
Technical Information

TI/EVO 1024 e
May 2007

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Supersedes edition dated December 2006



® = Registered trademark of
BASF Aktiengesellschaft

Glythermin® P 44

Concentrated heat-transfer fluid for solar heating equipment and for heating and cooling equipment used in food processing and water purification

Properties

Appearance	Clear liquid, dyed green	
Boiling point	> 150 °C	ASTM D 1120
Pour point	< -50 °C	ISO 3016
Density (20 °C)	1.054–1.058 g/cm ³	DIN 51757
Viscosity (20 °C)	68–72 mm ² /s	DIN 51562
Refractive index n _D ²⁰	1.435–1.437	DIN 51423
pH of concentrate	6.5–8.0	ASTM D 1287
pH of concentrate diluted 1 : 2 with neutral distilled water	7.5–8.5	ASTM D 1287
Water content	max. 4.0 %	ASTM D 1123/ DIN 51777
Flash point	> 100 °C	DIN 51578
Alkali reserve	10–13 ml M/10 HCl	ASTM D 1121

The above information is correct at the time of going to press. It does not necessarily form part of the product specification.

A detailed product specification is available from your local BASF representative.

Properties

Glythermin P 44 is a non-toxic, virtually odourless, hygroscopic liquid. It is based on polypropylene glycol, which poses no hazard to health and which may be used as a coolant or heat-transfer fluid in food processing and water purification applications.

The corrosion inhibitors contained in Glythermin P 44 reliably protect the metals normally used in solar collectors and other heating equipment from corrosion, ageing and scaling over long periods. Glythermin P 44 prevents the surfaces of heat exchangers from becoming fouled, and ensures consistently high thermal efficiency.

Glythermin P 44 is miscible with water in all proportions. Its mixtures with water protect against frost at temperatures of down to -50 °C, depending on their concentration. Its performance is not impaired by hard water, and there is no danger of precipitation.

Mixtures of Glythermin P 44 and water do not demix.

Glythermin P 44 does not contain any nitrites, phosphates or amines.

Miscibility

Glythermin P 44 is miscible with all commercial heat-transfer fluids based on propylene glycol.

Applications

Mixtures of Glythermin P 44 and water are employed as cooling brines and heat-transfer fluids in the food processing and confectionery industry, heat-transfer fluids in solar heating equipment and as an antifreeze for sprinkler systems.

Glythermin P 44 has to be diluted with at least 25 % v/v and no more than 75 % v/v of water when it is used in heating or cooling circuits. Potable water (100 mg/kg Cl⁻ max.) or demineralized water with a neutral pH must be used.

In order to prevent corrosion, the following minimum and maximum concentrations of Glythermin P 44 should be observed.

In solar heating equipment 40–75 % v/v Glythermin P 44
 In other equipment 25–75 % v/v Glythermin P 44

Stability in solar heating equipment

Sustained exposure to temperatures higher than 170 °C causes Glythermin P 44 to age prematurely. We would therefore recommend that the capacity of the expansion tanks should be sufficient to ensure that all of the heat-transfer fluid can drain out of the solar collectors when the maximum static temperature is reached.

Glythermin P 44 begins to undergo irreversible chemical changes at temperatures higher than 200 °C, with the result that the reliability of the equipment may be jeopardized.

The following table shows the effectiveness of mixtures of Glythermin P 44 in inhibiting corrosion.

Corrosion tests according to ASTM D 1384-93 (American Society for Testing and Materials)

Average change in weight of coupons in g/m²

Material	Glythermin P 44/ Water (ASTM standard) 1 : 2
Copper (F-Cu)	-0.2
Soft solder (L Pb Sn 30)	-0.1
Brass (Ms 63)	-0.3
Cast iron (GG 25)	± 0.0
Steel (H II)	+ 0.7
Cast aluminium (G AlSi6Cu4)	-0.5

Mixtures of Glythermin P 44 and water do not attack the sealants normally used in heating systems. The following list of sealants, elastomers and plastics that are resistant to mixtures of Glythermin P 44 and water has been compiled from experimental results, experience, and the literature.

Examples of sealants are Fermit® and Fermitol® (registered trademarks of Nissen & Volk GmbH, Hamburg) and hemp

Butyl rubber	IIR
Chloroprene	CR
Ethylene-propylene-diene rubber	EPDM
Fluorocarbon elastomers	FPM
Natural rubber at temperatures up to 80 °C	NR
Nitrile rubber	NBR
Polyacetal	POM
Polyamide at temperatures up to 115 °C	PA
Polybutene	PB
Polyethylene, soft/hard	PE-LD/PE-HD
Polyethylene, crosslinked	VPE
Polypropylene	PP
Polytetrafluoroethylene	PTFE
Polyvinyl chloride, rigid	PVC h
Silicone rubber	Si
Styrene-butadiene rubber at temperatures of up to 100 °C	SBR
Unsaturated polyester resins	UP

Phenolic and aminoplast resins, plasticized PVC and polyurethane elastomers are **not** resistant to Glythermin P 44.

An important point to note is that the performance of elastomers such as EPDM is determined by the nature and amount of the constituent additives and the vulcanization conditions, as well as the properties of the rubber itself. For this reason, we would recommend testing the resistance of these elastomers to mixtures of Glythermin P 44 and water before they are put into service for the first time. This applies particularly to elastomers intended for use as membranes for expansion tanks as described in DIN 4807.

Gaskets made from 70 EPDM 281* have been shown to be resistant to mixtures of Glythermin P 44 and water at temperatures of up to 160 °C, and gaskets such as REINZ-AFM 34** and Centellen 3820***, which is based on a combination of Aramid and special NBR, have been shown to be resistant at temperatures of up to 200 °C.

In view of the specific properties of Glythermin P 44, the following instructions must be adhered to for ensuring long-term protection.

