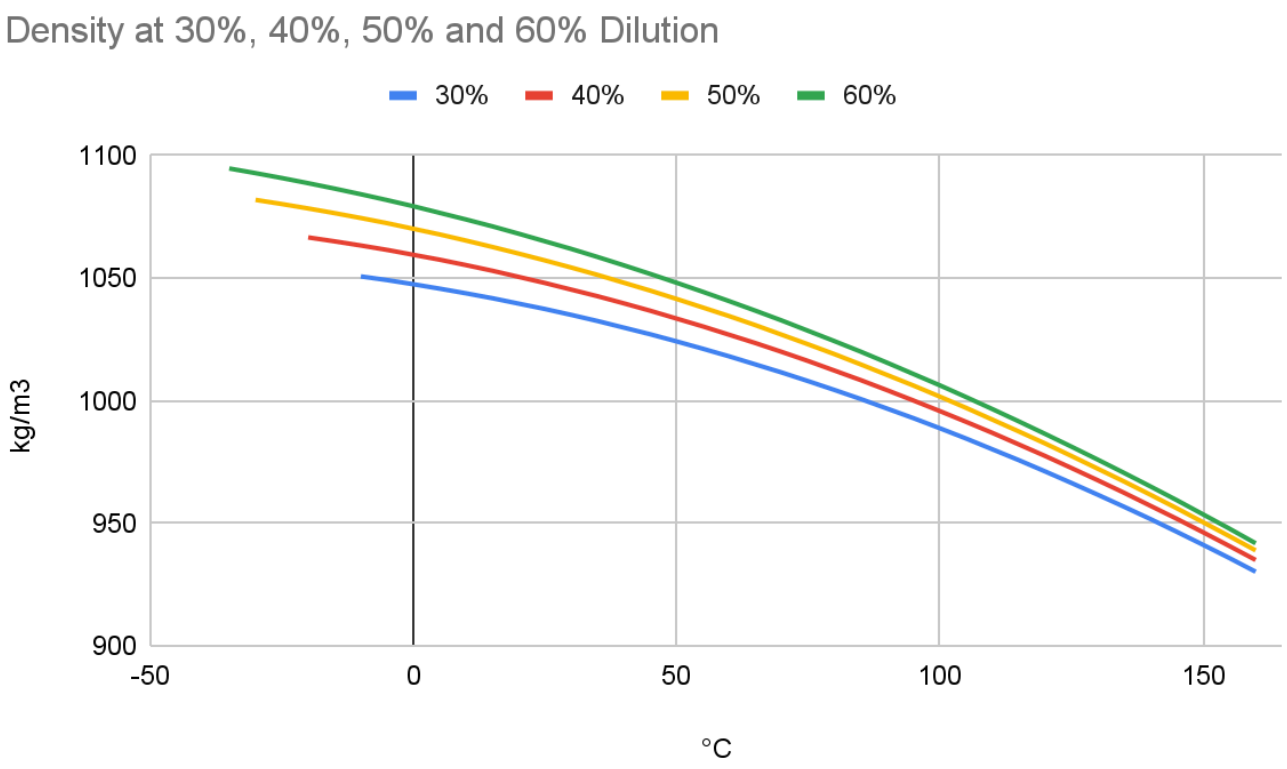


Chart 2 - Specific Heat (kJ/kg K) at 30%, 40% and 50%

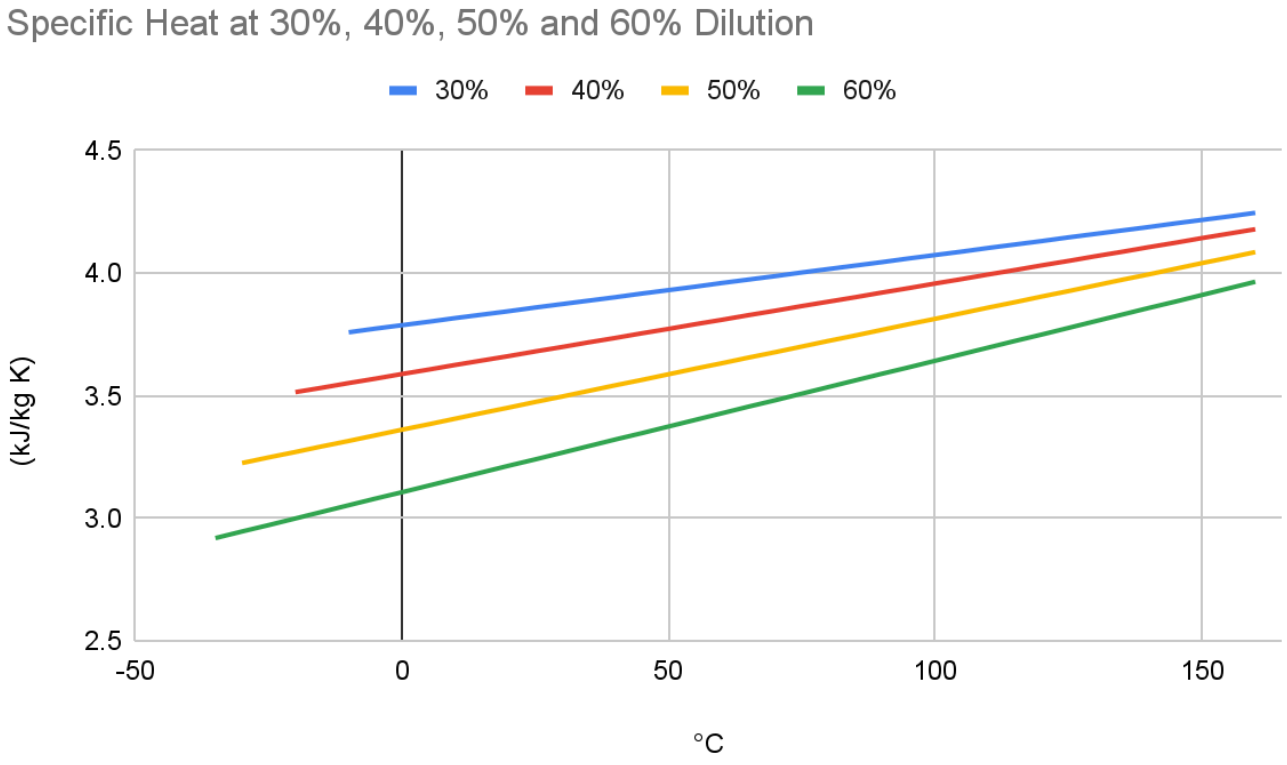


