The SF₆-ReUse-Process
A contribution on the sustainability of SF₆
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1 INTRODUCTION

Thanks to its outstanding insulation and arc-extinguishing properties, SF₆ is mainly used in the field of electrical engineering. For more than 40 years the gas has been used for high and medium voltage applications, such as gas-insulated switchgears (GIS), high-voltage cable-in-conduit conductors and transformers.

Due to the ecological and economical aspects, any SF₆ which escapes during maintenance work or when electrical systems are decommissioned should be contained and returned to the economic cycle. This limits emissions of SF₆ into the atmosphere to the extremely low leakage rate of the systems.[1]

Solvay, as a globally leading producer of SF₆, developed the SF₆ – ReUse – Process at the beginning of the 1990s in order to provide SF₆ users with virtually unlimited reuse possibilities for SF₆ and, consequently, to eliminate emissions as much as possible.

The known name "ReUse" represents within this concept an efficient process which is integrated in the production of SF₆. During this process the used SF₆ - as long as it meets certain quality requirements – is converted into new virgin SF₆ meeting all established specifications for new SF₆ incl. the non-toxic requirement according to IEC 60376.
In case the used gas does not meet the established quality requirements and, thus, cannot be transformed again into virgin new gas the used gas is treated as waste and environmentally friendly destroyed at accredited waste incineration plants.

The SF₆ – ReUse – Process has been successfully implemented by SF₆ system manufacturers and operators and also by accredited electrical and disposal companies for more than 15 years.

The SF₆ – ReUse – Brochure describes the SF₆ – ReUse – Process and various applications connected with reuse.

The brochure also contains descriptions of SF₆ measuring and service equipment, SF₆ treatment units and packaging and also lists the costs for returning used SF₆.
A prerequisite for the successful implementation of the SF$_6$ – Reuse – Process is the observation and the compliance with all information and guidelines contained in this brochure.

The effective implementation of a closed-cycle SF$_6$ – ReUse – Process requires company-internal regulations and stipulations.

Solvay operates SF$_6$ production plants at Bad Wimpfen, Germany and at Onsan, South Korea. At both SF$_6$ plants Solvay is able to accept used SF$_6$ gas and to convert the used SF$_6$ into new virgin SF$_6$ according to the SF$_6$ – ReUse – Process described in this brochure.

The information and guidelines in this brochure apply in particular for return of used SF$_6$ gas to Solvay’s plant at Bad Wimpfen, Germany, only. For the return of used SF$_6$ to Solvay’s plant in South-Korea please contact us for a separate information brochure as regulations and terms differ according to the plant locations.

In case of any further questions, our SF$_6$ experts will be glad to assist you and help you to develop an optimum solution for reusing your used SF$_6$. 
2 The SF₆ – ReUse – Process

The SF₆ – ReUse – Process from Solvay is illustrated in the following diagram in Figure 1, where a distinction is made among Inspection, ReUse and Disposal Cases.

**Figure 1**: Diagram for implementing the SF₆ – ReUse – Process

Before SF₆ is removed from electrical equipment, the gas state must be analyzed with the portable measuring instruments described in Table 3.

Generally, when used SF₆ is returned to Solvay for ReUse and Disposal Cases, its gas analysis is conducted at the Solvay plant laboratory.

The following case distinctions are made on the basis of the results from the gas analysis.
2.1 Inspection Case
All contaminants such as dust, moisture, air, oil and \( \text{SO}_2 / \text{SO}_2 \text{F}_2 \) compounds result from the operating process and are a normal ageing process of the gas. Operating-related contaminants may be eliminated by the operator on-site during maintenance work using service equipment fitted with the corresponding gas treatment systems, as described in Section 3.2. The treated gas is then analyzed with portable measuring instruments as described in Section 3.1.

If the treated \( \text{SF}_6 \) fulfills the requirements of the plant operator and IEC 60480 [2] for used \( \text{SF}_6 \) during this maintenance work, the \( \text{SF}_6 \) may be filled directly via an \( \text{SF}_6 \) service systems.

In case the used gas does not meet at least the requirements of the plant operator and the IEC 60480 standard, the \( \text{SF}_6 \) ReUse Case must be applied.

2.2 ReUse Case
If the analysis of the used \( \text{SF}_6 \) shows that the gas is contaminated above prescribed tolerance limits (e.g. IEC 60480 standard), the contaminated \( \text{SF}_6 \) should be liquefied by using \( \text{SF}_6 \) service devices at 50 bar and filled into \( \text{SF}_6 – \text{ReUse} – \text{Packaging} \). These contaminants may result from exceptional incidents or could be caused if the gas is not handled properly.

The filled \( \text{SF}_6 – \text{ReUse} – \text{Packaging} \) are sent back to Solvay’s plant in Germany where the used \( \text{SF}_6 \) is regenerated into new virgin gas. \( \text{SF}_6 \) which has been regenerated by Solvay fulfills even a higher specification than that required by IEC 60376, as illustrated in Table 1.

In order to be able to transform the used \( \text{SF}_6 \) gas back into new virgin \( \text{SF}_6 \) the used gas must fulfill the so-called \( \text{SF}_6 – \text{ReUse} – \text{Specification} \) in Table 2.

In addition the material must be of one sort only and shall not be radioactive. Also, information regarding the area of application in which the used \( \text{SF}_6 \) has been utilized must also be provided.

In case of other contaminants (e.g. \( \text{SOF}_2, \text{SO}_2\text{F}_2 \) etc), please contact Solvay to check if the material can be converted back into new \( \text{SF}_6 \).
The **Disposal Case** exists when the used SF₆ does not fulfill the SF₆ – ReUse – Specification.

**Table 1** : Solvay product specification, IEC 60376 specification and ASTM specification for new SF6 analysis of liquid phase[3]

<table>
<thead>
<tr>
<th></th>
<th>Solvay specification</th>
<th>IEC 60376 specification</th>
<th>ASTM D2472-00 specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assay</td>
<td>99.993 % wt</td>
<td>&gt; 99.7 % wt</td>
<td>99.8 % wt</td>
</tr>
<tr>
<td>Air</td>
<td>50 ppm wt</td>
<td>2000 ppm wt</td>
<td>500 ppm wt</td>
</tr>
<tr>
<td>CF₄</td>
<td>10 ppm wt</td>
<td>2400 ppm wt</td>
<td>0.05 % wt</td>
</tr>
<tr>
<td>Water</td>
<td>0.65 ppm wt (Dew point – 65 °C)</td>
<td>25 ppm wt (Dew point – 36 °C)</td>
<td>1.0 ppm wt (Dew point – 62 °C)</td>
</tr>
<tr>
<td>Oil Content</td>
<td>1 ppm wt</td>
<td>10 ppm wt</td>
<td>not specified</td>
</tr>
<tr>
<td>Acidity (as HF)</td>
<td>0.3 ppm wt</td>
<td>1.0 ppm wt</td>
<td>0.3 ppm wt*</td>
</tr>
<tr>
<td>Hydrolyzable Fluoride (as HF)</td>
<td>1 ppm wt</td>
<td>not specified</td>
<td>not specified</td>
</tr>
<tr>
<td>Toxicity</td>
<td>Non-toxic, acc.to IEC 60376</td>
<td>Not listed as a specification but required to be determined non-toxic by the supplier</td>
<td>not specified</td>
</tr>
</tbody>
</table>