1. Solar heating equipment must conform to DIN 4757 and be designed as a closed circuit, because exposure to atmospheric oxygen causes the inhibitors in Glythermin P 44 to be consumed more rapidly.
2. Equipment must not be fitted with galvanized heat exchangers, heat reservoirs, tanks or pipes, because polypropylene glycol can corrode zinc.
3. Flexible-membrane expansion tanks must conform to DIN 4807.
4. Silver or copper brazing solders must be used for the joints. If fluxes are used that contain chloride, all traces of chloride must be flushed out of the system before it is put into service, because chloride can cause corrosion.
5. Aqueous solutions of Glythermin P 44 are largely chemically inert, but it is important to ensure that all the seals and connectors used in solar heating equipment are resistant to temperatures up to the maximum static temperature according to the manufacturer's recommendations.
6. The only flexible connections that are permissible are hoses, preferably metal, that do not permit the diffusion of oxygen.
7. All tarnish must be removed from copper components before the system is put into service, because hot glycol-water mixtures strip tarnish from copper.
8. It must be ensured that no **external voltages** are applied between items of equipment that come into contact with the Glythermin P 44 solution, as otherwise corrosion may occur. At most, an external voltage of no more than 1.5 volts may be applied to components made of copper or copper alloys.
9. The layout of the tubes must ensure that circulation cannot be disturbed by gas pockets or solid deposits.
10. The level of the heat-transfer liquid must **never** be allowed to fall below the highest point in the system. A closed vessel fitted with a bleed valve must be provided at the highest point in the system in order to bleed gases from the system.
11. Only automatic bleed valves should be used in order to ensure that no air is entrained.

* Supplied by Carl Freudenberg, Dichtungs- und Schwingungstechnik, Postfach 1 00 03 63, D-69465 Weinheim

** Supplied by REINZ-Dichtungs GmbH, Postfach 19 09, D-89229 Neu-Ulm

*** Supplied by Hecker Werke GmbH & Co., D-71093 Weil im Schönbuch

12. Soil and water must not be allowed to enter the installation or its components during assembly and before filling. After assembly has been completed and the connections have been soldered, the system must be flushed to remove any foreign matter (swarf, fluxes, packaging, sawdust, etc.) and material used in assembly.

After the installation is complete, the system must be cleaned and tested for leaks according to DIN 18380. The system should then be completely drained and filled with Glythermin P 44 solution, even if the plant is not put into operation immediately, in order to prevent corrosion.

13. It must be ensured that no air pockets remain in the installation after it has been filled.

It is essential to eliminate gas pockets, because a vacuum would be formed if they collapsed following a drop in temperature, and this would cause air to be sucked into the system.

14. In order to ensure that there are no obstructions to the flow of the heat-transfer liquid, the in-circuit filters must be cleaned within 14 days, at the latest, after the equipment has been filled with heat-transfer fluid and put into operation for the first time.
15. If losses occur due to evaporation, the system can be topped up with neutral potable water. If leakages or other losses occur, the heat-transfer liquid in the system must be replenished with an aqueous Glythermin P 44 solution of the same concentration. In cases of doubt, the Glythermin P 44 content must be determined.

Glythermin P 44 % v/v	Density at 20 °C g/cm ³	Refractive index n _D ²⁰	Freezing point °C
25	1.023	1.3627	-10
30	1.029	1.3690	-13
35	1.033	1.3747	-17
40	1.037	1.3801	-21
45	1.042	1.3855	-26
50	1.045	1.3910	-32
55	1.048	1.3966	-40

Quality check of solar thermal fluids

As a special service, we offer to check the quality of used Glythermin P 44 solutions. Costs depend on the scope of the analyses.

Please send the sample (0.25 L min) to the following address:

BASF Aktiengesellschaft
EVO/MS – J 550 (L1314)
67056 Ludwigshafen, Germany

We provide customers with a test report that contains data on properties and corrosion protection of the sample sent.

Customers are supplied with a report on the test results.

Shelf life

Glythermin P 44 has a shelf life of at least three years in airtight containers.

Packaging/form of delivery

Glythermin P 44 is supplied in road tankers and 220 kg non-returnable metal drums.

Safety

Glythermin P 44 contains 1,2-propanediol (propylene glycol). The German *Gefahrstoffverordnung* of 26 October 1993 does not require it to be labelled.

Safety Data Sheet

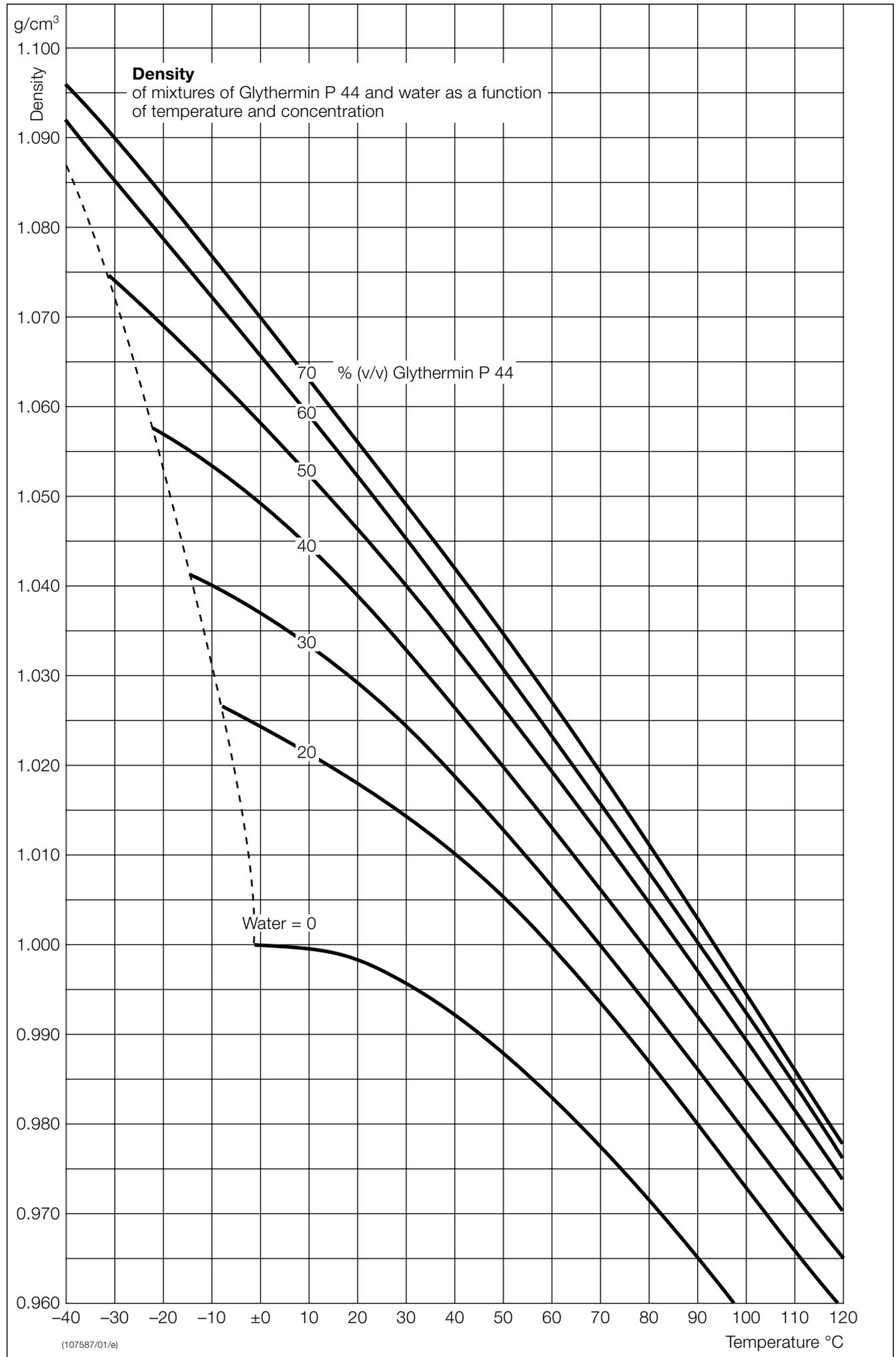
A Safety Data Sheet has been drawn up for Glythermin P 44 in accordance with EEC Directive 91/155/EEC.