Chart 3 - Thermal Conductivity (W/mK) at 30%, 40% and 50%

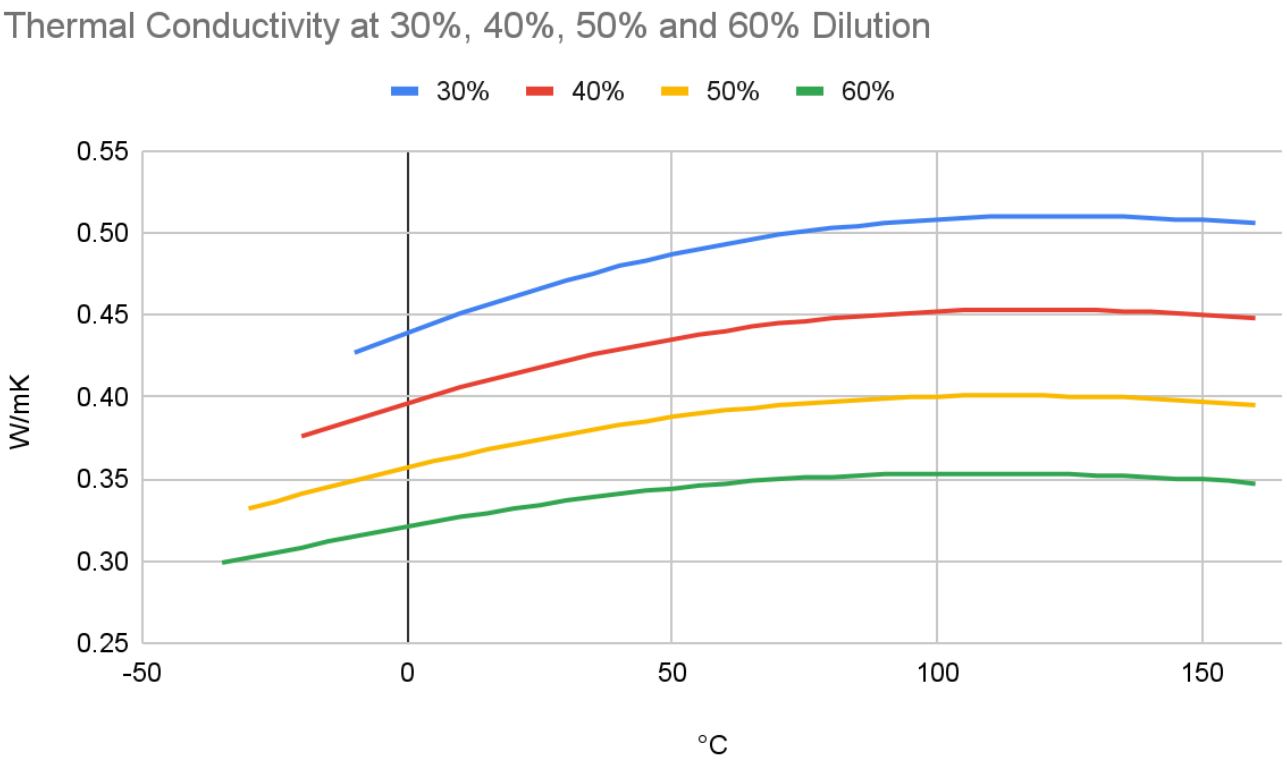


