

TYFOXIT[®] F



**High-performance Secondary Refrigerant
for cooling to -60 °C**

Technical Information

General

TYFOXIT[®] F is a high-performance, food-safe secondary refrigerant for all types of cooling circuits operated with indirect cooling. It has been developed as the successor to TYFOXIT[®] and has a number of improvements, the most significant of which is its vastly improved viscosity at low temperatures. This increases the efficiency of existing refrigeration systems by reducing energy costs and enables new circuits to be designed with less expensive, lower output pumps. TYFOXIT[®] F is a non-toxic, non-flammable, almost odourless liquid containing specific corrosion inhibitors, stabilisers, and buffering agents. The corrosion inhibition properties of TYFOXIT[®] F are the result of a completely new advanced formulation, and offer long term cor-

rosion protection covers all materials used to date in refrigeration technology such as steel, stainless steel grades, cast iron, brass, copper, bronze, and aluminium. In addition TYFOXIT[®] F now exhibits improved corrosion resistance to galvanised materials

Application

TYFOXIT[®] F is available in a series of five ready-to-use formulations F 20 to F 60, which numbers state the cooling limit of the respective refrigerant. The installation must be emptied completely, if possible, before filling it with TYFOXIT[®] F. However, slight dilutions will be compensated.

Table 1: Cooling limits and characteristic values of TYFOXIT[®] F20 – F60

TYFOXIT [®] F Cooling limit	Density (20 °C) [g/cm ³]	Viscosity (20 °C) [mm ² /s] [mPas]		pH value (20 °C)	Boiling point [°C]
F 20 / -20 °C	1.262	1.73	2.18	11.76	> 100 °C
F 30 / -30 °C	1.284	1.79	2.29	11.82	> 100 °C
F 40 / -40 °C	1.336	2.05	2.74	12.03	> 100 °C
F 50 / -50 °C	1.358	2.36	3.20	12.08	> 100 °C
F 60 / -60 °C	1.394	2.88	4.01	12.32	> 100 °C

Safety Data

MAK-value: not stipulated

Flash point: not applicable

Advice for disposal: see below

Water danger class: 1 (low rate endangering)

Transport regulations: no compulsory labelling for surface-, sea-, and air transport

Corrosion Protection

Table 2 shows the good anti-corrosive properties of aqueous TYFOXIT® F20 and F40 compared to an ethylene glycol/water mixture (cooling limit -40 °C) and calcium chloride brine (cooling limit -50 °C) tested according to ASTM D 1384 (336 h, 88 °C, 6 litres air/h)

Table 2: Corrosion test acc. ASTM D 1384

Average change of weight in g/m². The corrosion

Material	Ethylene glycol / H ₂ O 1:1	Tyfoxit F 20	Tyfoxit F 40	CaCl ₂ brine 30 %
Copper	-1.24	-0.80	-0.20	-11.0
Brass	-1.28	-1.70	+0.20	-36.0
Steel	-0.48	+1.40	+0.50	-95.0
Cast iron	-0.32	+1.60	+1.90	-310.0
Aluminium	+0.64	+4.80	+3.20	-135.0

limit values for copper, brass, steel, grey cast iron, and aluminium are: 2.0 g/m² (glycol testing specification)

Material Resistance

TYFOXIT® F preparations do not affect sealing

Application Guidelines

The properties of TYFOXIT® F require that the user adheres to the following guidelines to ensure long term corrosion protection.

1. Miscibility with other secondary refrigerants

TYFOXIT® F may on no account be mixed with traditional brines, especially chloride-containing brines or glycol/water mixtures since this may lead to precipitation of solid material or chemical reactions occurring. Plants that have previously utilised such secondary refrigerants must be washed out and cleansed thoroughly.

2. Temperature stability

TYFOXIT® F is suitable for use in systems operating between -60 °C and +80 °C. The upper temperature limit of TYFOXIT® F preparations depends on the materials used for the installation. For systems designed in stainless steel +80 °C is the temperature limit for short-termed overshooting, whereas in mixed installations +50 °C should not be exceeded. The limit for permanent application of TYFOXIT® F at elevated temperatures (not recommended) is set to +20 °C. In case of application-specific questions, we kindly ask you to contact us.

