

EEC - SAFETY DATA SHEET
acc. 91/155 /EEC; Revised: 01.09.99

1. Substance/preparation, and company name

Trade name: TYFOXIT® F15, F20, F30, F40, F50, F60 - ready-to-use preparations

2. Composition/data as to the compounds

| | | |
|-----------------------------|---|---|
| *Chemical characterization: | Aqueous potassium acetate solution with corrosion inhibitors. EINECS-No.: 209-677-9 CAS-No.: 590-29-4 | Content: < 50 % w/w Symbol: Xi R-phrases: 22,36 |
|-----------------------------|---|---|

3. Possible hazards

*Advice on critical hazards to man and the environment:

R22: Injurious to health if swallowed. R36: Irritant to eyes.

The preparations are not subject to registration acc. GefstoffV (German regulations of dangerous goods). The classification corresponds to present EC-lists and additional data from relevant literature and product information given by other companies.

4. First aid measures

| | |
|-----------------------|---|
| On contact with eyes: | Rinse thoroughly with plenty of water for at least 10 minutes, keeping eyes open. |
| On contact with skin: | Wash affected parts thoroughly with soap and water. |
| On inhalation: | Expose person to fresh air. |
| On ingestion: | Wash out mouth cavity with water, do not try to cause vomiting. In case of continuous complaints consult a physician. |

*Note to physician: No specific antidote. Supporting measures required. If larger amounts are swallowed, hyperkalemia and possibly heart arrhythmia may be caused.

5. Fire fighting measures

| | |
|--------------------------------|--|
| Suitable extinguishing agents: | TYFOXIT® F preparations are non-flammable. Water, carbon dioxide, alcohol-resistant foam, and dry extinguishers are suitable for extinguishing environmental fire. |
|--------------------------------|--|

| | |
|---------------------------------|---|
| *Dangerous combustion products: | In case of complete water evaporation combustion will result in carbon dioxide and water. |
|---------------------------------|---|

Special safety equipment for fire extinguishing: Wear fire brigade clothing.

***Special dangers caused by the substance itself or during its production, by its combustion products or gases thus generated:** None.

6. Accidental release measures

Personal precautions: Avoid excessive contact with skin and eyes, wearing of rubber gloves recommended. In case of release of larger amounts remove contaminated clothing and wash body down thoroughly with water.

***Environmental precautions:** Do not discharge product into natural waters without pretreatment (biological treatment plant).

***Methods for cleaning up:** Bind the liquid by using a suitable absorbent material (saw dust, sand, etc.) and dispose it in accordance with the regulations. 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 appropriate authorities.

7. Handling and storage

Handling: When correctly used, no special measures required.

Fire and explosion protection: Not applicable.

Storage: Storage in polyethylene or steel containers, not in galvanised vessels. Do not store with acids and oxidizing agents. Keep containers tightly shut.

*8. Exposure controls and personal protection

Additional comments regarding the design of the technical installations: No further comments, see item 7.

***Components with workplace control parameters (MAK-value):** None.

Personal protection equipment

Breathing protection: Not required.

Eye protection: Not required.

Hand protection: Rubber or PVC-gloves recommended.

Body protection: Observe the usual protection measures for handling chemicals.

*9. Physical and chemical properties

The following statements are valid for all TYFOXIT® F preparations.

Form: Liquid.

Colour: Colourless.
Odour: Characteristic.

Change of state:

Melting point: Not determined.
Boiling point: > 100 °C.
Solubility in water: Completely soluble.
Flash point: Not applicable.
Ignition temperature: Not inflammable.
Explosion limits: Not applicable.

| | | | | | | | |
|--|------------|------------|------------|------------|------------|------------|------|
| Cooling limit (°C): | F15 | F20 | F30 | F40 | F50 | F60 | |
| | -15 | -20 | -30 | -40 | -50 | -60 | |
| Density (20°C, g/cm³): | 1.22 | 1.26 | 1.28 | 1.34 | 1.36 | 1.39 | |
| pH value (20°C): approx. | 11.5 | 11.7 | 11.8 | 12.0 | 12.1 | 12.3 | |
| Viscosity (20°C, mPas) | | 2.04 | 2.18 | 2.29 | 2.74 | 3.25 | 4.01 |

10. Stability and reactivity

Chemical stability: Stable with usual handling and storage, elevated temperatures are to be avoided.

Substances to be avoided: Oxidizing agents and mineral acids.

*Hazardous decomposition products: None provided products are correctly processed.