Chart 4 - Fluid Viscosity (mPa) at 30%, 40% and 50%

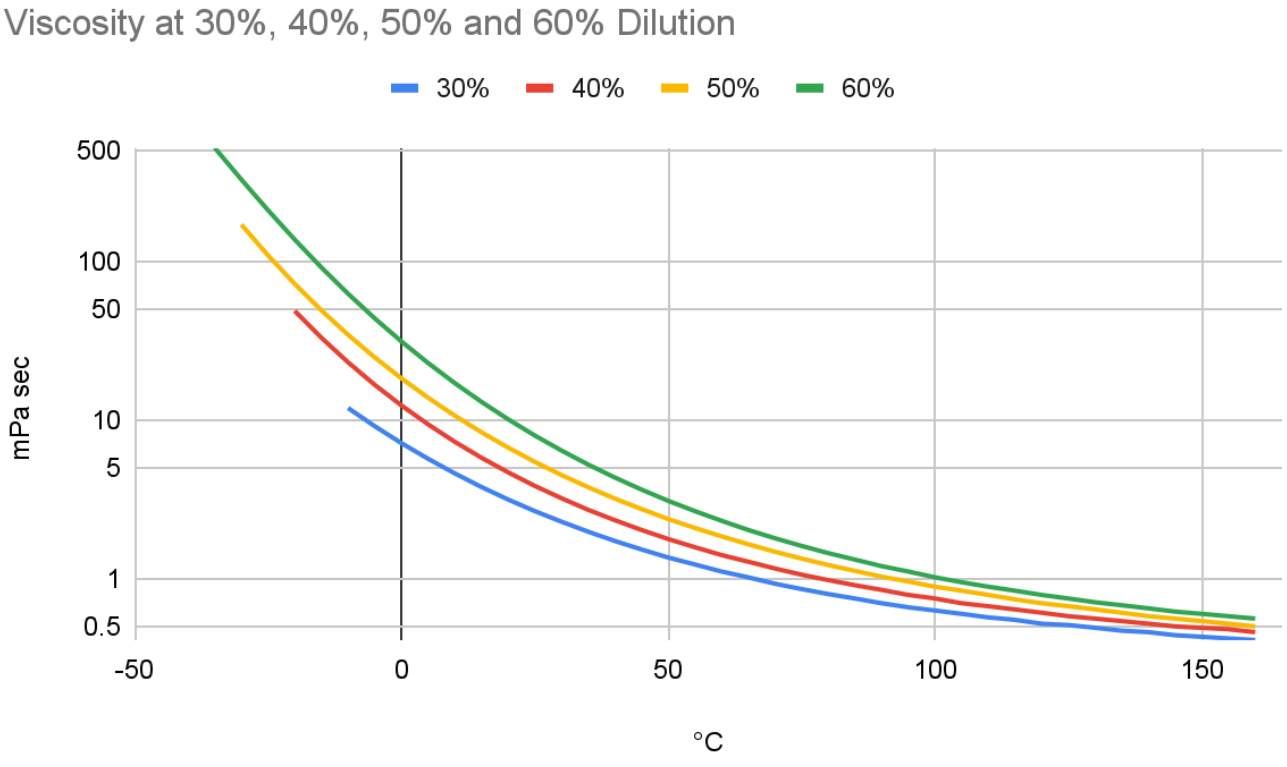
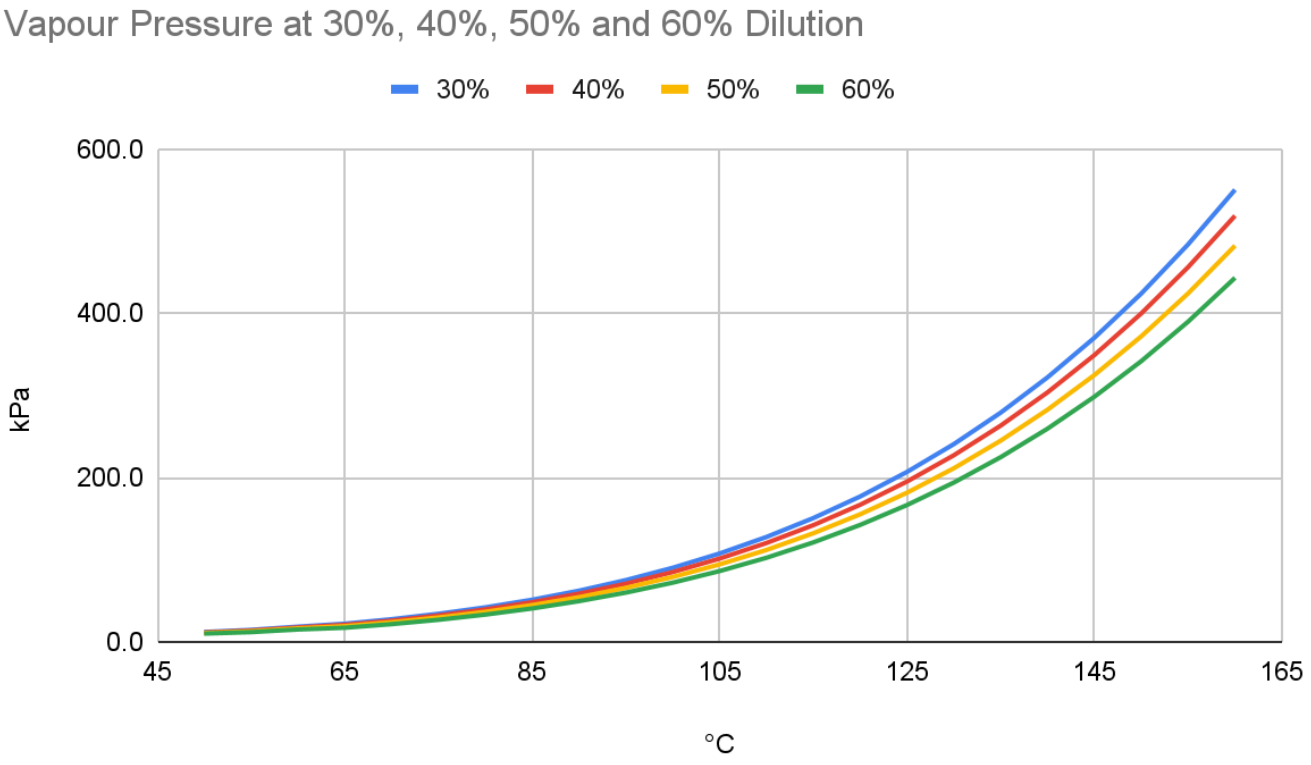