3. Design of the cooling plant

1. It is recommended that TYFOXIT® F should be

materials used for construction of refrigeration equipment. Durable materials include natural products such as cotton, hemp,

Butyl rubber	IIR
Polyethylene soft .hard	L/HDPE
Ethylene-propylene-diene rubber	EPDM
Polyethylene vulcanized	VPE
Epoxide resins	EP
Polypropylene	PP
Fluorocarbon elastomers	FPM
Polytetrafluoroethylene	PTFE
Nitrile rubber	NBR
Polyvinyl chloride soft, hard	PVC
Polyamide	PA
Styrene-butadiene rubber	SBR
Polychlorobutadiene rubber	CR
Unsaturated polyester resins	UP

Asbestos-free flat gaskets made of aramides are stable whereas aminoplastic and silicone compounds have been reported as not being unconditionally stable. If necessary, please consult the manufacturers. If using PTFE note that although this material is chemically inert towards TYFOXIT®, it shows irreversible thermal expansion behaviour which may lead to seal leakage.

used in **closed-circuit** cooling plants. This is because the presence of excess oxygen will decrease the concentration of the corrosion inhibitors. To avoid unnecessary entrainment of air in open systems, ensure that system return lines are situated below the surface level of the coolant. If an open system is used it is advisable to regularly check the pH value of the coolant.

2. A settling pot must be installed at the lowest part of the circuit to trap any washed down matter.

3. Piping must be installed so that no disruption of coolant circulation may occur due to the formation of gas pockets or deposits.

4. The level of the coolant must never be allowed to fall below the highest point in the circuit. A closed tank with a venting valve should also be installed at this point. Do not fit venting valves of a type that might allow air to enter the system.

5. The surface of heat exchangers, tanks, and piping exposed to the coolant must not be galvanised. In the event of exterior galvanised coatings being exposed to TYFOXIT® F, wash down with plenty of water.

6. Copper brazing solders must be used on joints. The use of soft solder is not advised. If in any doubt consult the manufacturer of the particular solder. Chloride containing fluxes must not be used.

7. It must be ensured that no external electrical potential exists between parts of the system that come into contact with TYFOXIT® F (due to risk of corrosion).

4. Cleansing and filling of the cooling plant

1. Dirt and water must not be allowed to enter the system or its components during installation or before it is filled. After the installation, the system should be flushed out in order to remove any foreign material (swarf, scale, remains of packaging etc.) and other contaminants. After internal cleaning and a leak test have been carried out, the system must be emptied completely and **immediately** filled with TYFOXIT® F to protect it from corrosion - even if the plant is to be run for the first time at a later date.

2. The system must be checked for air pockets after it has been filled. When the temperature decreases any pockets of gas will create a reduced pressure that enables air to be drawn into the system. These gas pockets must be removed from time to time.

3. If the system is being run for the first time, the in-circuit filters must be cleaned within 14 days so as

not to block the free flow of coolant or affect the function of the system pumps.

4. Losses of liquid through evaporation must be replaced by neutral water. Losses caused by leakage, or bleeding the system, must be replaced by TYFOXIT® F/water solution of similar concentration. If need be, check the TYFOXIT® F content.

5. Testing of TYFOXIT® F

If desired, there is available a service whereby the relevant TYFOXIT® F parameters may be checked (pH value, density, condition of inhibitor system, etc.). A sample of 0.5 litres should be taken within one month of installation and sent to us for initial analysis. Samples should be sent after six month's and one year's operation for testing and comparison with the original data. Should the results indicate that some adjustments are required we will advise on what is needed to return the system to optimal operating parameters. For measurement of density on site a hydrometer can be supplied if requested.

Handling Instructions for TYFOXIT® F

1. Packaging

TYFOXIT® F is supplied in road tankers, in 1 cubic metre containers, in 200 litre drums, and in 38 litre cans.