**Table 2** : SF₆ – ReUse – Specification

<table>
<thead>
<tr>
<th>Contamination</th>
<th>SF₆ – ReUse - Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air (N₂, O₂)</td>
<td>&lt; 30 % by volume</td>
</tr>
<tr>
<td>CF₄</td>
<td>&lt; 5 % by volume</td>
</tr>
<tr>
<td>H₂O</td>
<td>&lt; 1000ppm by weight</td>
</tr>
<tr>
<td>HF</td>
<td>&lt; 1000ppm by weight</td>
</tr>
<tr>
<td>Oil</td>
<td>&lt; 0.1% by weight</td>
</tr>
<tr>
<td>Companion substances</td>
<td>&lt; 5 % by weight</td>
</tr>
</tbody>
</table>

**2.3 Disposal Case**

When a Disposal Case arises, the used SF₆ must be incinerated in accredited incineration plants. The used SF₆ is listed with waste key numbers 160504* and
160215*. Solvay has the possibility to dispose contaminated SF₆ in the special waste incineration plant of Infraserv GmbH & Co. KG at Industriepark Frankfurt-Höchst.

3. APPLICATION INFORMATION

The following equipment and its proper use are important prerequisites for implementation of the SF₆ – ReUse – Process.

3.1 SF₆ Measuring equipment

The gas state is determined during maintenance work or before any used SF₆ is removed from the system.

Portable and easy-to-operate measuring devices are used to analyze the used SF₆ gas for moisture and oil content, the SO₂ and HF concentration as well as the SF₆ content. The SF₆ measuring devices are able to determine the state of the gas within a short time and with very little loss of sample gas.

Dew point or frost point measuring devices are used to determine the moisture concentration. The devices automatically display the dew point or frost point in ppm H₂O or in degree centigrade.

If the gas contains contaminants caused by decomposition, SO₂ is formed as a stable end product. For this reason, portable decomposition product measuring instruments using Dräger® Tubes may be used for detection. Because of the cross-sensitivity of these instruments, they also show the presence of other acidic constituents such as SO₂F₂.

Electro-chemical sensors for measuring SO₂ concentrations in SF₆ are available and were more and more inserted to used SF₆ gas determination.

Decomposition product measuring instruments using Dräger Tubes are also used to determine the HF and oil content. Other, more precise analytical instruments for field operations are available and are described in the reviewed IEC 62271-4.

The purity of SF₆ in regard to other gases, such as air, is determined with measuring instruments that determine the percentage of SF₆ by volume.

On top of this SF₆ combination measuring instruments are developed, which integrate the above measuring methods in one instrument shown in figure 2.
Table 3 contains an overview of analytical SF₆ instruments for determining the state of the gas. It is important that the different measuring ranges are considered when the results of the measurements are being assessed.

3.2 SF₆ Service Equipment
When users are maintaining or decommissioning gas-insulated systems, they may use service equipment, which can extract, clean, store and refill the gaseous SF₆ back into the

<table>
<thead>
<tr>
<th>Measuring instrument</th>
<th>Measuring medium</th>
<th>Measuring range</th>
<th>Measuring accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage by volume measuring instrument</td>
<td>SF₆/N₂, SF₆/air</td>
<td>0-100% by volume</td>
<td>+/- 1% by volume</td>
</tr>
<tr>
<td>Electronic moisture measuring instrument</td>
<td>H₂O/dew point</td>
<td>from -50°C to 0°C</td>
<td>+/- 3°C</td>
</tr>
<tr>
<td>Frost point measuring instrument</td>
<td>H₂O/frost point</td>
<td>from -60°C to 5°C</td>
<td>+/- 0.2°C</td>
</tr>
<tr>
<td>Decomposition product measuring instrument with Dräger® Tubes</td>
<td>SO₂, HF, Oil mist</td>
<td>1...500 ppm by vol. 1.5...15 ppm by vol. 0.16...1.6 ppm by weight</td>
<td>N/A</td>
</tr>
<tr>
<td>Electrochemical sensor</td>
<td>SO₂</td>
<td>typical 0-20 ppm by vol.</td>
<td>+/- 1 ppm by vol.</td>
</tr>
</tbody>
</table>
system. Service devices also exist which can evacuate the system and liquefy the gaseous SF$_6$ before it is filled into suitable pressurized gas containers (cf. section 3.3). The SF$_6$ service devices are portable, simple to use, gas-proof and oil-free (Figure 3).

![Figure 3 : Portable SF$_6$ – Service Devices[4]](image)

All materials used in the devices are compatible with SF$_6$ and its decomposition products. SF$_6$ service devices are equipped with filters and adsorption units from table 4.

Gas can be stored in a liquid or gaseous state. In all cases it should be possible to extract the gas from the SF$_6$ system until a residual pressure of max. 2 mbar is reached.

To prevent emissions during the evacuation, systems filled with SF$_6$ should be fitted with secure gas tight connections, such as DILO couplings with 8 and 20mm nominal width. The gas connection should be constructed in such a way that mistakes during filling, maintenance and emptying are prevented. Table 5 shows a survey on different service devices. **New gas quality according to IEC 60376 cannot be achieved with the SF$_6$ Service devices!**
Table 4: Various types of filters and adsorption agents used in gas treatment units

