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<b>Technical Rules for Hazardous Substances</b>	<b>Risks resulting from skin contact - identification, assessment, measures</b>	<b>TRGS 401</b>
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The Technical Rules for Hazardous Substances (TRGS) reflect the state of technology, occupational health and occupational hygiene as well as other sound knowledge for activities involving hazardous substances including their classification and labelling. The

### **Committee on Hazardous Substances (AGS)**

establishes the rules and adapts them to the current state of development accordingly.

The TRGS rules are announced by the Federal Ministry of Labour and Social Affairs (BMAS) in the Joint Ministerial Gazette (GMBI).

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## **1 Scope**

- (1) The present TRGS applies to activities involving skin contact with substances, preparations or articles.
- (2) Hazard due to skin contact is present when,
  1. in wet work or
  2. in activities involving hazardous substances which are harmful to skin or skin-resorptive, it is not possible to discount the possibility of a health hazard for the workers. A hazard may also be present when the hazardous substances are not labelled as such (see also number 3.2.3).
- (3) Under the Hazardous Substances Ordinance the employer has the duty within the framework of his risk assessment to identify and assess the nature, extent and duration of the dermal hazard and to lay down the protective measures required to prevent or minimise the hazard due to skin contact.
- (4) The present TRGS supports the employer with respect to his duties under paragraph 3 and in the selection and evaluation of personal protective equipment and skin protection agents.
- (5) The present TRGS must be applied in addition to TRGS 400 "Risk assessment for activities involving hazardous substances" if there are no standardised working procedures for the activities being assessed which involve skin contact with agents in accordance with number 5.1 para. 1 of TRGS 400 and none are used for the risk assessment.
- (6) Standardised working procedures and the conditions for their application are listed in number 5.1 of TRGS 400. They include
  1. a substance or activity-specific TRGS, in particular VSK according to TRGS 420, "Process- and substance-related criteria (VSK) for the risk assessment",
  2. concrete measures or procedures of a sector or activity-specific aid according to Annex 1 of the present TRGS,
  3. a provided risk assessment,where these contain specific statements on the skin exposure and protective measurements and are directly transferable to the activities being assessed.
- (7) For substances which may cause sensitisation both by skin contact and inhalation (R42/43) TRBA/ TRGS 406 "Sensitising substances for the respiratory tracts" applies in addition.

## **2 Definitions**

### **2.1 Skin contact**

Skin contact is direct contact of the skin with liquids, pastes, solids, including the wetting of the skin by splashes or contact with contaminated work clothing including personal protective equipment or contaminated work surfaces or work equipment. Skin contact also includes contact between aerosols, gases and vapours and the skin.

### **2.2 Harmful to skin (see also number 3.2.1)**

(1) Substances and preparations which are harmful to skin are those which may have damaging effects on skin after contact (e.g. in the form of burns, irritation and/or sensitisation). The following R-phrases refer to a corresponding property: R 34 (causes burns), R 35 (causes severe burns), R 38 (irritating to the skin), R 43 (may cause sensitisation by skin contact), R 66 (repeated exposure may cause skin dryness or cracking).

(2) This also includes substances or preparations which do not fulfil the criteria for the above-mentioned R-phrases, but which may harm the skin with extended or repeated exposure. Mechanical effects (friction, micro-lesions) can also be included here.

### **2.3 Skin-resorptive (see also number 3.2.2)**

Substances are skin-resorptive which can be taken in on account of their physical-chemical properties. The following R-phrases refer to a corresponding property: R 21 (harmful in contact with skin), R 24 (toxic in contact with skin), R 27 (very toxic in contact with skin), and all combinations with these R-phrases.

### **2.4 Wet work (see also number 3.3.4)**

Activities during which workers spend a considerable portion of their working time in a wet environment or wear liquid-proof gloves or wash their hands frequently or intensively count as wet work.

### **3 Information gathering**

#### **3.1 General**

(1) The employer must gather the information required for the risk assessment and establishment of measures with respect to all activities, working procedures and working conditions with a view to skin contact with substances, preparations and articles.

(2) The following must be identified:

1. Harmful properties of agents such as:
  - a) harmful to skin (see number 2.2),
  - b) skin-resorptive (see number 2.3),
  - c) other properties which may lead to a hazard for skin (e.g. degreasing).
2. Activities and working procedures to facilitate an estimation of the nature, extent and duration of possible skin contact,
3. Working conditions of a physical and chemical nature which may increase the hazard for workers (e.g. wet work or abrasive properties of the agents, work equipment).

#### **3.2 Gathering of substance-related information**

(1) In order to gather substance-related information the employer must refer in particular to the following sources: labelling, safety data sheet, technical specification, TRGS 900 "Occupational exposure limits", TRGS 905 "List of carcinogenic or mutagenic substances or substances toxic to reproduction", TRGS 906 "List of carcinogenic activities or processes according to Section 3 Subs. 2 No. 3 GefStoffV", TRGS 907 "List of sensitising substances" and the list of MAK and BAT values of the DFG.