2. Accidental release measures

Short term exposure to TYFOXIT® F should produce no ill effects. However, in accordance with guidelines for the general handling of chemical substances, it is recommended that protective rubber gloves are worn during handling. In the event of unprotected exposure to TYFOXIT® F the following measures should be taken:

Nature of exposure	Symptoms	Treatment
Contact with eyes	Temporary burning and redness may occur	Rinse thoroughly with water for at least 10 minutes, keeping eyes open
Contact with skin	Longer exposure may produce slight irritation	Wash affected parts thoroughly with water. Remove clothing
Inhalation	Inhalation of mists or aerosols may irritate mucosal membranes	Remove patient to fresh air
Ingestion	Irritations of mucosal membranes may occur	Wash out mouth cavity with water. Do not induce vomiting

In the event of accidental release of TYFOXIT® F the following measures should be taken:

1. Spills should be absorbed using a suitable absorbent material (saw dust, sand, etc.) and then disposed off in accordance with regulations (see below, **3. Disposal**).

2. Smaller amounts should be washed away with large quantities of water. If larger quantities enter the drains contact the local water authority.

3. Plant components that have been exposed to TYFOXIT® F should be rinsed immediately with plenty of water and then dried using clean cloths. The use of warm water or steam will improve the cleansing efficiency. Industrial floors are to be treated in the same manner.

3. Disposal

Absorbed TYFOXIT® F should be sent for incineration to a licensed disposal contractor. Contaminated packaging may be reused after thorough cleansing

4. Storage and stability

TYFOXIT® F can be stored indefinitely in air-tight polyethylene containers if the correct conditions are observed. The product is chemically stable if higher temperatures and storage with strong oxidising agents (e.g. hydrogen peroxide, nitric acid) and mineral acids (hydrochloric acid) are avoided.

5. Safety

TYFOXIT® F requires no special labelling according to the latest legislations of COSHH and C(HIP). The information given in the EEC Safety Data Sheet (directive 91/155/EEC) must be strictly observed.

6. Ecology

TYFOXIT® F is biodegradable. It does not affect the performance of activated sludge in a biological effluent treatment plant if introduced according to the regulations by the responsible authorities.

Table 3: Physical Data of Tyfoxit® F20 – F60

Product	T [°C]	Specific thermal capacity* [J/g·K]	Thermal conductivity [W/m·K]	Viscosity		Density [g/cm ³]
				[mm ² /s]	[mPas]	
TYFOXIT® F 20	+40	2.97	0.553	1.29	1.62	1.254
	+30	2.96	0.542	1.47	1.84	1.258
	+20	2.95	0.531	1.73	2.18	1.262
	+10	2.94	0.519	2.06	2.61	1.266
	±00	2.93	0.508	2.58	3.28	1.270
	-10	2.92	0.497	3.57	4.55	1.274
	-20	2.91	0.486	5.00	6.39	1.278
TYFOXIT® F 30	+40	2.84	0.537	1.33	1.69	1.276
	+30	2.83	0.524	1.50	1.92	1.280
	+20	2.82	0.511	1.79	2.29	1.284
	+10	2.81	0.498	2.20	2.83	1.288
	±00	2.80	0.485	2.74	3.54	1.292
	-10	2.79	0.472	3.77	4.89	1.296
	-20	2.78	0.459	5.36	6.97	1.300
-30	2.77	0.446	8.35	10.89	1.304	
TYFOXIT® F 40	+40	2.72	0.513	1.49	1.98	1.328
	+30	2.71	0.502	1.70	2.26	1.332
	+20	2.70	0.491	2.05	2.74	1.336
	+10	2.69	0.480	2.58	3.46	1.340
	±00	2.68	0.469	3.25	4.37	1.344
	-10	2.67	0.458	4.55	6.13	1.348
	-20	2.66	0.447	6.57	8.88	1.352
	-30	2.65	0.436	10.31	13.98	1.356
-40	2.64	0.425	19.06	25.92	1.360	
TYFOXIT® F 50	+40	2.64	0.493	1.73	2.34	1.350
	+30	2.63	0.481	2.00	2.71	1.354
	+20	2.62	0.468	2.36	3.20	1.358
	+10	2.61	0.455	2.92	3.98	1.362
	±00	2.60	0.443	3.87	5.29	1.366
	-10	2.59	0.431	5.30	7.26	1.370
	-20	2.58	0.418	8.07	11.09	1.374
	-30	2.57	0.405	12.89	17.89	1.378
	-40	2.56	0.392	24.19	33.43	1.382
-50	2.55	0.379	54.96	76.17	1.386	
TYFOXIT® F 60	+40	2.54	0.486	2.05	2.84	1.386
	+30	2.53	0.473	2.43	3.38	1.390
	+20	2.52	0.460	2.88	4.01	1.394
	+10	2.51	0.447	3.65	5.10	1.398
	±00	2.50	0.434	4.85	6.79	1.402
	-10	2.49	0.421	7.08	9.95	1.406
	-20	2.48	0.408	10.79	15.21	1.410
	-30	2.47	0.395	18.22	25.76	1.414
	-40	2.46	0.382	37.94	53.79	1.418
	-50	2.45	0.369	93.08	132.35	1.422
-60	2.44	0.356	271.28	386.85	1.426	