11. Toxicological data

Acute oral toxicity: LD50/oral/rat: > 2000 mg/kg

*Experiences in humans:

On contact with eyes: Temporary burning, redness may occur, avoid contact with eyes.

On contact with skin : Occasional contact produces no or only slight effects. Repeated longer exposure may produce slight irritation.

On inhalation: Inhalation of mists or aerosols may lead to irritation of mucous membranes of the respiration system.

On ingestion: Irritation of mucous membranes of digestive system possible.

Additional information: When correctly used as prescribed the products will not, acc. the best of our knowledge and experience, be injurious to health.

12. Ecological data

Elimination information: (OECD 301 D, 28 d): 92 % (18 mg O₂/l, literature data)
(OECD 301 C, 28 d): 89 % (30.4 mg O₂/l, literature data)
Evaluation: readily biodegradable.

Behaviour and environ- Inhibition of degradation activity in activated sludge

| | |
|--|---|
| mental fate: | is not to be anticipated during correct introduction of low concentrations. |
| Ecotoxic effects: | Acute toxicity (LC50): > 1000 mg/l, 96 h (rainbow trout). |
| Further ecological information: | AOX: This product contains no organically bound halogen. |

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: | not dangerous good |
| GGVS/ADR: | not dangerous good |
| IMDG-Code: | not dangerous good |
| UN-No.: | not dangerous good |
| IATA-DGR: | not dangerous good |
| TA-air: | not dangerous good |

The preparations are not classified according to transport regulations.

15. Regulations

The preparations are not subject to registration acc. paragraph 2 (1) 2 of the GefStoffV [German regulations of dangerous goods] and, therefore, they do not have to be marked by law. However, in accordance with the data to hand, we voluntarily mark the preparations acc. appendix 1, No 1.1 of the GefStoffV resp. the EC-Guide to Classification and Marking.

***Contents:** Potassium formate.

Symbol: Xi Irritant.

R-phrases: 22 Injurious to health if swallowed.
36 Irritant to eyes.

S-phrases: 24/25 Avoid contact with skin and eyes.

***National legislation/ regulations:** Water hazard class: WGK 1 (Germany), acc. VwVwS of 17.05.99.

Wear suitable protective clothing. In dealing with chemicals observe the usual protection measures.

16. Further Information

Items marked with "*" have been changed.
This present version supersedes preceded editions.

This safety data sheet is intended to provide information and recommendations as to:
1. how to handle chemical substances and preparations in accordance with the essential requirements of safety precautions and physical, toxicological, and ecological data. 2. how to handle, store, use, and transport them safely.

No liability for damage occurred in connection with the use of this information or with the use, application, adaption, or processing of the products here described will be accepted. An exception will be made in the case that our legal representatives should come to be held responsible and liable by reason of intent or gross negligence. No liability will be accepted for damage indirectly incurred.

We provide this information and data according to our present level of knowledge and experience. No assurances concerning the characteristics of our product are hereby furnished.

Department which issued the data sheet: Dept. AT, Phone ++49-40-61 40 39

1. Packaging

TYFOXIT® F15-F60 is supplied in road tankers, in 1 m³ containers, in 200 l drums, and in 30 l cans.

2. Accidental release measures

Short-term exposure to the media 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® F15-F60 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 product, 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 the 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 product 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 product should be sent for incineration to a licensed disposal contractor. Contaminated packaging may be reused after thorough cleansing.

4. Storage and stability

The media can be stored indefinitely in air-tight polyethylene containers if the correct conditions are observed. The products are 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 preparations require no special labelling acc. German Gefahrstoffverordnung dated 26th August 1986. The informations given in the EEC-Safety Data Sheet (directive 91/155/EEC) must be strictly observed.

***6. Ecology**

TYFOXIT® F15-F60 are readily biodegradable, and do not affect the performance of activated sludge in a biological effluent treatment plant if introduced according the regulations by the responsible authorities.

The properties of TYFOXIT® F15-F60 require that the user adheres to the following guidelines to ensure long term corrosion protection.

1. Miscibility with other secondary refrigerants

TYFOXIT® F preparations 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 cleansed thoroughly.

2. Temperature stability

TYFOXIT® F formulations are suitable for use in systems operating between -60 and +80 °C. The upper temperature limit of TYFOXIT® F preparations depends on the materials used for the respective 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® F15-F60 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® F15-F60 should be 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 the medium, 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 resp. 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 the medium (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 the medium 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 caused by leakage, or bleeding the system, must be replaced by using the suitable TYFOXIT® F preparation. If need be, check the TYFOXIT® F content.