(2) Where there is no labelling it must not be automatically assumed that there is no hazard. A check should therefore be made to establish whether the safety data sheet or other product information documents refer to properties which are harmful to skin, skin-resorptive or otherwise relevant. If they do not contain such information (e.g. no indication of the pH value for aqueous solutions, or a lack of details concerning skin resorption), an enquiry can be directed at the manufacturer or person placing the product on the market asking whether such hazards are present (Section 7 Subs. 2 GefStoffV). Furthermore specialists can refer to the properties of chemically similar substances (structure-effect relationships) to estimate the hazard.

(3) If there is no information on harmfulness to skin or skin resorption (e.g. in chapter 8 or 11 of the safety data sheet or in sector regulations according to Annex 1), at least the following must be implemented:

1. protective measures for properties which irritate skin (R 38) and
2. protective measures for the skin-resorptive properties (R 24).

(4) If a hazardous substance is classified with R-phrases of column 1 in the following table and if there is no information in chapter 11 of the safety data sheet concerning skin-resorptive properties, the protective measures for skin-resorptive properties according to the R-phrases in column 2 must be taken.

<b>When classifying with R-phrase xx and when there is a lack of information on skin resorption in chapter 11 of the safety data sheet</b>	<b>Take protective measures in accordance with</b>
R 20 (harmful by inhalation) R 22 (harmful if swallowed)	R 21 (harmful in contact with skin)
R 23 (toxic by inhalation) R 25 (toxic if swallowed)	R 24 (toxic in contact with skin)
R 26 (very toxic by inhalation) R 28 (very toxic if swallowed)	R 27 (very toxic in contact with skin)

Table 1: Protective measures where there are no details on skin resorption available

### 3.2.1 Hazardous substances which are harmful to skin

(1) Hazardous substances are harmful to skin when they result in irritative reactions on the skin (reddening of the skin, irritative contact eczema) or in serious skin damage, or which have skin-sensitising properties and display one of the following criteria:

Classification with:

1. R 34 (causes burns),
2. R 35 (causes severe burns),
3. R 38 (irritating to skin),
4. R 43 (may cause sensitisation by skin contact)
5. R 66 (repeated exposure may cause skin dryness or cracking) or
6. pH value  $\leq 2$  or  $\geq 11.5$  which leads to classification as causing burns if no contrary knowledge is available.

(2) Further information on skin-sensitising substances is given in TRGS 900 (labelling "Sh") and TRGS 907. Substances which have a sensitising effect on skin and respiratory tracts are labelled with R 42/43 or in TRGS 900 with "Sah". For these substances TRBA/TRGS 406 must be complied with in addition.

(3) Substances which are sensitising/toxic through UV light (phototoxic/photosensitising substances) may cause oversensitivity in combination with exposure to sunlight. These include substances such as chlorpromazine which can cause photoallergic reactions in individual workers, and other substances (e.g. psoralene and other furocoumarins in plants), which may cause phototoxic reactions among a large number of workers where there is a corresponding exposure to sunlight.

### 3.2.2 Skin-resorptive hazardous substances

(1) Skin-resorptive hazardous substances can be taken in both through predamaged skin and intact skin and may cause disorders of bodily organs. These are hazardous substances if they display one of the following criteria:

1. Named as skin-resorptive in TRGS 900 and TRGS 905
2. Classification with
  - a) R 21 (harmful in contact with skin),
  - b) R 24 (toxic in contact with skin),
  - c) R 27 (very toxic in contact with skin) and
3. all combination with these R-phrases,
  - a) in particular with R 39/... (danger of very serious, irreversible effects),
  - b) R 48/... (danger of serious damage to health by prolonged exposure) or
  - c) R 68/.... (possible risk of irreversible effects).

(2) Substances labelled with "H" in in the list of MAK and BAT values of the DFG are also to be regarded as skin-resorptive.

(3) Annex 2 number 2 contains examples of substance groups with which, experience shows, it must be assumed that there is a harmful effect if resorbed by the skin.

(4) For hazardous substances labelled with one of the following R-phrases or which are classified accordingly in TRGS 905, it is always necessary to determine whether they can be resorbed through skin:

1. R 39 (danger of very serious irreversible effects),
2. R 40 (limited evidence of a carcinogenic effect),
3. R 62 (possible risk of impaired fertility) or R 63 (possible risk of harm to the unborn child),
4. R 45 (may cause cancer),
5. R 46 (may cause heritable genetic damage),
6. R 60 (may impair fertility) or R 61 (may cause harm to the unborn child),
7. R 68 (possible risk of irreversible effects).

Examples of such hazardous substances with skin-resorptive properties are listed in Annex 2 number 3. A relevant resorption via the skin must be assumed if there is no contrary knowledge or if no information is available.

(5) With skin-resorptive hazardous substances in particular both direct skin contact and resorption of the substance via the gaseous/vapour phase or aerosols must be considered. Annex 2 number 1 gives examples of substances where resorption via the gaseous/vapour phase is an additional, relevant resorption path.