<table>
<thead>
<tr>
<th>Contamination</th>
<th>Filter type</th>
<th>Task</th>
<th>Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>General contamination: Oil, moisture, particles, reactive products, etc.</td>
<td>Prefilter</td>
<td>Reduce the concentration of solid and gaseous contamination before heavily contaminated gas enters the treatment unit</td>
<td>Pore size 10 μm Residual moisture &lt; 200 ppm by vol. Residual reactive products &lt; 200 ppm by vol. Also retains oil</td>
</tr>
<tr>
<td>Dust/particles, carbon switching dust: CuF₂, WO₃Fy</td>
<td>Particle filter / solids filter</td>
<td>Remove solid contaminants and other particles before the gas enters the treatment unit</td>
<td>Pore size 1 μm</td>
</tr>
<tr>
<td>Moisture</td>
<td>Moisture filter</td>
<td>Remove moisture</td>
<td>Alumina (Al₂O₃, aluminium oxide) Molecular sieve (pore size 4-5 Å) Residual moisture &lt; 100 ppm by vol.</td>
</tr>
<tr>
<td>Gaseous decomposition products: SF₆, WF₆, SOF₄, SO₂F₂, SOF₂, SO₂, HF</td>
<td>Gas filter</td>
<td>Remove gaseous decomposition products</td>
<td>Activated carbon and zeolites Also retains small particles SO₂⁺SOF₂ &lt; 12 ppm by vol.</td>
</tr>
<tr>
<td>Oil</td>
<td>Oil filter</td>
<td>Remove oil</td>
<td>Activated carbon, special filter with sight glass at the inlet and outlet sides</td>
</tr>
<tr>
<td>SO₂, SOF₂, SO₂F₂, HF</td>
<td>Detoxification filter</td>
<td>Reduce reactive decomposition products to 200 ppm by vol., to enable transport as a non-toxic gas</td>
<td>Like prefilters</td>
</tr>
</tbody>
</table>
We recommend SF$_6$ service devices enabling evacuation until 1mbar in order to avoid SF$_6$ emissions.

### 3.3 Packaging, Labeling and Transportation

A distinction is always made between packaging for new gas and for used SF$_6$ gas.

As used SF$_6$ may contain decomposition products, used SF$_6$ must be filled only into SF$_6$ – ReUse – Packaging, as shown in Figure 5. Special service devices are needed to transfer the used gas into the SF$_6$ – ReUse – Packaging.
Figure 5: 40l and 600l SF₆ – ReUse – Packaging

SF₆ – ReUse – Packaging approved to minimum 100bar is available.

Minimum 100bar SF₆ – ReUse – Packaging complies with the regulations for hydrogen chloride and is approved for used SF₆ with corrosive substances > 1% by mass [6].

All SF₆ – ReUse – Packaging are equipped with valves (DIN 477 – Part 1 : Type A, 1” No. 8) and screw-in fittings which are different from those used in containers for new gas to prevent inadvertent filling and contamination of new SF₆. The valves are made of stainless steel to resist corrosive decomposition products.

The Solvay plant in Bad Wimpfen provides this packaging on a rental basis. They contain a small SF₆ residual pressure and are marked with the prescribed hazard labels (UN3308) as shown in Table 6. The described SF₆ – ReUse – Packaging for used SF₆ may be purchased from Solvay plant. Customers may also send their own SF₆ – ReUse – Packaging if they fulfill the described criteria.
In case of contamination of new SF₆ packaging with used gas, packaging has to be cleaned in a costly and time-consuming process. Responsible parties will be invoiced for the cleaning costs.

**Transportation of used SF₆ in pressurized gas containers**

The party who is the shipper of the goods (e.g. used SF₆ gas in the appropriate containers) is responsible for the transport of the consignment.

When these packaging are being transported, ADR (road), RID (rail), IMDG code (sea) and IATA - DGR (air) regulations must be respected.

The packaging must be labeled and the transportation documents must contain the information as described in Table 6.

It is the sender’s responsibility to attach the prescribed hazard label and UN number to the container. The required Accident Instruction Leaflets for road transportation and the prescribed hazard labels with UN numbers are listed in the appendix and can be sent on request.
Table 6: Gas Categories, Packaging and Labeling according to ADR, RID, IMDG Code and IATA - DGR

<table>
<thead>
<tr>
<th>Regulation</th>
<th>SF₆ complies with IEC 60480</th>
<th>SF₆ does not comply with IEC 60480</th>
<th>SF₆ does not comply with IEC 60480</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Contains toxic by-products</td>
<td>Contains toxic and corrosive by-products</td>
</tr>
<tr>
<td>Packaging</td>
<td>70 bar SF₆ packaging</td>
<td>Corrosive by-products &lt; 1% by mass [5], 70 bar SF₆ – ReUse - Packaging</td>
<td>Corrosive by-products &gt; 1% by mass [5], 100 or 250 bar SF₆ – ReUse - Packaging</td>
</tr>
<tr>
<td>Valve Type A acc. to DIN 477</td>
<td>Brass, side connection - external – right-hand thread, W21.8 x 1/14”, Connection No. 6</td>
<td>Stainless steel, side connection – external – right-hand thread, 1”, Connection No. 8</td>
<td>Stainless steel, side connection – external – right-hand thread, 1”, Connection No. 8</td>
</tr>
<tr>
<td>UN number</td>
<td>3163 (liquefied gas)</td>
<td>3162 (liquefied and toxic gas)</td>
<td>3308 (liquefied, toxic and corrosive gas)</td>
</tr>
<tr>
<td>Classification code (Class 2)</td>
<td>2A</td>
<td>2T</td>
<td>2TC</td>
</tr>
<tr>
<td>Hazard category</td>
<td>2.2</td>
<td>2.3</td>
<td>2.3 + 8</td>
</tr>
<tr>
<td>Final classification</td>
<td>UN 3163 Liquefied gas, n.o.s., 2.2</td>
<td>UN 3162 Liquefied gas, toxic, n.o.s., 2.3</td>
<td>UN 3308 Liquefied gas, toxic, corrosive, n.o.s., 2.3 (8)</td>
</tr>
<tr>
<td>Transport document</td>
<td>UN 3163 Liquefied gas, n.o.s. (sulphur hexafluoride and air or nitrogen or carbon tetrafluoride), 2.2</td>
<td>UN 3162 Liquefied gas, toxic, n.o.s. (sulphur hexafluoride and hydrogen fluoride and thionylfluoride), 2.3</td>
<td>UN3308 Liquefied gas, toxic, corrosive, n.o.s. (sulphur hexafluoride and hydrogen fluoride and thionylfluoride), 2.3 (8)</td>
</tr>
</tbody>
</table>

3.4 Filling Factor

Filling factors must be considered when pressurized gas containers are being filled in order to guarantee operational safety. The filling factor describes the mass of gas that may be filled into a pressurized gas container with a specific volume.

The filling factor depends on the test pressure of the container and is 1.04kg/l [6] for new SF₆ with a packaging test pressure of 70 bar and less than 0.8kg/l [7] for used SF₆ with IEC 60480 specification. The filling factor for containers with 100 and 250bar test pressure is 1.3kg/l [6] filled with new SF₆ gas and shall not exceed 1kg/l (see Figure 6) for used SF₆ gas.
As the inert gas concentration rises – e.g. the concentration of air – the filling factor falls, as illustrated in Figure 6. This must be considered.