The data given above has been determined under laboratory conditions which are not transferable to technical installations. We do not guarantee the values as being attainable in a cooling system and recommend that these figures are used only as a guideline in the design of a plant.



EEC – SAFETY DATA SHEET

Acc. 91/155/EEC

Last Revision Date: 01/04/97

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1. Identification of compound/preparation, and company

Trade name: TYFOXIT® F20, F30, F40, F50, F60

Distributor: Environmental Process Systems Limited, Unit 18, The Business Village,
Wexham Road, Slough, UK, SL2 5HF
Tel: +44 (0)1753 692212 Fax: +44 (0)1753 692457
e-mail: info@eps ltd.co.uk

Producer: Tyforop Chemie GmbH, Hamburg, Germany

2. Composition/Information on ingredients

Chemical characterisation: Inhibited aqueous solution of a carboxylic acid salt
CAS No: 590-29-4

3. Possible dangers

Hazardous to health if swallowed. Symbol: X_n , R-phrases: 22, 36.

The product is not subject to registration according to GefstoffV (German regulations of dangerous goods) and does not fall under legislation according to COSHH and CHIP (Great Britain). The classification corresponds to present EC-lists and additional data from relevant literature and product information given by other companies.

4. First aid measures

Contact with eyes	Rinse thoroughly with plenty of water for at least 10 minutes, keeping eyes open
Contact with skin	Wash affected parts thoroughly with soap and water
Inhalation	Expose person to fresh air
Swallowing	Wash out mouth cavity with water, do not try to cause vomiting. In case of continuous complaints consult a physician
General	No specific measures necessary

5. Measures to be taken in the event of fire

Suitable extinguishing agents	TYFOXIT® F preparations are non-flammable. Water spray, carbon dioxide, alcohol resistant foam, and dry extinguishers are suitable for extinguishing environmental fires
Dangerous combustion products	In cases of complete water evaporation of the preparations evolution of hydrogen may occur
Special safety equipment	Use respiratory protective device. Wear fire brigade clothing
Special dangers caused by the substance itself or during its production, by its combustion products or gases thus generated	See above

6. Accidental release measures

Personal protective measures	Avoid excessive contact with skin and eyes. The wearing of rubber gloves is recommended. In case of release of larger amounts remove contaminated clothing and wash body down thoroughly with water
Environmental protection measures	No special measures required. Wash away spills thoroughly with large quantities of water. In case of release of larger quantities which might flow into the draining system or waters, contact the appropriate authorities.
Process of cleaning/absorption	Bind the liquid by using a suitable absorbent material (sawdust, sand, etc.) and dispose of in accordance with local regulations

7. Handling and storage

Handling	When correctly used, no special measures required
Fire and explosion protection	Not applicable
Storage	Store in polyethylene or steel containers. Storage in galvanised containers is not recommended. Do not store with acids and oxidising agents. Keep containers tightly shut