Chart 5 - Vapour Pressure (kPa) at 30%, 40% and 50%



2.5. Safety considerations

Follow the guidance below when handling ethylene glycol-based heat transfer fluids:

1. Refer to heat transfer fluid SDS before beginning any work. Wear appropriate PPE such as safety glasses or goggles, nitrile or other impervious gloves and suitable clothing when handling the fluid.
2. Using appropriate safety equipment, small spills may be soaked up with common absorbent material. For large spills, the fluid should be pumped into suitable containers. Residual material should be cleaned up with water.
3. Flush eyes or skin if exposed to the heat transfer fluid.
4. Avoid exposure to glycol mists.
5. Unopened containers should be stored out of direct sunlight and avoiding high humidity. Under these conditions the product will have a shelf life of 5 years. Do not store in galvanised steel containers.

2.6. Dilution water

GLY-PRO™ MG HTF can be diluted with water to expand their temperature performance range. However, GLY-PRO™ MG30 should not be diluted further, as 30% glycol is the minimum recommended concentration.

GLY-PRO™ is available in ready to use, pre-diluted form on request should adequate dilution water not be available. Contact GSA to discuss and order ready to use product.

Use distilled, deionized, or equivalently purified water for dilution where possible. Impure water can cause corrosion and fouling problems. However, due to the robust nature of the inhibitor package in GLY-PRO™ MG, use of hard water is possible for dilution. Whilst deionized

water is desirable, it is not essential. Water must meet the following minimum requirements:

Table 10. Dilution water quality requirements

Parameter	Acceptable limit
Total Chlorides (as Cl-)	<50 mg/L
Total Sulphates (as SO_4^{2})	<100 mg/L
Total Hardness (as $CaCO_3$)	<200 mg/L
pH	6 < pH < 9

Although deionized water can be corrosive to many metals, it's safe to use when mixed with GLY-PRO™ MG.

2.7. Glycol concentration and freezing point

GLY-PRO™ MG HTF should have a freezing point at least 3°C below the lowest expected system temperature. This ensures free flow and system integrity during cold conditions. Regardless of the required freezing point, GLY-PRO™ MG should not be diluted below 30% ethylene glycol. Use dilution water that meets the quality standards specified in section 2.7.

GLY-PRO™ is available in ready to use, pre-diluted form on request should adequate dilution water not be available. Contact GSA to discuss and order ready to use products.

Over-dilution can reduce corrosion inhibitor effectiveness and allow for bacterial or fungal biodegradation. These contaminants can be introduced through dilution water or air vents.

The ethylene glycol concentration and freezing point can be determined by measuring refractive index and consulting Table 4 or 11. GLY-PRO™ MG 30 HTF contains 30% ethylene glycol.

Table 11. Freezing points[1] of GLY-PRO™ MG HTF on glycol concentration

Freezing Point °C	wt %	Vol %	Boiling Point °C @ 0.96 Barr
0	0	0	100
-1.4	5	4.4	101
-3.2	10	8.9	101
-5.4	15	13.6	102
-7.8	20	18.1	102
-8.4	21	19.2	102
-8.9	22	20.1	102
-9.5	23	21	103
-10.2	24	22	103
-10.7	25	22.9	103
-11.4	26	23.9	103
-12	27	24.8	103
-12.6	28	25.8	104
-13.3	29	26.7	104
-14.1	30	27.7	104
-14.8	31	28.7	104
-15.4	32	29.6	104
-16.2	33	30.6	104
-17	34	31.6	104
-17.9	35	32.6	105
-18.6	36	33.5	105
-19.4	37	34.5	105
-20.3	38	35.5	105
-21.3	39	36.5	105
-22.3	40	37.5	106
-23.2	41	38.5	106
-24.3	42	39.5	106
-25.3	43	40.5	106
-26.4	44	41.5	106
-27.5	45	42.5	107
-28.8	46	43.5	107
-29.8	47	44.5	107
-31.1	48	45.5	107
-32.6	49	46.6	107
-33.8	50	47.6	107
-35.1	51	48.6	107
-36.4	52	49.6	107
-37.9	53	50.6	108
-39.3	54	51.6	108
-41.1	55	52.7	108
-42.6	56	53.7	108
-44.2	57	54.7	109

Freezing Point °C	wt %	Vol %	Boiling Point °C @ 0.96 Barr
-45.6	58	55.7	109
-47.1	59	56.8	109
-48.3	60	57.8	110
-	65	62.8	113
-	70	68.3	117
-	75	73.6	120
-	80	78.9	124
-	85	84.3	134
-	90	89.7	141
-	95	95	158

1 General properties, not definitive specifications

2.8. Corrosion Protection

GLY-PRO™ MG glycol-based coolants are engineered to safeguard your critical systems. These advanced coolants feature a specialised inhibitor package that provides dual-action protection for metals commonly used in HVAC, food processing, and industrial heat transfer equipment.

How GLY-PRO™ MG Protects:

- Our specially formulated inhibitors bind to the EG molecule stopping degradation of the glycol.
- Surface shield: Our inhibitors form a protective layer on metal surfaces, preventing corrosive acids from attacking them. Unlike traditional coolants that can reduce heat transfer efficiency, GLY-PRO™ MG maintains optimal performance.
- Acid neutralisation: GLY-PRO™ MG actively neutralises harmful organic acids that form over time, ensuring long-lasting protection and peak system efficiency.