![Figure 6: Relation between inert gas concentration and filling factor for SF₆][6]

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**Figure 6**: Relation between inert gas concentration and filling factor for SF₆ [6]
4. Costs
When contaminated SF₆ from switchgear and other application is returned, the following costs can be expected.

4.1 Service Fee
A service fee of €500 excluding VAT is charged for each individual Re-Use case / return of used SF6 to cover all administrative and order processing cost.

4.2 Freight
Freight costs are incurred for sending empty packaging to their destination and returning the filled packaging to Solvay’s plant. The amount depends on the respective destination and is calculated on a case-by-case basis.

4.3 Rental Packaging (Rental Fees)
Solvay provides 40l and 600l cylinders for SF₆ – ReUse – rental packaging for contaminated SF₆ which is outside the IEC 60376 specification. This special packaging is provided to our SF₆ customers at no cost for 14 days. From the 15th day we charge €0.35 per day for the 40l cylinder and €5.50 per day for the 600l container.

4.4 Analysis
When we receive 40l cylinders or 600l containers with reusable SF₆, we invoice €205 per cylinder or container regardless of the filling rate.

4.5 Additional Costs (Disposal Case)
If the analysis shows a composition of SF₆, which exceeds the SF₆ – ReUse – Specification, and no use for SF₆ production is possible, the disposal is necessary and the following costs will be incurred in addition to the above costs:

- Freight Costs from the Solvay plant in Bad Wimpfen to the disposal plant in Frankfurt and back to Bad Wimpfen.

- Incineration Costs of €2.60 per kilogram product. A minimum charge of €50 per 40l cylinder and €100 per 600l container will be invoiced for each procedure.
5. LITERATURE


6. Appendix
Appendix 1 : Material Safety Data Sheet for Used SF6 (12 pages)
Appendix 2 : Labels for SF$_6$ – ReUse – Packaging (1 page)
Appendix 3 : ADR Transport Document (1 page)
SECTION 1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. Product identifier
   - Product name: USED SULFUR HEXAFLUORIDE
   - Chemical Name: Sulfur hexafluoride
   - Molecular formula: SF6
   - Type of product: Mixture

1.2. Relevant identified uses of the substance or mixture and uses advised against
   - Identified uses: Recycling

1.3. Details of the supplier of the safety data sheet
   - Company: SOLVAY FLUOR GmbH
   - Address: HANS-BOECKLER-ALLEE 20
               D-30173 HANNOVER
   - Telephone: +495118570
   - Fax: +495118572146
   - E-mail address: manager.sds@solvay.com

1.4. Emergency telephone number
   - Emergency telephone number: +44(0)1235 239 670 [CareChem 24] (Europe)

SECTION 2. HAZARDS IDENTIFICATION

2.1. Classification of the substance or mixture

2.1.1. European regulation (EC) 1272/2008, as amended

   Classified as hazardous according to the European regulation (EC) 1272/2008, as amended

<table>
<thead>
<tr>
<th>Hazard class</th>
<th>Hazard category</th>
<th>Route of exposure</th>
<th>H Phrases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gases under pressure</td>
<td>Liquefied gas</td>
<td>Inhalation</td>
<td>H280</td>
</tr>
<tr>
<td>Acute toxicity</td>
<td>Category 3</td>
<td>Oral</td>
<td>H302</td>
</tr>
<tr>
<td>Acute toxicity</td>
<td>Category 4</td>
<td>Dermal</td>
<td>H302</td>
</tr>
<tr>
<td>Eye irritation</td>
<td>Category 2</td>
<td></td>
<td>H319</td>
</tr>
<tr>
<td>Skin irritation</td>
<td>Category 2</td>
<td></td>
<td>H315</td>
</tr>
<tr>
<td>Target Organ Systemic Toxicant - Single exposure</td>
<td>Category 1</td>
<td>Inhalation</td>
<td>H335</td>
</tr>
</tbody>
</table>

2.1.2. European Directive 67/548/EEC or 1999/45/EC, as amended

<table>
<thead>
<tr>
<th>Hazard class / Hazard category</th>
<th>R-phrase(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>R23</td>
</tr>
<tr>
<td>Xn</td>
<td>R21/22</td>
</tr>
<tr>
<td>Xi</td>
<td>R36/37/38</td>
</tr>
</tbody>
</table>
2.2. Label elements

2.2.1. Name(s) on label

Hazardous components: Hydrogen fluoride
Thionyl difluoride
Disulfur decafluoride

2.2.2. Signal word

Danger

2.2.3. Hazard pictograms

2.2.4. Hazard statements

H280 - Contains gas under pressure; may explode if heated.
H331 - Toxic if inhaled.
H302 - Harmful if swallowed.
H312 - Harmful in contact with skin.
H315 - Causes skin irritation.
H319 - Causes serious eye irritation.
H335 - May cause respiratory irritation.

2.2.5. Precautionary statements

Prevention

P261 - Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P280 - Wear protective gloves/ protective clothing/ eye protection/ face protection.

Response

P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water.
P309 + P311 - IF exposed or if you feel unwell: Call a POISON CENTER or doctor/ physician.

Storage

P410 + P403 - Protect from sunlight. Store in a well-ventilated place.

2.3. Other hazards

- Causes asphyxiation in high concentrations.
- Hazardous decomposition products formed under fire conditions.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

3.2.1. Concentration

<table>
<thead>
<tr>
<th>Substance name</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfur hexafluoride</td>
<td>&gt;= 95 %</td>
</tr>
<tr>
<td>CAS-No.: 2551-62-4 / EC-No.: 219-854-2 / Index-No.: -</td>
<td></td>
</tr>
<tr>
<td>REACH Registration Number: 01-2119458769-17</td>
<td></td>
</tr>
<tr>
<td>Hydrogen fluoride (Impurities)</td>
<td>&lt;= 0.1 %</td>
</tr>
<tr>
<td>CAS-No.: 7664-39-3 / EC-No.: 231-634-8 / Index-No.: 009-002-00-6</td>
<td></td>
</tr>
</tbody>
</table>
**Thionyl difluoride**  
(Impurities)  
CAS-No.: 7783-42-8 / EC-No.: 231-997-2 / Index-No.: -  
<= 2 %