8. Measures to restrict exposure and for personnel protection equipment

Additional comments regarding the design of the technical installations see item 7

Workplace related limits to be controlled None

Personal protection equipment

Breathing protection	Not required
Eye protection	Protective goggles
Hand protection	Rubber gloves
Body protection	Observe usual precautions when handling chemicals

Physical and chemical characteristics

Form	liquid
Colour	colourless
Odour	typical
Boiling point	>100 °C
Solubility in water	completely soluble
Flash point	not applicable
Ignition temperature	not inflammable
Lower explosion limit	not applicable
Upper explosion limit	not applicable

	F20	F30	F40	F50	F60
Cooling limit:	-20 °C	-30 °C	-40 °C	-50 °C	-60 °C
Density at 20 °C	1.262 g/cm ³	1.284 g/cm ³	1.336 g/cm ³	1.358 g/cm ³	1.394 g/cm ³
pH value at 20 °C	11.76	11.82	12.03	12.08	12.32
Viscosity at 20 °C	2.18 mPas	2.29 mPas	2.74 mPas	3.25 mPas	4.01 mPas

10. Stability and reactivity

Chemical stability	Stable with usual handling and storage, elevated temperatures are to be avoided
Substances to be avoided	Strong oxidising agents and mineral acids

11. Toxicological data

Acute oral toxicity	(LD ₅₀): >2000 mg/kg (rat)
Contact with eyes	Temporary burning and redness may occur, avoid contact with eyes
Contact with skin	Occasional contact produces no or only slight effects. Longer exposure may produce slight irritation
Inhalation	Inhalation of mists or aerosols may lead to irritation of mucosal membranes in the respiratory system
Swallowing	Irritation of mucosal membranes and digestive system possible
Additional information	When correctly used as prescribed the product will not, according to best available knowledge and experience, be damaging to health

12. Ecological data

General Indications	Water danger class: 1 (low rate endangering)
Acute toxicity (LC₅₀)	>1000 mg/l, 96 h (rainbow trout)
Biological degradability (OECD 301 D, 28 d)	92% (18 mg O ₂ /l)
(OECD 301 D, 28 d)	89% (30.4 mg O ₂ /l)

Avoid pollution of groundwater and sewage systems by larger amounts of TYFOXIT® F preparations. The product will not affect the performance of activated sludge in a biological effluent clarification plant if introduced correctly according to local regulations

13. Information about the disposal of toxic waste

Disposal	According to local legislations. Recommendation: small quantities may be treated like domestic waste. Waste code no. 991 (Germany)
Contaminated packaging	Contaminated packaging may be used again after cleansing it thoroughly
Recommended cleaning agent	Water

14. Transportation data

Not subject to the regulations for inflammable liquids. May be sent by post

GGVE/RID: -	GGVS/ADR: -	IMDG-Code: -
UN-No: -	IATA-DGR: -	TA-air: -

The product is not classified according to transport regulations

15. Regulations

The product is not subject to registration according to paragraph 2 (1) 2 of the GefStoffV (German regulations of dangerous goods) and therefore does not have to be marked by law. However, in accordance with the data to hand, we voluntarily mark the product according to appendix 1, No. 1.1 of the GefStoffV concerning the EC-guide to Classification and Marking

Contents	Alkali salt of a carboxylic acid	
Symbol	X _i	Irritant
R-phrases	22	Hazardous to health if swallowed
	36	Irritant to eyes
S-phrases	24	Avoid contact with skin
	25	Avoid contact with eyes
Water danger class (wdc)	1 (low rate endangering, self classification)	

Wear suitable protective clothing. In dealing with chemicals observe the usual protection measures. When storing observe the "Wasserhaushaltsgesetz" of 16 October 1976 (BGB 11, p.373), including the 1st addendum of 26 April 1987 (German Water Metabolism Law)

16. Further information

This safety data sheet is intended to provide information and recommendations as to how to handle chemical substances and preparations in accordance with the essential requirements of safety precautions and physical, toxicological, and ecological data, and how to handle, store, transport, and use them safely.

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