By combining these powerful features, GLY-PRO™ MG delivers superior corrosion protection and extended system life.

The standard ASTM D1384 corrosion test provides a baseline assessment of a coolant's corrosion protection capabilities under controlled conditions. Table 12 highlights the superior performance of GLY-PRO™ MG fluids. These fluids consistently demonstrate corrosion rates well below industry-accepted limits, indicating excellent protection.

It's important to note that while ASTM D1384 offers valuable insights, it may not fully predict real-world performance. Excessive levels of contaminants like chlorides, sulphates, and ammonia can significantly accelerate corrosion, even in well-protected systems. For instance, high chloride concentrations can lead to the formation of iron chloride, which, in the presence of oxygen, can cause under-deposit corrosion.

To ensure optimal system performance and longevity, it is crucial to maintain high-quality dilution water. Refer to Table 10 of this guide for specific water quality guidelines.

Table 12. Glassware Corrosion ASTM D1384 Test

Metals & Alloys	Average Weight Loss	Spec. Limit
Copper	1.0	10 max
Solder	1.0	30 max
Brass	2.0	10 max
Steel	0.0	10 max
Cast Iron	-1	10 max
Aluminium	-2	30 max

Test carried out in 30% v/v glycols

3. System design considerations

3.1. General

It is essential to verify the compatibility of all system components and materials with GLY-PRO™ MG HTF at both minimum and maximum expected operating temperatures. This ensures optimal performance and prevents any potential issues due to chemical reactions or corrosion.

3.2. Liquid addition and drainage

Install ports for draining, filling, and adding chemicals to maintain fluid chemistry while the system remains operational. The size and complexity of the additional system should be determined by local system requirements. All components used for fluid addition and draining should comply with the wetted materials list and any chemicals to be added. The loop should be designed for complete drainage, avoiding any dead legs that could trap contaminants.

3.3. Fluid temperature range

GLY-PRO™ MG has a recommended operating range of -50° to 160°C. GLY-PRO™ MG can tolerate brief temperatures up to 50°C above the maximum recommended temperature. Extended exposure to temperatures in excess of 25°C above the recommended temperature will result in accelerated degradation of GLY-PRO™ MG.

If the system is operated in excess of 50°C, to maintain integrity and prevent degradation of GLY-PRO™ MG, the system must operate in a pressurised state.

3.4. Ethylene glycol quality & material compatibility

When selecting materials for use in the system, chemical compatibility is a critical factor to consider. Ensuring that the materials used can withstand exposure to the heat transfer fluid without undergoing degradation or corrosion is essential for the long-term reliability and performance of the system.

Steel, cast iron, copper, brass, bronze, solder and most plastic piping materials are all generally acceptable and compatible with GLY-PRO™ MG.

Aluminium at temperatures above 60°C is not recommended.

Galvanised steel is not recommended as the zinc could react with the inhibitor in the fluid causing degradation and depletion of the inhibitor package.

Glycol-based HTFs can deteriorate due to oxidation and thermal decomposition, producing acidic glycol compounds when exposed to air and heat during regular operation. Metallic surfaces can accelerate these degradation reactions. Consequently, the additive package must be specifically designed for HTF applications. GLY-PRO™ MG HTF is formulated for this purpose.

3.5. Elastomers and plastics

Plant heat transfer fluids, elastomers, and plastics must meet specific requirements for optimal system performance. These materials should be chemically stable, thermally stable, non-toxic, corrosion-resistant, compatible with other materials, anti-fouling, low viscosity, and have good wetting properties. Elastomers must also be chemically resistant, temperature resistant, compression set resistant, and flexible. Plastics should be chemically resistant, temperature resistant, dimensionally stable, and mechanically strong. By selecting materials that meet these criteria, you can ensure the reliable and efficient operation of your plant. Check with the component material supplier before use.

3.6. Filtration

Bypass filters are recommended components for several reasons:

1. Particulate removal: Filters help remove suspended particles, such as dirt, rust, and scale, from the heat transfer fluid. These particles can clog the cooling system, reducing its efficiency and potentially causing damage to equipment.
2. Contaminant removal: Bypass filters can also remove contaminants, including chlorine, organic compounds, and odours, from the HTF. These contaminants can degrade the fluid's performance and shorten its lifespan.
3. Biofouling prevention: Filters can help prevent the growth of bacteria, algae, and other microorganisms within the cooling system. Biofouling can reduce heat transfer efficiency, increase pressure drop, and even cause corrosion.
4. System protection: By removing contaminants and preventing biofouling, bypass filters help to protect the system from damage and ensure its long-term reliability.
5. Fluid quality maintenance: Bypass filters help to maintain the quality of the heat transfer fluid, ensuring that it continues to perform its intended function effectively.

Specific filter requirements:

- Flow rate: The system should filter 10% of the heat transfer fluid's flow rate.
- Filter media: Filters made of nonabsorbent cotton, or cellulose-type media having a pore size of 25 micron should be used.
- Regular checks: Filters should be frequently inspected for clogging and biocontamination, especially during startup and after any changes. Optional pressure gauges can measure delta-P to help with this.

3.7. Wetted Materials Compatibility

Ethylene glycol is compatible with a variety of materials. However, it's crucial to remember that compatibility can vary depending on factors like temperature, concentration, and the specific grade of ethylene glycol.