**Disulfur decafluoride**  
(Impurities)  
CAS-No.: 5714-22-7 / EC-No.: 227-204-4 / Index-No.: -  
< 1 %

**Carbon tetrafluoride**  
(Impurities)  
CAS-No.: 75-73-0 / EC-No.: 200-896-5 / Index-No.: -  
<= 3 %

### 3.2.2. Hazardous components - According to Regulation (EC) 1272/2008, as amended

<table>
<thead>
<tr>
<th>Substance name</th>
<th>Hazard class</th>
<th>Hazard category</th>
<th>Route of exposure</th>
<th>H Phrases</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sulfur hexafluoride</strong></td>
<td>Gases under pressure</td>
<td>Liquefied gas</td>
<td></td>
<td>H280</td>
</tr>
<tr>
<td><strong>Hydrogen fluoride</strong></td>
<td>Acute toxicity</td>
<td>Category 2</td>
<td>Inhalation</td>
<td>H330</td>
</tr>
<tr>
<td></td>
<td>Acute toxicity</td>
<td>Category 1</td>
<td>Dermal</td>
<td>H310</td>
</tr>
<tr>
<td></td>
<td>Acute toxicity</td>
<td>Category 2</td>
<td>Oral</td>
<td>H300</td>
</tr>
<tr>
<td></td>
<td>Skin corrosion</td>
<td>Category 1A</td>
<td></td>
<td>H314</td>
</tr>
<tr>
<td><strong>Thionyl difluoride</strong></td>
<td>Acute toxicity</td>
<td>Category 3</td>
<td>Oral</td>
<td>H301</td>
</tr>
<tr>
<td></td>
<td>Acute toxicity</td>
<td>Category 3</td>
<td>Inhalation</td>
<td>H331</td>
</tr>
<tr>
<td></td>
<td>Eye irritation</td>
<td>Category 2</td>
<td>Dermal</td>
<td>H319</td>
</tr>
<tr>
<td></td>
<td>Skin irritation</td>
<td>Category 2</td>
<td></td>
<td>H315</td>
</tr>
<tr>
<td></td>
<td>Target Organ Systemic Toxicant - Single exposure</td>
<td>Category 3</td>
<td></td>
<td>H335</td>
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<tr>
<td><strong>Disulfur decafluoride</strong></td>
<td>Acute toxicity</td>
<td>Category 2</td>
<td>Inhalation</td>
<td>H330</td>
</tr>
<tr>
<td></td>
<td>Skin corrosion</td>
<td>Category 1A</td>
<td>Dermal</td>
<td>H314</td>
</tr>
</tbody>
</table>

### 3.2.3. Hazardous components - European Directive 67/548/EEC or 1999/45/EC, as amended

<table>
<thead>
<tr>
<th>Substance name</th>
<th>Classification</th>
<th>Hazard category</th>
<th>R-phrase(s)</th>
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<tr>
<td><strong>Hydrogen fluoride</strong></td>
<td>T+</td>
<td>Very toxic</td>
<td>R26/27/28</td>
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<tr>
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<td>C</td>
<td>Corrosive</td>
<td>R35</td>
</tr>
<tr>
<td><strong>Thionyl difluoride</strong></td>
<td>T</td>
<td>Toxic</td>
<td>R23/25</td>
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<tr>
<td></td>
<td>Xi</td>
<td>Irritant</td>
<td>R36/37/38</td>
</tr>
<tr>
<td><strong>Disulfur decafluoride</strong></td>
<td>T+</td>
<td>Very toxic</td>
<td>R26</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>Corrosive</td>
<td>R34</td>
</tr>
</tbody>
</table>

## SECTION 4. FIRST AID MEASURES

### 4.1. Description of first aid measures

#### 4.1.1. If inhaled
- Remove to fresh air.
- Oxygen or artificial respiration if needed.
- If symptoms persist, call a physician.
- Exposure to decomposition products:
  - If inhaled
  - Remove to fresh air.
  - Immediate medical attention is required.
4.1.2. In case of eye contact
- Keep eyelids open to allow evaporation of product.
- Rinse thoroughly with plenty of water, also under the eyelids.
- If eye irritation persists, consult a specialist.

4.1.3. In case of skin contact
- Allow to evaporate.
- Rinse with lukewarm running water.
- If symptoms persist, call a specialist.

4.1.4. If swallowed
- not applicable

4.2. Most important symptoms and effects, both acute and delayed

4.2.1. Inhalation
- Risk of cardiac and nervous disorders.
- Symptoms: narcosis, Cough, Asphyxia
- Risk of: Lung oedema
- In case of higher concentrations: chemical pneumonitis, chronic bronchitis

4.2.2. Skin contact
- Cold sensation followed by redness of the skin.
- Prolonged skin contact may defat the skin and produce dermatitis.

4.2.3. Eye contact
- Severe eye irritation
- Symptoms: Lachrymation, Redness, Swelling of tissue

4.2.4. Ingestion
- gas
- not applicable

4.3. Indication of any immediate medical attention and special treatment needed
- Immediate medical attention is not required.
- When symptoms persist or in all cases of doubt seek medical advice.

SECTION 5. FIREFIGHTING MEASURES

5.1. Extinguishing media

5.1.1. Suitable extinguishing media
- Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

5.1.2. Unsuitable extinguishing media
- None.

5.2. Special hazards arising from the substance or mixture
- The product is not flammable.
- Heating can release hazardous gases.
- Container may explode if heated.

5.3. Advice for firefighters
- Wear self-contained breathing apparatus and protective suit.
- Fire fighters must wear fire resistant personnel protective equipment.
- Wear chemical resistant oversuit
- Protect intervention team with a water spray as they approach the fire.
- Clean contaminated surface thoroughly.
SECTION 6. ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. Advice for non-emergency personnel
- Prevent further leakage or spillage if safe to do so.
- Keep away from Incompatible products.

6.1.2. Advice for emergency responders
- Approach from upwind.
- Suppress (knock down) gases/vapours/mists with a water spray jet.
- Avoid spraying the leak source.
- Try to re-position leaking containers, to have the leak in the gaseous phase.
- Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.
- Keep away from open flames, hot surfaces and sources of ignition.

6.2. Environmental precautions
- Should not be released into the environment.

6.3. Methods and materials for containment and cleaning up
- Allow to evaporate.
- Prevent product from entering drains.

6.4. Reference to other sections
- Refer to protective measures listed in sections 7 and 8.

SECTION 7. HANDLING AND STORAGE

7.1. Precautions for safe handling
- Used in closed system
- Use only in well-ventilated areas.
- Use only equipment and materials which are compatible with the product.
- Prevent any product decomposition from contacting hot spots.
- Prevent product vapours decomposition from electric arc action (welding).
- Keep away from Incompatible products.

7.2. Conditions for storage, including incompatibilities

7.2.1. Storage
- Keep in a well-ventilated place.
- Keep only in the original container at a temperature not exceeding 50 °C.
- Keep away from Incompatible products.
- Refer to protective measures listed in sections 7 and 8.