5. Testing of the secondary refrigerants

If desired, there is a service available whereby the relevant 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.

*Corrosion Protection

Table 2 shows the good anti-corrosive properties of TYFOXIT® F20 and F40 compared to an ethylene glycol/water mixture (cooling limit -40 °C) and CaCl₂ brine (cooling limit -50 °C), tested acc. ASTM D 1384 (336 h, 88 °C, 6 l Air/h).

Table 2: Corrosion test acc. ASTM D 1384

| Material | Ethylene glycol / H2O 1:1 | Tyfoxit F20 | Tyfoxit F40 | CaCl2 brine 30 % |
|-----------|---------------------------|-------------|-------------|------------------|
| Copper | 3.6 | 2.3 | 0.6 | 30.0 |
| Brass | 3.9 | 5.2 | n. c. | 110.0 |
| Steel | 1.6 | n. c. | n. c. | 320.0 |
| Cast iron | 1.1 | n. c. | n. c. | 1040.0 |
| Aluminium | n. c. | n. c. | n. c. | 1250.0 |

Corrosion rates in mikrometer per year [$\mu\text{m/a}$].
n. c.: no corrosion observed.

Material Resistance

TYFOXIT® F preparations do not affect sealing materials used for the construction of refrigeration equipment. Durable sealing materials include natural products such as cotton, hemp, and

| | |
|---------------------------------|----------|
| Butyl rubber | IR |
| Polyethylene soft, hard | L/HDPE |
| Ethylene propylene-diene-rubber | EPDM |
| Polyethylene vulcanized | VPE |
| Epoxide resins | EP |
| Polypropylene | PP |
| Fluorcarbon-elastomers | FPM |
| Polytetrafluorethylene | PTFE |
| Nitrile rubber | NBR |
| Polyvinyl chloride soft, hard | PVC s, h |
| 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, consult the manufacturers. If using PTFE note that although this material is chemically inert towards TYFOXIT® F15-F60, it shows irreversible thermal expansion behaviour which may lead to seal leakage.

TYFOXIT® F15-F60 are high-performance, food-safe secondary refrigerants for all types of cooling circuits operated with indirect cooling. This product group has been developed as the successor to TYFOXIT® and offers 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 preparations are non-toxic, non-flammable, almost odourless liquid containing specific corrosion inhibitors, stabilisers, and buffering agents. The corrosion inhibition properties of TYFOXIT® F15-F60 are the result of a completely new advanced formulation, and offer longterm corrosion protection for the materials currently used in refrigeration technology, such as steel, stainless steel grades, cast iron, brass, copper, bronze and aluminium. In addition the media now exhibit improved corrosion resistance to galvanised

materials.

***Application**

TYFOXIT® F is available in a series of six ready-to-use formulations F15 to F60, which numbers state the cooling limit of the respective refrigerant. The installation must be emptied completely, if possible, before filling it with TYFOXIT® F15-F60. However, slight dilutions will be compensated by the respective medium.

***Table 1: Cooling limits and characteristic values of TYFOXIT® F15-F60**

| TYFOXIT® F Cooling limit | Density | | Viscosity [mPas] | pH value (20 °C) | Boiling point [°C] |
|-----------------------------|---------------------------------|--------------------|---------------------|---------------------|--------------------------|
| | (20 °C) [g/cm ³] | (20 °C) [mml/s] | | | |
| F15 / -15 °C | 1.222 | 1.67 | 2.04 | 11.50 | > 100 °C |
| F20 / -20 °C | 1.262 | 1.73 | 2.18 | 11.76 | > 100 °C |
| F30 / -30 °C | 1.284 | 1.79 | 2.29 | 11.82 | > 100 °C |
| F40 / -40 °C | 1.336 | 2.05 | 2.74 | 12.03 | > 100 °C |
| F50 / -50 °C | 1.358 | 2.36 | 3.20 | 12.08 | > 100 °C |
| F60 / -60 °C | 1.394 | 2.88 | 4.01 | 12.32 | > 100 °C |

***Safety Information for TYFOXIT® F15-F60**

| | |
|-----------------------|--|
| MAK-value: | Not stipulated. |
| Flash points: | Not applicable. |
| Advice for disposal: | See below. |
| Water hazard class: | 1 (low-rate endangering, acc. VwVwS of 17.05.1999, Germany). |
| Transport regulation: | Not subject to labelling according to EEC directives. |