Metals:

- Stainless steel
- Carbon steel
- Copper
- Aluminum up to 60°C

Plastics:

- High-density polyethylene (HDPE)
- Polypropylene (PP)
- Polyvinyl chloride (PVC)
- Chlorinated polyvinyl chloride (CPVC)
- Polytetrafluoroethylene (PTFE/Teflon)
- Acrylonitrile butadiene styrene (ABS)
- Polyethylene (PEX)

Elastomers:

- Ethylene propylene diene monomer (EPDM)
- Nitrile rubber (NBR/Buna-N)
- Fluorocarbon rubber (FKM/Viton)
- Silicone rubber.

Other Materials:

- Glass
- Ceramics

Important Notes:

- Consider operating conditions: Temperature, pressure, and concentration of ethylene glycol can affect material compatibility. Higher temperatures, in particular, can accelerate degradation or reactions.
- Application-specific requirements: The ideal material choice will depend on the specific application. For example, automotive coolant systems have

different requirements than industrial heat transfer systems.

Remember to always consult the manufacturer's documentation or conduct compatibility testing to ensure the chosen materials are suitable for your specific ethylene glycol application.

4. System preparation & installation direction

This section is to provide a general guideline to prepare the system prior to filling with GLY-PRO™ MG. **For a detailed system flushing methodology and works guide please consult with GSA on 1300 459 265**

4.1. System flushing

To remove fabrication debris or particulates like pipe scale, weld slag, or solder flux, flush the system with purified water immediately before installing GLY-PRO™ MG HTF. If chemical cleaning is necessary, consult with GSA. Specifically formulated high performance cleaning chemicals are available that are compatible with GLY-PRO™ MG HTF. These compatible cleaning products ensure any remaining cleaning fluid will have no performance effect on GLY-PRO™ MG. If alternative cleaning agents are used, ensure all traces of the cleaning agent are removed by thoroughly flushing the system with appropriate water (see table 11 for flushing water minimum specifications).

4.2. Hydrostatic testing and system volume measurement

Hydrostatic testing and system volume measurement are essential procedures to ensure the integrity and proper functioning of a plant before the deployment of glycol-based heat transfer fluid.

Hydrostatic testing of system piping can be combined with system flushing using suitable quality water that meets the requirements specified in section 2.4. Cleaning additives will not interfere with hydrostatic testing.

Accurate system volume measurement is necessary to determine the correct amount of glycol-based heat transfer fluid to be added. This helps to prevent overfilling or underfilling, which can both lead to operational problems.

Methods for system volume measurement:

1. Direct measurement: If the system geometry is simple and well-defined, the volume can be calculated directly using mathematical formulas.
2. Water displacement: Fill the system with water and measure the volume of water displaced.
3. Calibration tank: Connect the system to a calibrated tank and measure the volume of fluid that fills the system.

By conducting hydrostatic testing and system volume measurement, you can ensure that your system is in good condition and properly prepared for the deployment of glycol-based heat transfer fluid.

4.3. HTF containers and product seals

To prevent debris from entering the system and ensuring fluid integrity, GLY-PRO™ MG heat transfer fluid should be used from an unopened container or an opened container that has been properly sealed and stored according to the GSA recommendations.

4.4. Certificate of analysis

GSA will provide a certificate of analysis (CoA) for GLY-PRO™ MG, confirming its quality at time of delivery. Keep a copy of the CoA for your records.

4.5. Cleanliness

With the help of the installer/fabricator, ensure that all products with fluid passage are handled and cleaned properly:

1. Verify that all products in the cooling loop comply with the wetted material list.
2. Confirm that all components are clean and factory sealed until installation. GSA recommends that all pipework ends are sealed until installation to ensure dust and contamination free.

3. Ensure that the cooling loop components are clean and free of soldering or brazing flux.
4. Immediately notify the owner or pipework manufacturer if there are signs of mishandling or contamination, and develop a corrective action plan.

4.6. Piping

All piping materials must be confirmed compatible with GLY-PRO™ MG HTF as per Section 3.7 for wetted materials. Piping diameter should be adequate, following industry best practices, to avoid excessive flow velocity and pressure drop.

4.7. System vents

System vents are crucial in closed loop systems for several reasons:

1. Air removal: During the filling and refilling process, air pockets can become trapped within the system. These air pockets can impede the flow of heat transfer fluid, reducing cooling efficiency and potentially leading to overheating. Vents allow these air pockets to escape, ensuring optimal fluid circulation.
2. Pressure relief: As the heat transfer fluid circulates through the system, it can expand due to changes in temperature or pressure. Vents provide a safe way for excess pressure to be released, preventing the system from bursting or experiencing other damage.
3. Fluid level monitoring: Vents can also be used to monitor the fluid level within the system. If the fluid level drops below a certain point, air can enter the system, compromising cooling performance. By observing the vents, operators can ensure that the fluid level is maintained at the appropriate level.
4. Vacuum prevention: If the system is not properly vented, a vacuum can develop, hindering the flow of fluid and potentially causing damage to components. Vents help to prevent the formation of a vacuum by allowing air to enter the system as needed.

Properly located and maintained vents are essential for the reliable and efficient operation of a system. They help to ensure optimal cooling performance, prevent damage to equipment, and facilitate maintenance and troubleshooting.

4.8. By-pass filters

Ideally, systems should be equipped with bypass filters to remove solids or particulates that may form. Precipitates and other solids can cause clogging, localised corrosion, and fouling of heat transfer surfaces. Filters made of non-absorbent cotton or cellulose-type media with a pore size of 25 microns are recommended.

4.9. Spills

For minor spills of GLY-PRO™ MG, a non-abrasive absorbent material like paper towels or rags can be used.