7.2.2. Packaging material
7.2.2.1. Suitable material
- Steel drum

7.3. Specific end use(s)
- For further information, please contact: Supplier

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

8.1.1. Exposure Limit Values

Sulfur hexafluoride
- UK_EH40 Workplace Exposure Limits (WELs) 12 2011
  time weighted average = 1,000 ppm
  time weighted average = 6,070 mg/m3
- **UK. EH40 Workplace Exposure Limits (WELs) 12 2011**
  - short term exposure limit = 1,250 ppm
  - Short term exposure limit = 7,590 mg/m3
- **US. ACGIH Threshold Limit Values 03 2013**
  - time weighted average = 1,000 ppm

**Hydrogen fluoride**
- **UK. EH40 Workplace Exposure Limits (WELs) 12 2011**
  - time weighted average = 1.8 ppm
  - time weighted average = 1.5 mg/m3
  - Remarks: as F
- **UK. EH40 Workplace Exposure Limits (WELs) 12 2011**
  - Short term exposure limit = 3 ppm
  - Short term exposure limit = 2.5 mg/m3
  - Remarks: as F
- **US. ACGIH Threshold Limit Values 03 2013**
  - time weighted average = 0.5 ppm
  - Remarks: as F
- **US. ACGIH Threshold Limit Values 03 2013**
  - Ceiling Limit Value = 2 ppm
  - Remarks: as F
  - time weighted average = 1.8 ppm
  - time weighted average = 1.5 mg/m3
  - Remarks: Indicative
  - Short term exposure limit = 3 ppm
  - Short term exposure limit = 2.5 mg/m3
  - Remarks: Indicative
- **US. ACGIH Threshold Limit Values 03 2013**
  - Remarks: as F, Can be absorbed through skin.

**Thionyl difluoride**
- **UK. EH40 Workplace Exposure Limits (WELs) 12 2011**
  - time weighted average = 2.5 mg/m3
  - Remarks: as F
- **US. ACGIH Threshold Limit Values 03 2013**
  - time weighted average = 2.5 mg/m3
  - Remarks: as F
  - time weighted average = 2.5 mg/m3
  - Remarks: Indicative

**Disulfur decafluoride**
- **US. ACGIH Threshold Limit Values 03 2013**
  - Ceiling Limit Value = 0.01 ppm
- **UK. EH40 Workplace Exposure Limits (WELs) 12 2011**
  - time weighted average = 2.5 mg/m3
  - Remarks: as F
  - time weighted average = 2.5 mg/m3
  - Remarks: Indicative

**Carbon tetrafluoride**
- **US. ACGIH Threshold Limit Values**
8.1.2. Other information on limit values

8.1.2.1. Predicted No Effect Concentration

**Sulfur hexafluoride**

- Fresh water, 0.15 mg/l, Water
- Intermittent use/release, 1.5 mg/l, Water

8.1.2.2. Derived No Effect Level / Derived minimal effect level

**Sulfur hexafluoride**

- Workers, Inhalation, Long-term exposure, 77900 mg/m³, Systemic effects, Local effects
- Consumers, Inhalation, Long-term exposure, 23254 mg/m³, Systemic effects, Local effects

8.2. Exposure controls

8.2.1. Appropriate engineering controls

- Ensure adequate ventilation.
- Apply technical measures to comply with the occupational exposure limits.

8.2.2. Individual protection measures

8.2.2.1. Respiratory protection

- Self-contained breathing apparatus in confined spaces/insufficient oxygen/in case of large uncontrolled emissions/in all circumstances when the mask and cartridge do not give adequate protection.
- Use only respiratory protection that conforms to international/ national standards.

8.2.2.2. Hand protection

- Suitable material: Copolymer VF2-HFP (fluoroelastomer)

8.2.2.3. Eye protection

- Chemical resistant goggles must be worn.

8.2.2.4. Skin and body protection

- Wear suitable protective clothing.

8.2.2.5. Hygiene measures

- When using, do not eat, drink or smoke.
- Gloves, overalls and boots have to be double layered (protection against cold temperature).
- Handle in accordance with good industrial hygiene and safety practice.

8.2.3. Environmental exposure controls

- Dispose of rinse water in accordance with local and national regulations.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

9.1.1. General Information

- Appearance: Liquefied gas
- Colour: colourless
- Odour: pungent
- Molecular weight: 146 g/mol

9.1.2. Important health safety and environmental information

- **pH**: 2 - 5
- **pKa**: not applicable
- **Melting point/freezing point**: -50.8 °C (Sulfur hexafluoride)
- **Boiling point/boiling range**: -63.8 °C. Sublimation point (Sulfur hexafluoride)
- **Flash point**: not applicable
SAFETY DATA SHEET
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USED SULFUR HEXAFLUORIDE

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- Evaporation rate: No data
- Flammability (solid, gas): The product is not flammable.
- Flammability: not applicable
- Explosive properties: Not explosive
- Vapour pressure: 21.4 bar, at 20 °C
- Vapour density: 5.1 (Sulfur hexafluoride)
- Density: no data available
- Relative density: no data available
- Bulk density: not applicable
- Solubility(ies): 0.04 g/l, at 20 °C, Water
- Solubility/qualitative: slightly soluble, Water, Alcohol, Ether
- Partition coefficient: n-octanol/water: log Pow: 1.68
- Auto-ignition temperature: No data
- Decomposition temperature: 200 °C, Decomposition under influence of moisture is highly accelerated by heating.
- 800 °C
- Viscosity: not applicable
- Oxidizing properties: No data

9.2. Other information
Remarks: no data available

SECTION 10. STABILITY AND REACTIVITY

10.1. Reactivity
- Decomposition under influence of moisture is highly accelerated by heating.

10.2. Chemical stability
- Stable under recommended storage conditions.
- Vapours are heavier than air and may spread along floors.
- Hazardous Polymerisation/Polymerization: no

10.3. Possibility of hazardous reactions
- no data available

10.4. Conditions to avoid
- Heat.

10.5. Incompatible materials
- Oxidizing agents

10.6. Hazardous decomposition products
- Gaseous hydrogen fluoride (HF), Sulphur oxides, Sulphur compounds, Thionyl difluoride, Disulfur decafluoride
- The release of other hazardous decomposition products is possible.
SECTION 11. TOXICOLOGICAL INFORMATION

11.1. Acute toxicity
11.1.1. Acute oral toxicity
- not applicable
11.1.2. Acute inhalation toxicity
- LC50, 10 min, Various species, 0.1 - 0.9 mg/l (Disulfur decafluoride)
- LC50, 1 h, rat, 2240 - 2340 ppm (Hydrogen fluoride)
11.1.3. Acute dermal toxicity
- not applicable
11.2. Skin corrosion/irritation
- corrosive effects (Hydrogen fluoride)
11.3. Serious eye damage/eye irritation
- Corrosive (Hydrogen fluoride)
11.4. Sensitisation
- not applicable
11.5. Mutagenicity
- In vitro tests did not show mutagenic effects (Sulfur hexafluoride)
- In vivo tests did not show mutagenic effects (Sulfur hexafluoride)
11.6. Carcinogenicity
- Animal testing did not show any mutagenic effects. (Sulfur hexafluoride)
11.7. Toxicity for reproduction
- no data available
11.8. Specific target organ toxicity - single exposure
- Remarks: Corrosive to respiratory system (Thionyl difluoride)
11.9. Repeated dose toxicity
- Inhalation, 28-day, rat, no observed effect (Sulfur hexafluoride)
11.10. Other information
- Presents a risk due to the presence of possible contaminants.