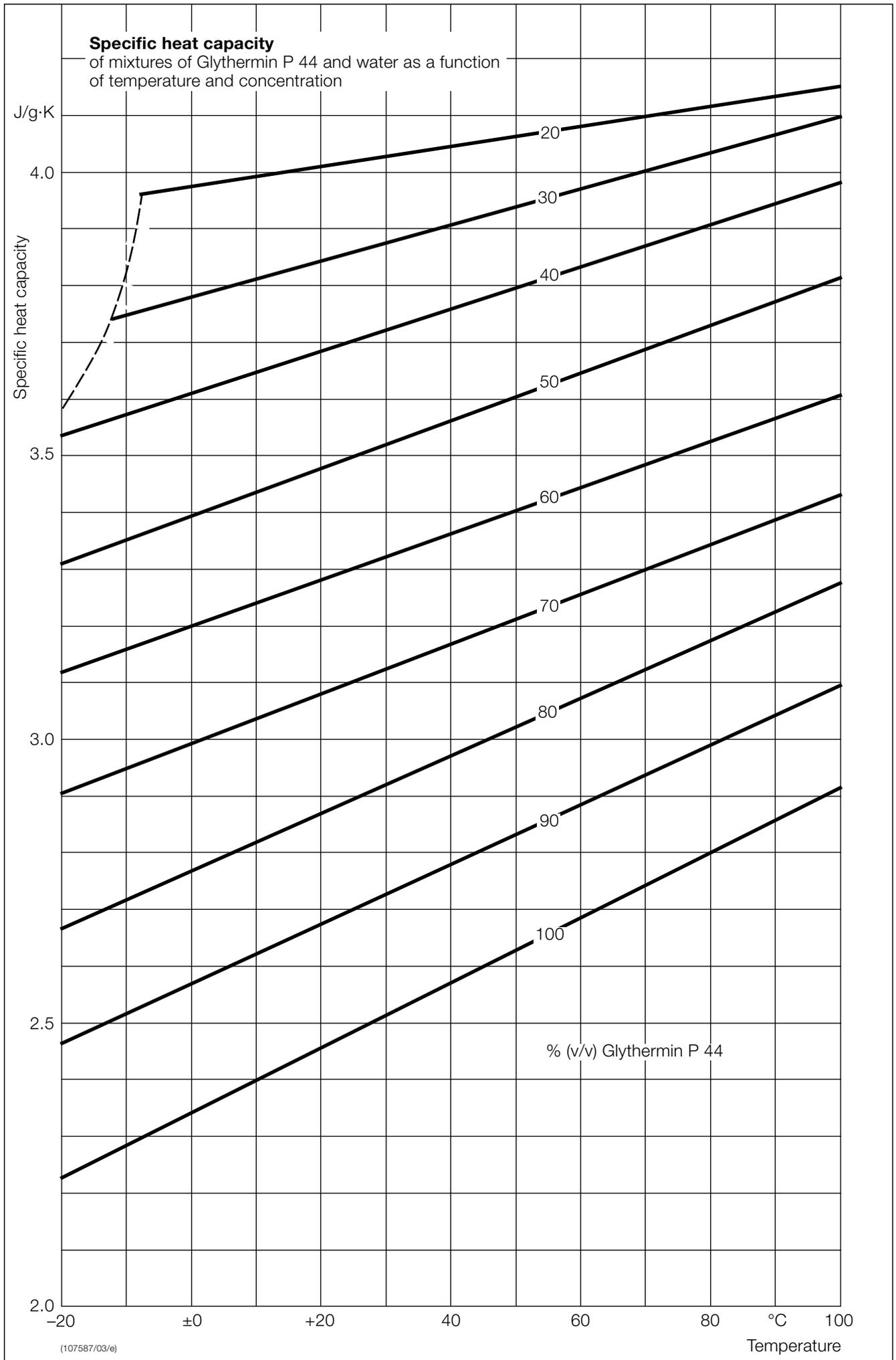
Disposal

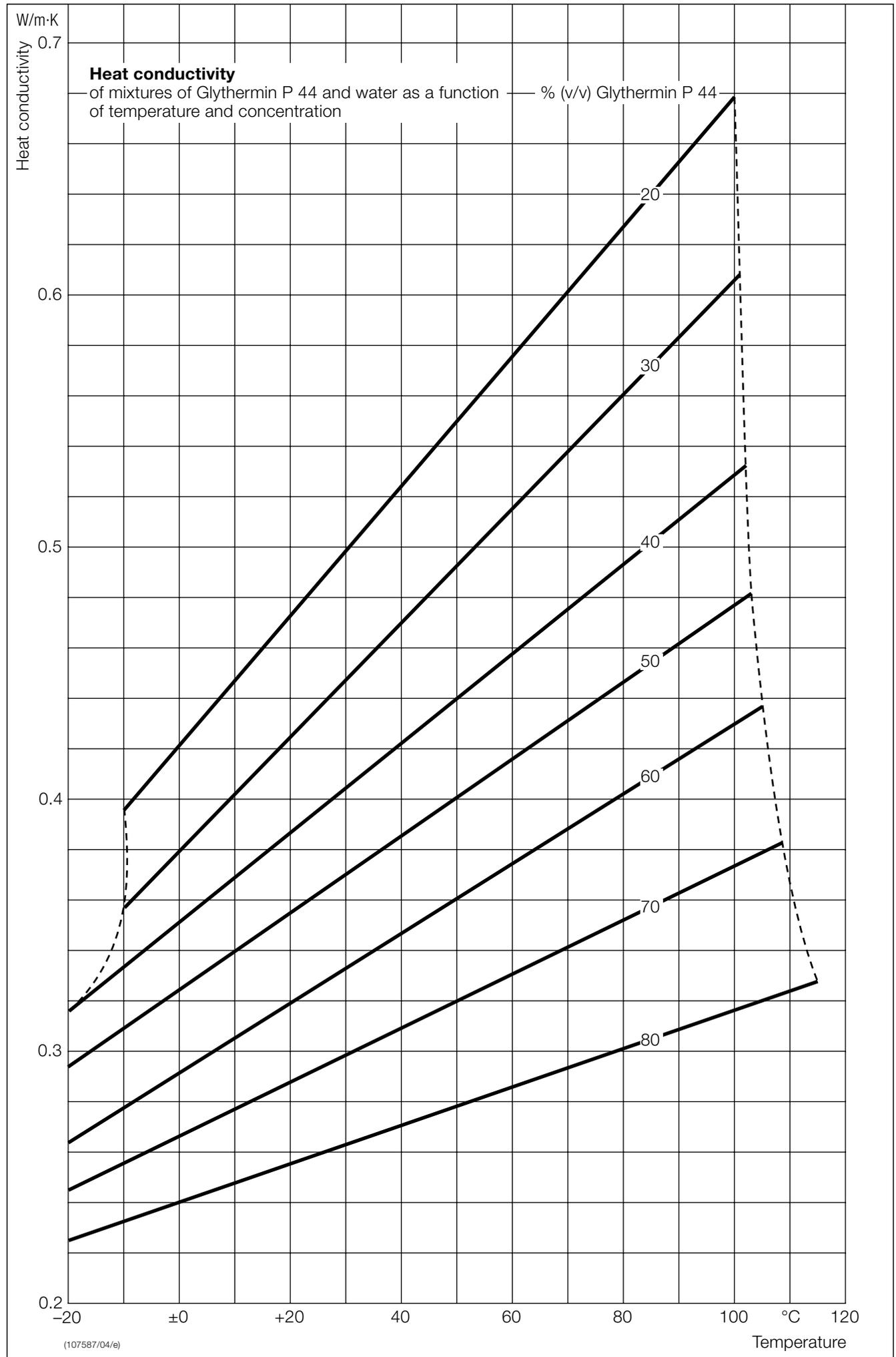
Glythermin P 44 spills must be taken up with an absorbent binder and disposed of in accordance with regulations.

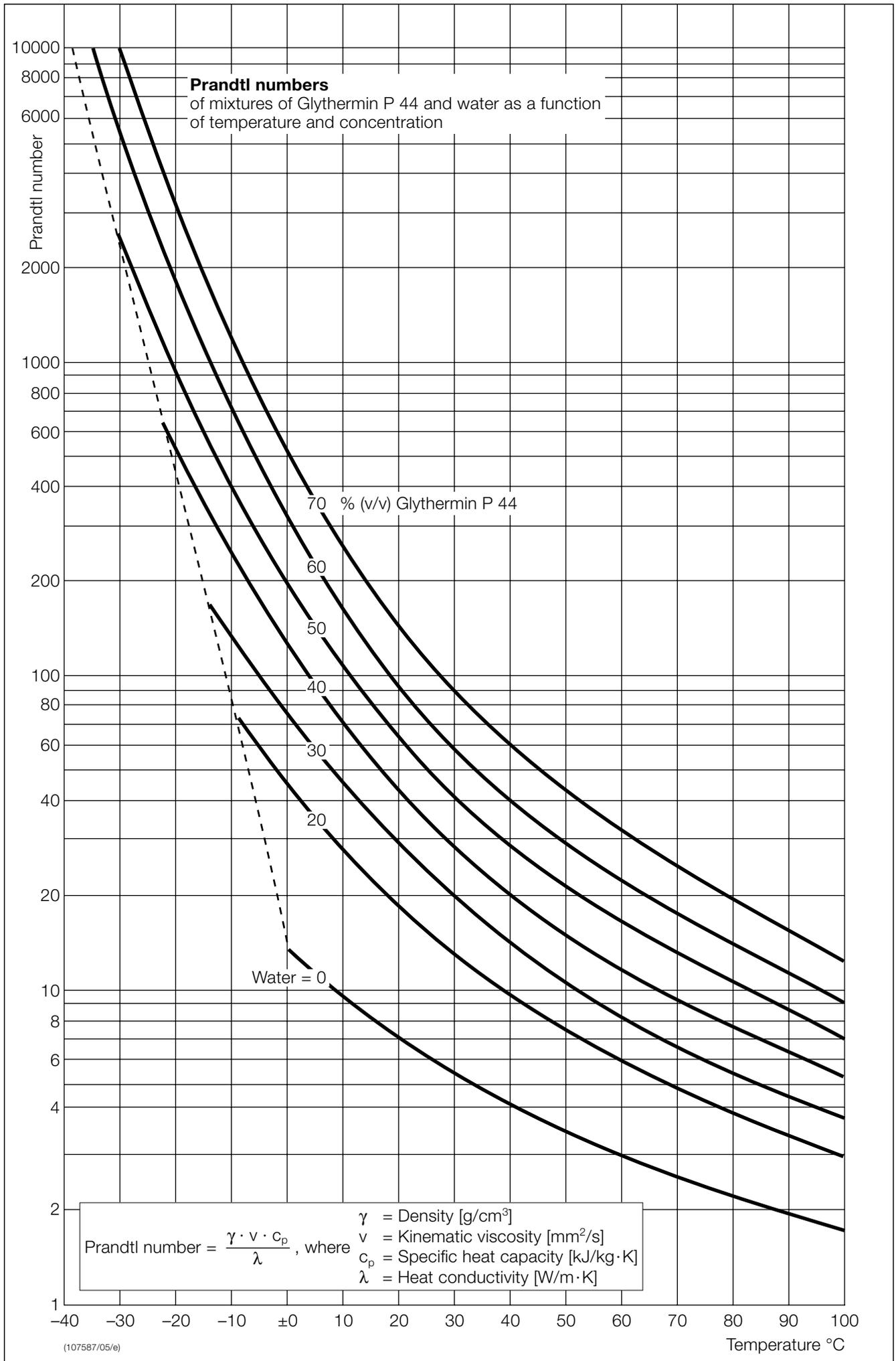
Glythermin P 44 can be disposed of by special treatment, e.g. combustion in an authorized incinerator, in accordance with local authority regulations. Regulations on waste avoidance and disposal must be observed.