Here are some additional tips for handling minor spills:

- Contain the spill: Quickly contain the spill to prevent it from spreading.
- Absorb the fluid: Use absorbent materials to soak up the spilled fluid.
- Clean the area: Once the spill is absorbed, clean the area with mild soap and water.
- Dispose of waste properly: Dispose of the contaminated absorbent materials in accordance with local regulations.

If a spill is significant it is important to follow proper emergency procedures and contact local authorities. Please consult with SDS for instructions.

4.10. System name plate

It is recommended that a system nameplate be labelled clearly in a prominent location with the

following information to assist with fluid identification and maintenance:

1. Date the GLY-PRO™ MG HTF was installed
2. Volume of fluid installed
3. A copy of the Safety Data Sheet (SDS)

These are supplied from GSA with the purchase of GLY-PRO™ MG

5. Fluid testing and maintenance

5.1. Sampling and testing frequency

A 'representative' sample for HTF is a sample that accurately reflects the overall quality and composition of the fluid within the system.

To obtain a representative sample, it is important to consider the following factors:

- Sampling location: The sample should be taken from multiple points within the system to ensure that it represents the entire fluid volume.
- Sampling frequency: Regular sampling is necessary to monitor changes in fluid quality over time.
- Sample size: The sample size should be sufficient to provide accurate results for analysis.
- Storage and handling: The sample should be stored and handled properly to prevent contamination and degradation.

A representative sample of the HTF must be collected after the HTF has been circulating for at least 24 hours to establish a baseline..

Regular testing of additional samples, at least once per year, should be conducted to verify the fluid's continued ability to protect system components.

For the first 12 months of operation, it is recommended to send a fluid sample to GSA lab at 0-month, 6- month and 12-month intervals of operation. This is to establish the baseline of the fluid. Thereafter, annual analysis of the fluid is recommended

5.2. Visual Inspection

Regularly checking the visual appearance of HTF samples, at least every three months for a new installation and then annually, is recommended. Clear GLY-PRO™ MG HTF, without cloudiness or solids, indicate acceptable fluid conditions. Cloudiness or the presence of solids signals a potential problem with the heat transfer fluid. If the fluid exhibits unacceptable appearance, GSA should be contacted for technical advice. In most cases GLY-PRO™ MG is serviceable, however in rare cases, heavily depleted or contaminated fluids may need to be replaced.

Over time, an in-use fluid may start to appear darker in colour or less vibrant, which is considered normal for prolonged use.

5.3. Refractive index or freezing point (Concentration)

A handheld refractometer can be used to verify that the refractive index (concentration) of GLY-PRO™ MG HTF has not changed (refer table 4 or 11). The refractive index should remain the same as when initially installed. Fluids with a refractive index below 1.3570 (25% concentration) should be adjusted by adding more GLY-PRO™ MG concentrate. If the appearance is also unacceptable, consult with GSA for the best correction. HTF with a refractive index above 1.400 (60% concentration) should be adjusted by adding purified water that meets the requirements in section 2.1. Again, If the appearance is also unacceptable, consult with GSA.

Glycol specific, hand-held refractometers are available from GSA.

Table 11. Freezing points[1] of GLY-PRO™ MG HTF on glycol concentration and Refractive Index

Freezing point	Ethylene Glycol		Refractive Index
°C	Wt %	Vol %	20°C
-7.8	20	18.1	1.3523
-10.7	25	22.9	1.3570
-14.1	30	27.7	1.3628
-17.9	35	32.6	1.3680

-22.3	40	37.5	1.3728
-27.5	45	42.5	1.3769
-33.8	50	47.6	1.3830
-41.1	55	52.7	1.3890
-48.3	60	57.8	1.3931

1 General properties, not definitive specifications

5.4. GLY-PRO™ MG pH levels

The acceptable pH level for HTF typically falls within a narrow range, usually between 8.0 and 10.5.

Maintaining the pH level within this range is important for several reasons:

- Corrosion prevention: A pH level outside of this range can increase the risk of corrosion in the cooling system components.
- Fluid stability: A pH level that is too high or too low can lead to the degradation of the heat transfer fluid and its additives.
- Microbiological control: A pH level outside of the acceptable range can promote the growth of microorganisms, which can clog the cooling system and reduce its efficiency.

If the pH level of the HTF falls outside of the acceptable range, it is important to take corrective action to bring it back within the desired range. Consult with GSA for appropriate fluid correction methods.

Regular monitoring of the pH level is essential for ensuring the optimal performance and longevity of a system.

5.5. Reserve Alkalinity (RA)

GLY-PRO™ MG 30% HTF should have a Reserve Alkalinity (RA) greater than 4 mL when tested according to ASTM D1121.. Reserve Alkalinity indicates the level of corrosion inhibitors. Insufficient concentration can lead to excessive corrosion. Consult with GSA for correction steps should RA levels deteriorate.

5.6. Degradation of product

All glycol-based heat transfer fluids degrade when exposed to heat and air (oxygen) during operation. Over time, fluid degradation compounds accumulate, depleting corrosion inhibitors and stabilisers. This is inevitable. GLY-PRO™ MG is specifically formulated to combat this degradation but it cannot be completely kept at bay.

All heat transfer fluids eventually reach the end of their useful life when degradation products significantly impact corrosion additive effectiveness. If the fluid pH drops below 7.5 it may put the systems integrity at risk causing excessive corrosion or fouling. To maintain consistent heat removal, it may require replacement of HTF when it deviates from normal operating ranges. Contact GSA for technical advice for maintenance or replacement if required.