SECTION 12. ECOLOGICAL INFORMATION

12.1. Toxicity
- Fishes, LC50, 96 d, 236 mg/l, calculated value (Sulfur hexafluoride)
- Crustaceans, LC50, 48 h, 247 mg/l (Sulfur hexafluoride)
- Algae, EC50, 96 h, 151 mg/l (Sulfur hexafluoride)
12.2. Persistence and degradability
12.2.1. Abiotic degradation
- Air, t 1/2 > 1,000 y
- Result: non-significant photolysis (Sulfur hexafluoride)
- Water/soil, t 1/2 (Hydrolysis) 1,000 y
- Result: non-significant hydrolysis (Sulfur hexafluoride)
12.2.2. Biodegradation
- The methods for determining biodegradability are not applicable to inorganic substances.
12.3. Bioaccumulative potential
- Does not bioaccumulate.
12.4. Mobility in soil
- **Soil/sediments**, non-significant adsorption (Sulfur hexafluoride)
- **Water**, t1/2: 3.5 h
  Conditions: calculated value
  The product evaporates readily. (Sulfur hexafluoride)
- **Air**, Henry's law constant (H), ca. 458 kPa·m³/mol, 25 °C
  Conditions: calculated value
  considerable volatility (Sulfur hexafluoride)

12.5. Results of PBT and vPvB assessment
- This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
- This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

12.6. Other adverse effects
- Global Warming Potential :
  = 23,900
  Halocarbon global warming potential; HGWP; (R-11 = 1) (Sulfur hexafluoride)

SECTION 13. DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods
- In accordance with local and national regulations.
- Refer to manufacturer/supplier for information on recovery/recycling.

13.2. Contaminated packaging
- To avoid treatments, as far as possible, use dedicated containers.

SECTION 14. TRANSPORT INFORMATION

International transport regulations
- IATA-DGR
  14.1. UN number UN 3308
  14.2. UN proper shipping name LIQUEFIED GAS, TOXIC, CORROSIVE, N.O.S. (MIXTURE, CONTAINS SULPHUR HEXAFLUORIDE AND HYDROFLUORIC ACID)

  14.3. Transport hazard class(es)
    Hazard class FORBIDDEN
    Labels 2.3 - Toxic gas
            8 - Corrosive

  14.4. Packing group
  14.5. Environmental hazards
  14.6. Special precautions for user

- IMDG
  14.1. UN number UN 3308
  14.2. UN proper shipping name LIQUEFIED GAS, TOXIC, CORROSIVE, N.O.S. (MIXTURE, CONTAINS SULPHUR HEXAFLUORIDE AND HYDROFLUORIC ACID)
14.3. Transport hazard class(es)
    Hazard class  2.3
    Labels  2.3 - Toxic gasses
             8 - Corrosive

14.4. Packing group
14.5. Environmental hazards
14.6. Special precautions for user
    EmS  F-C
         S-U

- ADR
  14.1. UN number  UN 3308
  14.2. UN proper shipping name  LIQUEFIED GAS, TOXIC, CORROSIVE, N.O.S. (MIXTURE, CONTAINS SULPHUR HEXAFLUORIDE AND HYDROFLUORIC ACID)

14.3. Transport hazard class(es)
    Hazard class  2
    Labels  2.3 - Toxic gas
             8 - Corrosive

14.4. Packing group
14.5. Environmental hazards
14.6. Special precautions for user
    HI/UN No.  268 / 3308
    Tunnel restriction code  C/D

- RID
  14.1. UN number  UN 3308
  14.2. UN proper shipping name  LIQUEFIED GAS, TOXIC, CORROSIVE, N.O.S. (MIXTURE, CONTAINS SULPHUR HEXAFLUORIDE AND HYDROFLUORIC ACID)

14.3. Transport hazard class(es)
    Hazard class  2
    Labels  2.3 - Toxic gas
             8 - Corrosive

14.4. Packing group
14.5. Environmental hazards
14.6. Special precautions for user
    HI/UN No.  268 / 3308

- ADN
  14.1. UN number  UN 3308
  14.2. UN proper shipping name  LIQUEFIED GAS, TOXIC, CORROSIVE, N.O.S. (MIXTURE, CONTAINS SULPHUR HEXAFLUORIDE AND HYDROFLUORIC ACID)
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14.3. Transport hazard class(es)
   Hazard class  2
   Labels  2.3 - Toxic gas
            8 - Corrosive

14.4. Packing group
14.5. Environmental hazards
14.6. Special precautions for user

SECTION 15. REGULATORY INFORMATION

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture
     the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), as amended
     approximation of the laws, regulations and administrative provisions of the Member States relating to the
     classification, packaging and labelling of dangerous preparations, as amended
     classification, labelling and packaging of substances and mixtures, as amended

15.1.1. Notification status

<table>
<thead>
<tr>
<th>Inventory Information</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA. Toxic Substances Control Act (TSCA)</td>
<td>- In compliance with inventory</td>
</tr>
<tr>
<td>Australia. Inventory of Chemical Substances (AICS)</td>
<td>- One or more components not listed on inventory</td>
</tr>
<tr>
<td>Canada. Domestic Substances List (DSL)</td>
<td>- In compliance with inventory</td>
</tr>
<tr>
<td>Canada. Non-Domestic Substances List (NDSL)</td>
<td>- =&gt;CAS: 2551-62-4 &amp; 75-73-0</td>
</tr>
<tr>
<td>China. Inventory of Existing Chemical Substances (IECSC)</td>
<td>- One or more components not listed on inventory</td>
</tr>
<tr>
<td>EU list of existing chemical substances (EINECS)</td>
<td>- In compliance with inventory</td>
</tr>
<tr>
<td>Japan. Inventory of Existing &amp; New Chemical Substances (ENCS)</td>
<td>- One or more components not listed on inventory</td>
</tr>
<tr>
<td>New Zealand. Inventory of Chemicals (NZIOC)</td>
<td>- In compliance with inventory</td>
</tr>
<tr>
<td>Korea. Existing Chemicals Inventory (KECI KR)</td>
<td>- One or more components not listed on inventory</td>
</tr>
<tr>
<td>Philippine. Inventory of Chemicals and Chemical Substances (PICCS)</td>
<td>- One or more components not listed on inventory</td>
</tr>
<tr>
<td>Mexico INSQ (INSQ)</td>
<td>- One or more components not listed on inventory</td>
</tr>
</tbody>
</table>