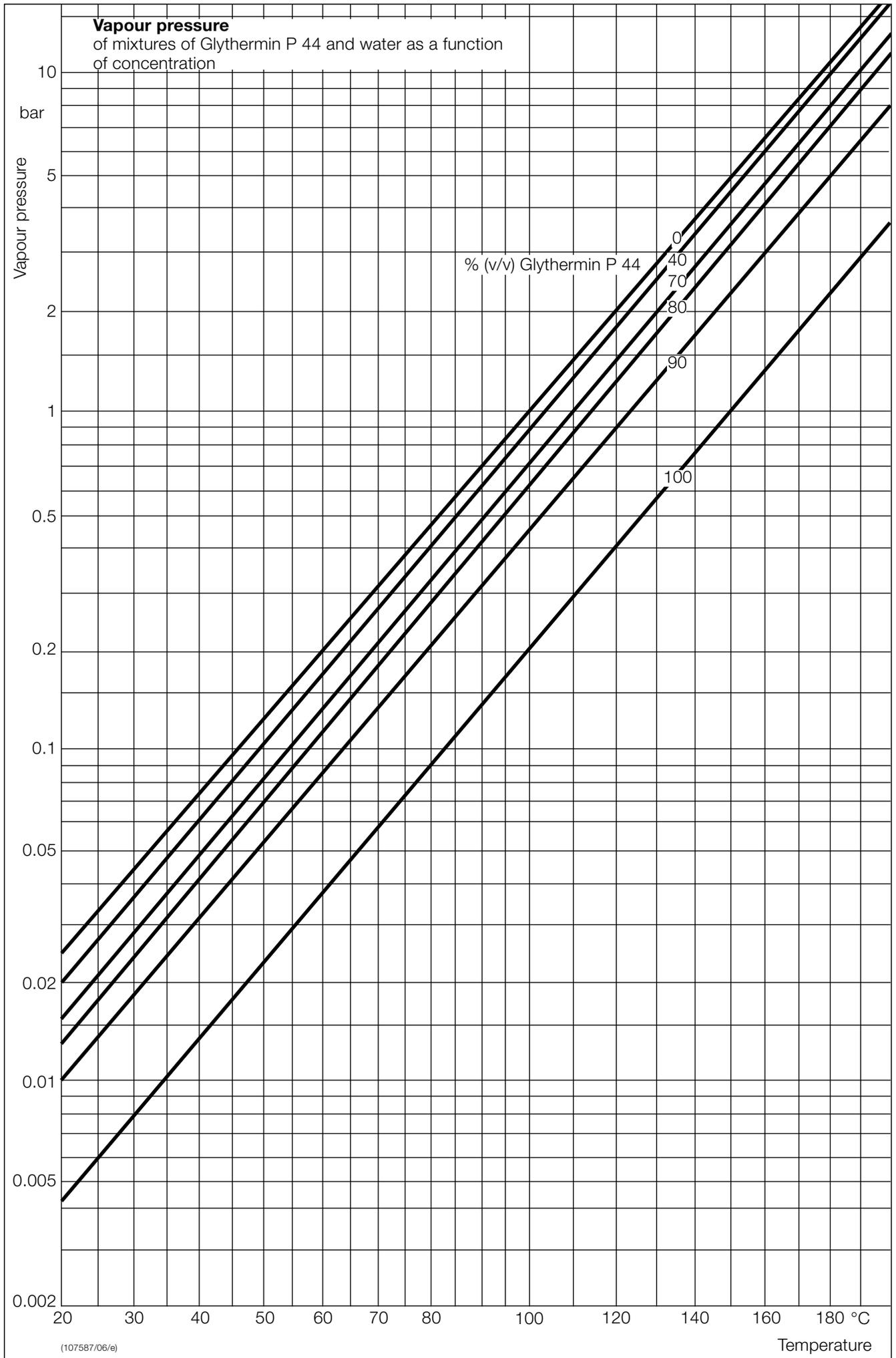
Glythermin P 44 is biodegradable. It does not impair the efficiency of the activated sludge if it is run with the appropriate care into an acclimated effluent treatment plant.