If glycol degrades to unacceptable levels in a system it may require the following actions:

1. Fluid analysis: Conduct a thorough analysis of the degraded fluid to determine the specific contaminants or degradation products present. This information will help identify the root cause of the problem and guide the remediation process.
2. Component inspection: Inspect all components of the cooling system for signs of corrosion, scaling, or other damage caused by the degraded fluid. If necessary, replace or repair any damaged components.
3. Additive treatment: Adding GLY-PRO™ MG concentrate to the fluid to address any underlying issues that may have contributed to the fluid degradation. In some cases, raw inhibitors can be added to the system to bring the fluid back into specification. This is only done in consultation with GSA following fluid testing.
4. System maintenance: Implement regular maintenance procedures to prevent

future fluid degradation. This may include monitoring fluid quality, conducting periodic system flushes, and inspecting components for signs of wear or damage.

By following these steps, you can effectively address glycol degradation in your system and restore its optimal performance.

5.7. Fluid replacement

If impurities and compound degradation is left untreated, GLY-PRO™ MG may need to be completely replaced in the system. There is no other practical way to remove the harmful impurities or degradation compounds that combine to cause corrosion, fouling or foaming problems for the system. Once a glycol has degraded to unacceptable levels, the glycol forms glycolic acids and there is no recovery apart from complete replacement. The product must be drained from the system and replaced with new GLY-PRO™ MG. Potentially further system cleaning to remove corrosion may be required.

5.8. Fluid disposal

Do not dispose of this fluid in sewers, on the ground, or in bodies of water. All disposal practices must comply with federal, state, and local laws and regulations. Regulations can vary by location. The waste generator is solely responsible for characterising the waste and ensuring compliance with applicable laws. If recycling is preferred over disposal, contact a fluid recycler. Many used ethylene glycol-based heat transfer fluids can be recycled by commercial companies.

5.9. Conditions to avoid

5.9.1. Excessive fluid temperature

GLY-PRO™ GG can tolerate brief temperature excursions up to 50°C above the maximum recommended temperatures. However, extended exposure of the fluids to temperatures in excess of 25°C above the maximum recommended temperatures will result in accelerated degradation of the glycol and inhibitor properties.

In addition, the maximum recommended bulk fluid temperature for GLY-PRO™ MG HTF is 185°C, while the minimum operating temperature is typically considered ~-50°C.

Operating above the maximum recommended fluid temperature can lead to excessive glycol degradation, compromising the expected lifespan of GLY-PRO™ MG and negatively affecting performance.

5.9.2. Excessive aeration

Avoid excessive turbulence in expansion tanks vented to the atmosphere or other situations where GLY-PRO™ MG HTF is exposed to large amounts of air. This can cause air entrainment, foaming, and increased glycol oxidation, which may compromise performance.

6. Submittals and records

6.1. Submittals

A comprehensive works guide including system preparation checklists, flush water records, HTF sample reports, deployment guidelines, etc is available from GSA for submission to project owners and investors.

6.2. Records

GSA recommends the following records are maintained following installation of GLY-PRO™ MG

1. Maintain a file for each system with the identity and source of the heat transfer fluid, copies of all fluid analyses and a history of cooling system components that were replaced.
2. Maintain a file that documents the volume for each system on-site, which is critical for inhibitor addition.
3. Maintain a file that documents any adjustments that were made to each system, including the date, amount and type of inhibitor added.
4. Maintain a record of the materials of construction of each system (metals, elastomers, etc.) as well as confirmation of compatibility.

Product Safety Note

To ensure the safe and effective use of HTF, it is essential to follow proper handling, storage, and use procedures. Always wear appropriate personal protective equipment (PPE), such as gloves, eye protection, and respiratory protection, when handling the fluid. Store the fluid in a cool, well-ventilated area, away from heat sources and open flames. Avoid contact with skin and eyes, and wash thoroughly after handling. If the fluid is ingested or comes into contact with the eyes, seek medical attention immediately. Additionally, ensure that the system is properly vented to prevent the buildup of pressure and to allow for the release of any vapours. By following these guidelines, you can minimise the risk of accidents and ensure the safe and efficient operation of your system. Before using any GSA products in a specific application, review the latest Safety Data Sheets (SDS) from GSA to ensure safe use. For other products mentioned, obtain the current SDS and available product safety information. Take necessary precautions to ensure safety before handling.

Do not use any chemical as or in a food, drug, medical device, or cosmetic, or in a product or process where it may contact such items.

Government regulations and use conditions can change. It's the user's responsibility to determine the appropriateness and legality of this information under current laws and regulations.

About GSA

GSA is committed to the safety and well-being of those who distribute and use our products, as well as the environment.

We believe it's our responsibility to fully understand how our products are designed and used. We carefully understand our customers' needs and provide them with the highest quality, most suitable products for their applications.

GSA's specialised heat transfer fluid portfolio covers a wide temperature range of -120°C to +600°C. Our long-lasting products are supported by a fluid sampling program to ensure optimal performance. We differentiate ourselves by offering tailored supply options, including bulk deliveries via ISO tank or tanker, premix, or concentrate.
GSA's service division continually adapts to meet our customers' evolving needs. We provide comprehensive service solutions, including removal of existing or spent fluid, plant cleanup, and installation of new heat transfer fluid. We collaborate with recycling partners to offer the most environmentally sustainable solutions possible.

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