15.2. Chemical Safety Assessment
   - no data available

SECTION 16. OTHER INFORMATION

16.1. Full text of H-Statements referred to under section 3
   H280  - Contains gas under pressure; may explode if heated.
   H300  - Fatal if swallowed.
   H301  - Toxic if swallowed.
   H310  - Fatal in contact with skin.
   H314  - Causes severe skin burns and eye damage.
   H315  - Causes skin irritation.
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H319 - Causes serious eye irritation.
H330 - Fatal if inhaled.
H331 - Toxic if inhaled.
H335 - May cause respiratory irritation.

16.2. Full text of R-phrases referred to under sections 2 and 3

16.2.1. Full text of R-phrases referred to under section 2

R23  - Toxic by inhalation.
R21/22 - Harmful in contact with skin and if swallowed.
R36/37/38 - Irritating to eyes, respiratory system and skin.

16.2.2. Full text of R-phrases referred to under section 3

R23/25  - Toxic by inhalation and if swallowed.
R26  - Also very toxic by inhalation.
R26/27/28  - Very toxic by inhalation, in contact with skin and if swallowed.
R34  - Causes burns.
R35  - Causes severe burns.
R36/37/38 - Irritating to eyes, respiratory system and skin.

16.3. Other information

- Update
  This data sheet contains changes from the previous version in section(s): 1.3,2.1.1,8.1.1,8.1.2.2,15.1

This SDS is only intended for the indicated country to which it is applicable. The European SDS format compliant with the applicable European legislation is not intended for use nor distribution in countries outside the European Union with the exception of Norway and Switzerland. Safety datasheets applicable in other countries/regions are available upon request.

The information given corresponds to the current state of our knowledge and experience of the product, and is not exhaustive. This applies to product which conforms to the specification, unless otherwise stated. In this case of combinations and mixtures one must make sure that no new dangers can arise. In any case, the user is not exempt from observing all legal, administrative and regulatory procedures relating to the product, personal hygiene, and protection of human welfare and the environment.

Print Date: 13.03.2014
APPENDIX 2: LABEL FOR SF6 - REUSE – PACKAGING

Used Sulfur Hexafluoride · Hexafluorure de soufre usé · Hexafluoruro de azufre usado

Signal Words:
Gefahr, Danger, danger, peligro, Pericolo, gevaar, perigo

Made in Germany
Emergency Telephone +44 (0) 1235 239 670
<table>
<thead>
<tr>
<th>Absender (Name, Anschrift, Land)</th>
<th>Versandort</th>
<th>Ort/Lieu</th>
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<tbody>
<tr>
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<td>Beladestelle</td>
<td>Gemeinde-Bereich</td>
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<td>Land / Pays</td>
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**FRACHTBRIEF**

Für den gewerblichen Güterkraftverkehr

national/international

*Nichtzutreffendes streichen!*

<table>
<thead>
<tr>
<th>Nr.</th>
<th>Empfänger (Name, Anschrift, Land)</th>
<th>Destinataire (nom, adresse, pays)</th>
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<td>Gemeinde-Bereich</td>
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<tr>
<td></td>
<td>Land/Pays</td>
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<table>
<thead>
<tr>
<th>Versandort</th>
<th>Ort/Lieu</th>
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<tbody>
<tr>
<td>Beladestelle</td>
<td>Gemeinde-Bereich</td>
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<tr>
<td>Land / Pays</td>
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**Erklärungen, Vereinbarungen**

(ggf. Hinweis auf Spezialfahrzeuge)

Anweisungen des Absenders (Zoll- und sonstige amtliche Behandlung)

Instructions de l’expéditeur (formalités et autres)

---

<table>
<thead>
<tr>
<th>Druckfass Schwefelhexafluorid aus elektrischen Anlagen</th>
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</thead>
<tbody>
<tr>
<td>Gefahrart: netto: … kg</td>
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<tr>
<td>UN 3308 verflüssigtes Gas, giftig, ätzend, N.A.G. (Mischung aus Schwefelhexafluorid und Fluorwasserstoff), 2.3 (8) (C/D)</td>
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</table>

<table>
<thead>
<tr>
<th>Kennzeichen/Nr.</th>
<th>Anzahl der Packstücke</th>
<th>Art der Verpackung</th>
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<tbody>
<tr>
<td>Marques et numéros</td>
<td>No. des colis</td>
<td>Mode d’emballage</td>
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<table>
<thead>
<tr>
<th>Art der Verpackung</th>
<th>Bezeichnung des Gutes</th>
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</thead>
<tbody>
<tr>
<td>Mode d’emballage</td>
<td>Nature de la marchandise</td>
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<table>
<thead>
<tr>
<th>Bruttogewicht kg</th>
<th>Poids brut kg</th>
<th>Umfang m³</th>
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**Sondervorschriften**

Prescriptions particulières

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<table>
<thead>
<tr>
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<tr>
<td>Empfang der Sendung bescheinigt</td>
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<tr>
<td>Empfänger (Signature et timbre du destinataire)</td>
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<tr>
<td>Frachtberechnung im Binnenverkehr</td>
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<tr>
<td>Bezeichnung</td>
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<td>Frachtpf. Gew.</td>
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<table>
<thead>
<tr>
<th>Frachtberechnung im Binnenverkehr</th>
<th>Zusätzliche Vereinbarungen</th>
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<tbody>
<tr>
<td>Betrag</td>
<td>Summe</td>
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<table>
<thead>
<tr>
<th>Euro-Palette</th>
<th>Gitterbox-Palette</th>
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<tr>
<td>Einfach-Palette</td>
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<table>
<thead>
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<th>Art</th>
<th>Anzahl</th>
<th>Kein Tausch</th>
<th>Tausch</th>
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<tbody>
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<table>
<thead>
<tr>
<th>Bestätigung des Empfängers/Datum/Unterschrift</th>
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</thead>
<tbody>
<tr>
<td>Bestätigung des Fahrers/Datum/Unterschrift</td>
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| + _____ % Umsatzsteuer |
| Beförderungs-entgelt, Gesamtsumme |

<table>
<thead>
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<th>Nettobetrag</th>
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