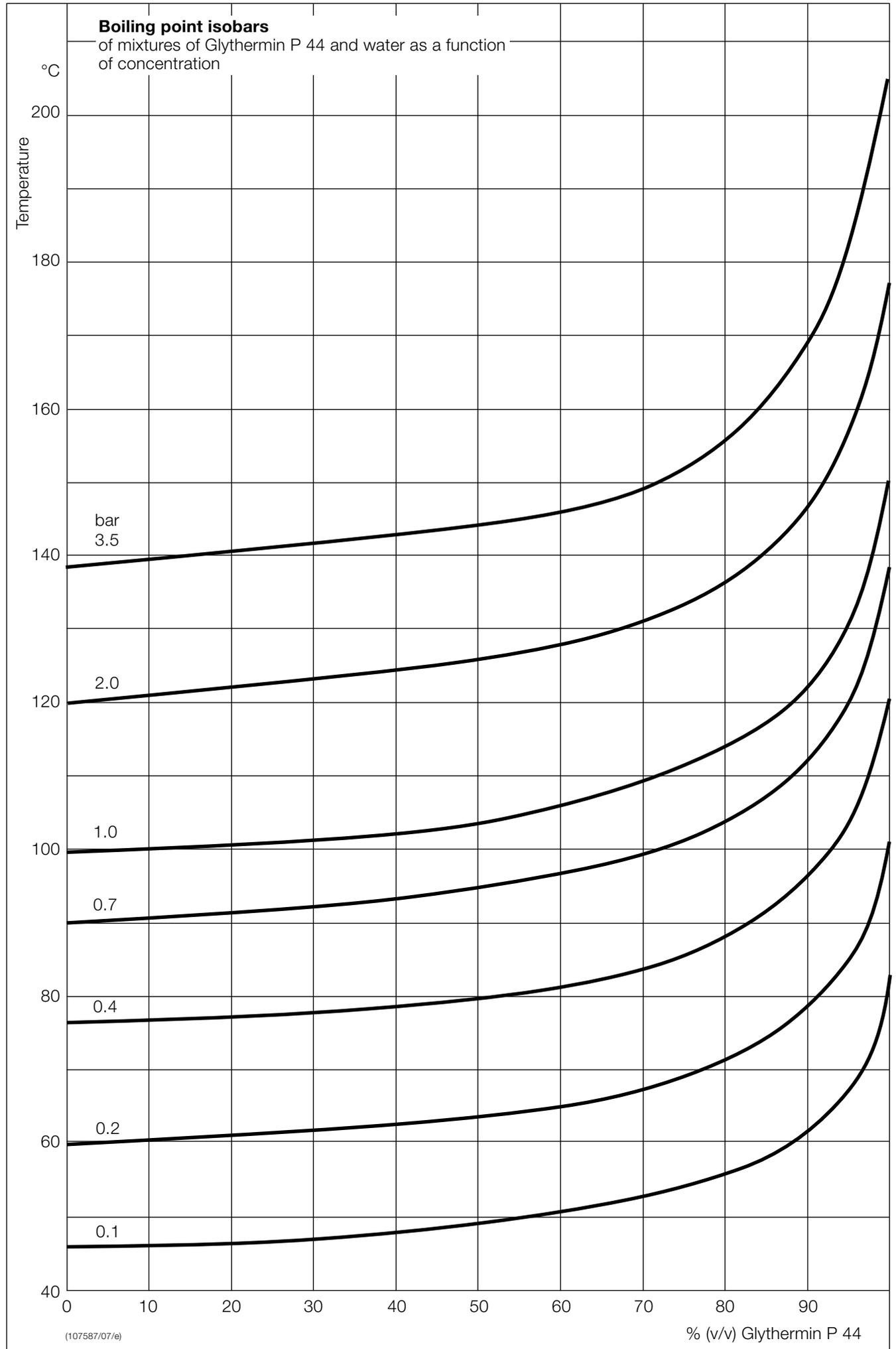


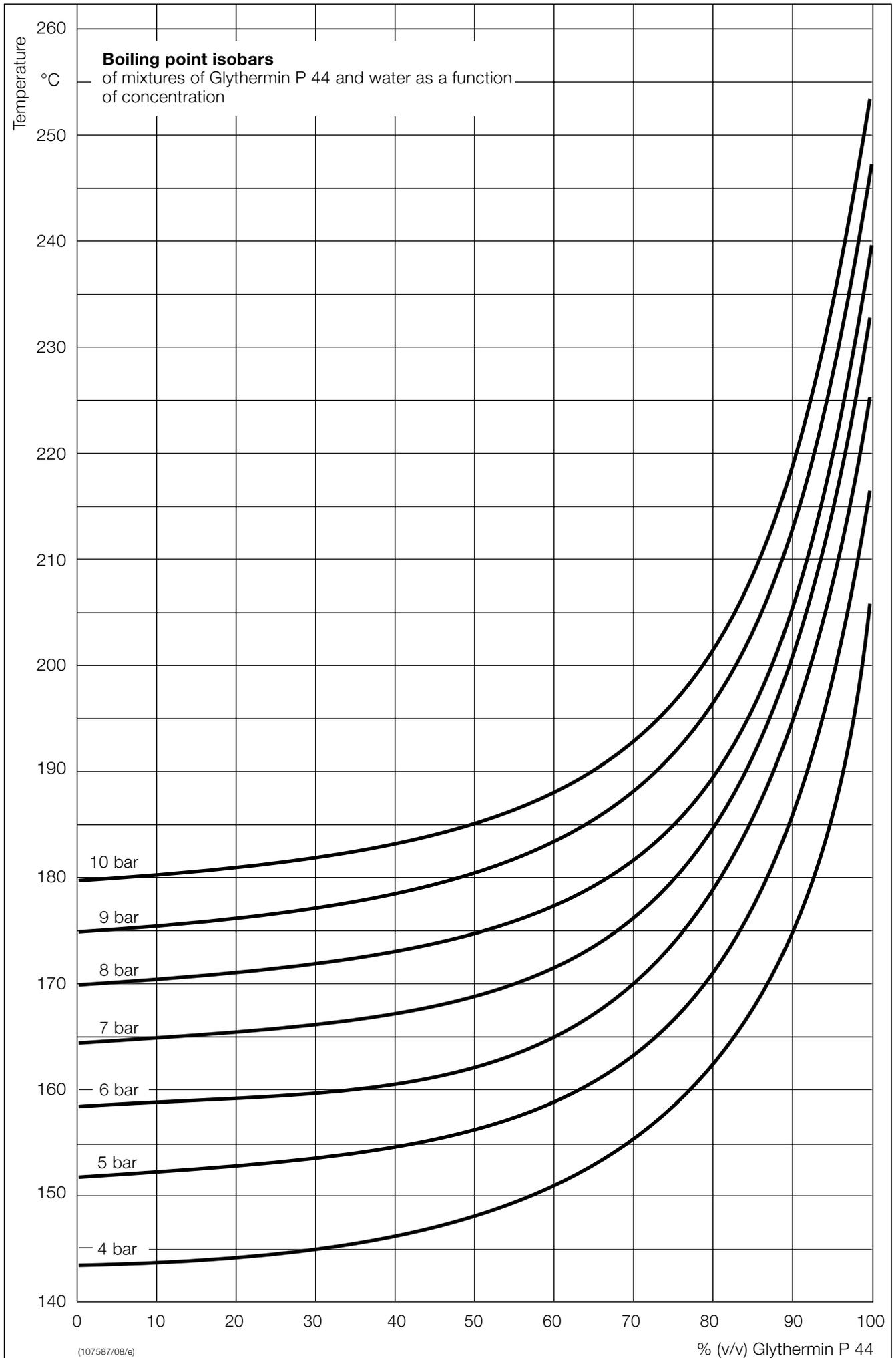


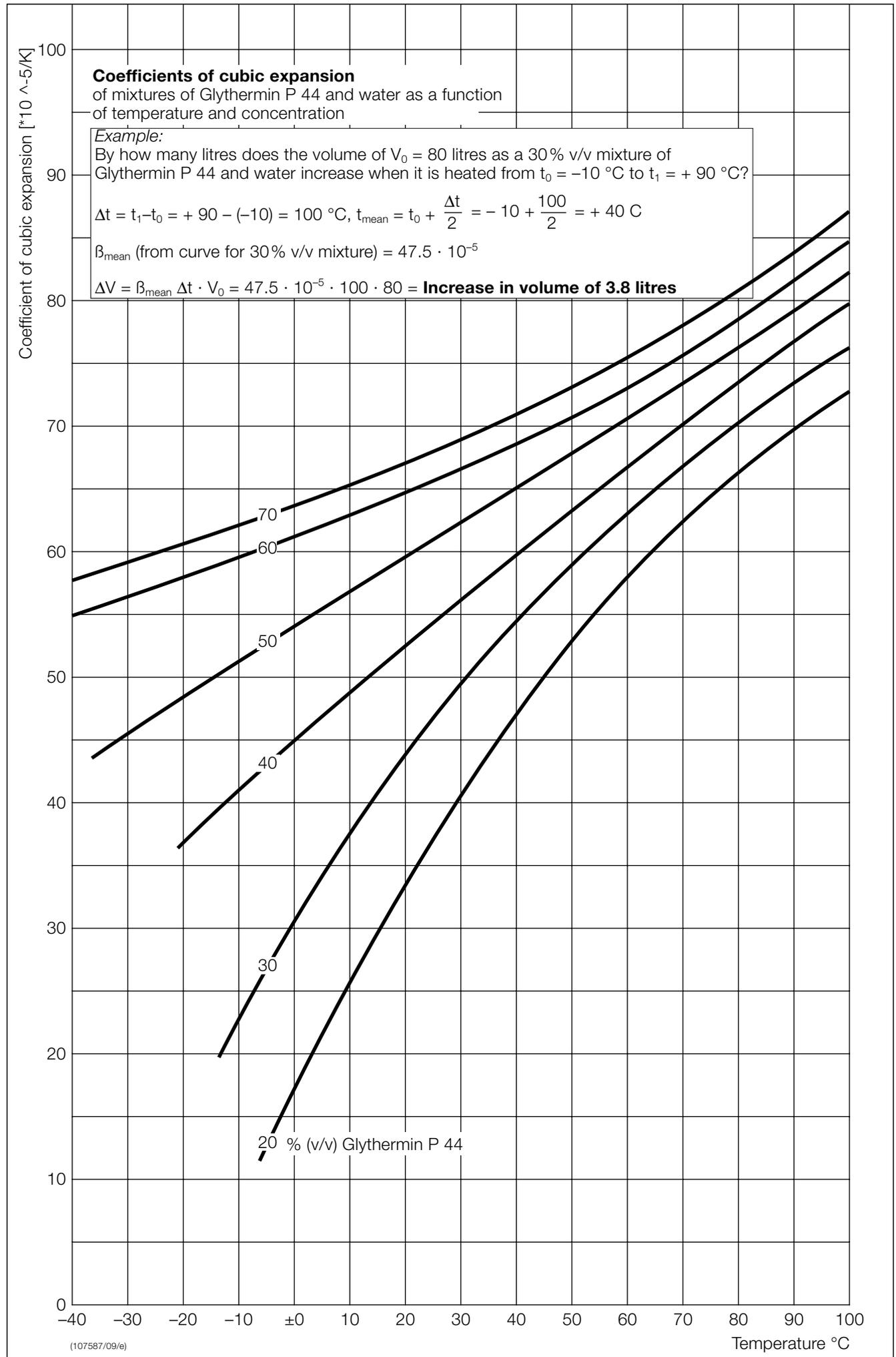


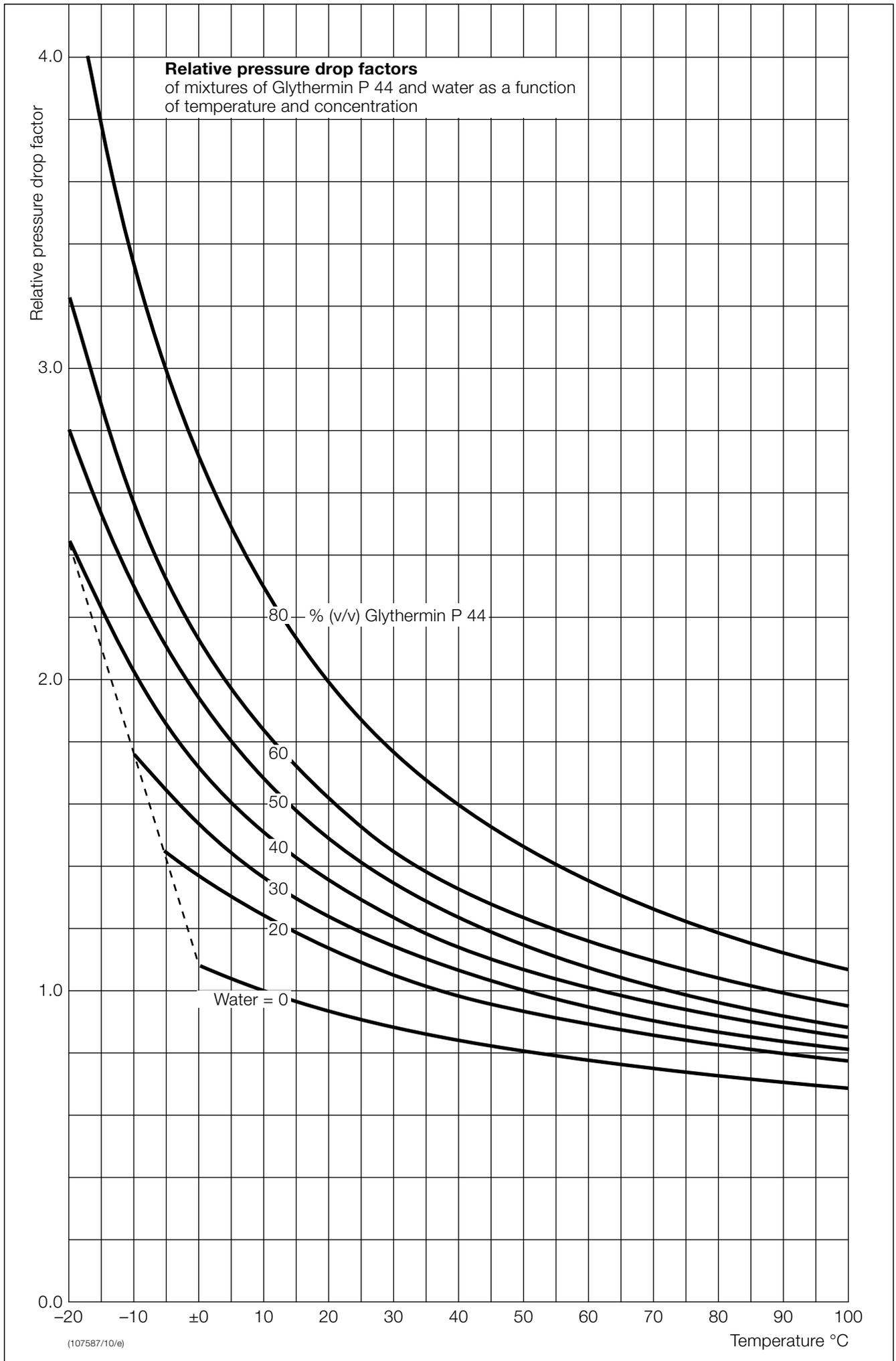


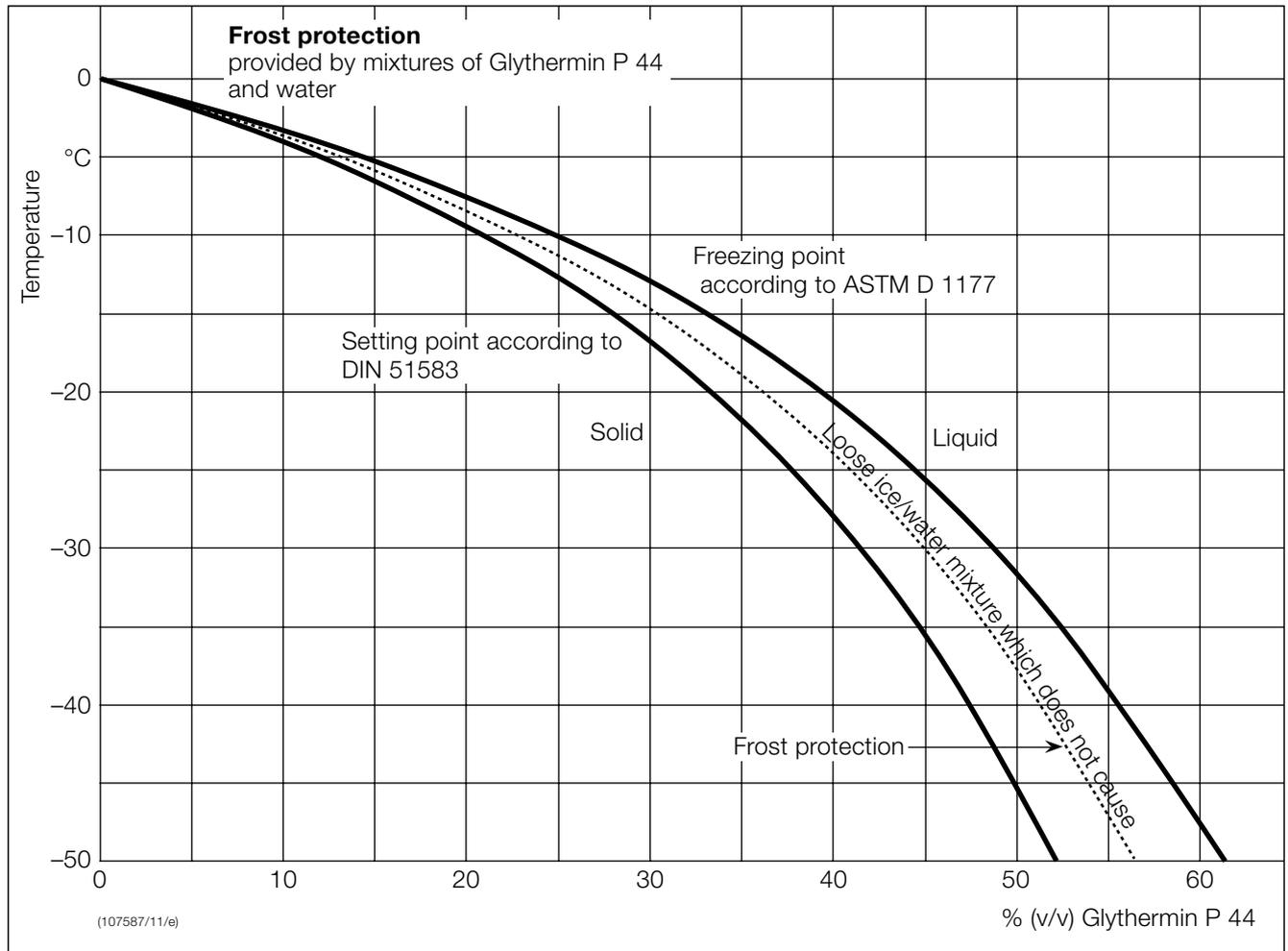












Note

The data contained in this publication are based on our current knowledge and experience. In view of the many factors that may affect processing and application of our product, these data do not relieve processors from carrying out their own investigations and tests; neither do these data imply any guarantee of certain properties, nor the suitability of the product for a specific purpose. Any descriptions, drawings, photographs, data, proportions, weights etc. given herein may change without prior information and do not constitute the agreed contractual quality of the product. It is the responsibility of the recipient of our products to ensure that any proprietary rights and existing laws and legislation are observed.

May 2007