(6) In the case of contact with hazardous substances which are themselves not skin-resorptive or only slightly so, there is the possibility that they can be resorbed through the skin in combination with other substances. In the risk assessment the

greater resorption of hazardous substances through substances with carrier effects must be considered. Important examples of substances which act as carriers are dimethylsulphoxide (DMSO), N,N-dimethylformamide (DMF) and glycol compound.

### 3.2.3 Other substances (see also TRGS 400)

Cosmetic agents, foodstuffs and food additives, animal feed and animal feed additives, medications, medical products, tobacco products, waste products to be disposed of and used oil and waste water do not basically have to be labelled as such, but they may also be hazardous substances on skin contact at the workplace if they have dangerous properties within the meaning of the Hazardous Substances Ordinance. The hazardous substances also include the constituents of plants and animals if they display dangerous properties (e.g. sensitising according to TRGS 907).

## 3.3 Gathering of activity-related information

(1) The employer must determine

1. the nature, extent and duration of the skin contact and
2. the workplace conditions which lead to an increase in the hazard.

(2) In addition it must be checked whether skin contact and/or resorption via the gaseous/vapour phase or aerosols is possible.

(3) The results of precautionary occupational medical examinations (according to Annex V GefStoffV) must be taken into account, while respecting the mandatory confidentiality of doctors. Where, within the framework of precautionary occupational medical examinations according to Section 16 Subs. 1 GefStoffV biomonitoring is introduced, the results for skin-resorptive hazardous substances must be included in the determination of the extent and duration of the skin contact.

### 3.3.1 Nature of the skin contact

(1) Skin contact may arise directly, for example, by splashes, aerosols, wetting of skin via work equipment or indirectly by, for example, through contaminated clothing or contaminated surfaces.

### 3.3.2 Extent of skin contact

(1) The extent of skin contact is established by the size of the exposed area of the body surfaces affected and the frequency and intensity of the contact. It must be determined by an analysis of the activities or the working process. Account must be taken of the quantity of the substance acting on the skin, including the concentration.

(2) A distinction is drawn between

1. large-area skin contact (wetting of the skin or contact via vapour or gaseous phase or by aerosols) and
2. small-area skin contact (e.g. splashes).

### 3.3.3 Duration of skin contact

(1) The duration of skin contact can be estimated taking account of the following breakdown:

1. short-term effect (< 15 minutes/shift),
2. long-term effect (> 15 minutes/shift).

If repeated skin contact is to be expected, the exposure times with the respective hazardous substance over a shift must be taken into account.

(2) Where there is a hazard due to contact with skin the duration of skin contact begins with the contamination of the skin by the hazardous substance concerned and only ends with its effective removal.

### 3.3.4 Hazardous working conditions, including wet work

(1) Working conditions which lead to a hazard to skin or increase the corresponding effect of agents are:

1. heavy soiling or mechanical load (microlesions from sharp-edged particles) which can damage the skin beforehand,
2. exposure to other agents which exhibit a harmful effect to skin but are not classified in this respect according to the criteria of the Hazardous Substances Ordinance - GefStoffV (e.g. application solutions of detergents, disinfectants, cooling lubricants and many degreasing solvents) as well as
3. acid or alkali environment which does not result in a classification, but can lead to irritative changes to skin after prolonged contact.

(2) The employer must determine whether the criteria for wet work are present. Wet work includes activities where the workers

1. perform the work for a major portion of their working time, i.e. regularly more than two hours per day, with their hand in a wet environment or
2. have to wash their hands frequently or intensively or
3. wear protective gloves with occlusion effects (accumulation of heat and moisture) for a corresponding period. The liquid-tight effect of protective gloves prevents the dissipation of perspiration to the outside and so the skin swells up as the time the gloves are worn increases, which lessens their barrier effect. Because the skin is predamaged in this way, it becomes easier for irritants, potentially allergenic (sensitising) substances or infectious agents to penetrate.

(3) The times of working in a wet environment and the times for which liquid-tight gloves are worn must be added together if no effective measures are taken to regenerate the skin.

## **4 Risk assessment**

### **4.1 General remarks**

(1) The employer must assess the risk and establish the necessary measures on the basis of the information in number 3 with reference to

1. the substance properties,
2. the nature, extent and duration of skin contact and
3. the additional information to be gathered

(2) In the risk assessment account must also be taken of possible contact with contaminated work clothing, personal protective equipment, and contaminated work surfaces and equipment.

(3) The present TRGS classifies the hazard into three categories:

1. low risk due to skin contact,
2. moderate risk due to skin contact and
3. high risk due to skin contact.

(4) In particular the risk arising from skin-resorptive and sensitising hazardous substances is difficult to assess. It is therefore recommended to the employer that he invariably obtain advice with respect to these risks from suitably qualified individuals according to Section 7 Subs. 7 GefStoffV, e.g. the company doctor.

(5) The technical, organisational, hygienic and personal measures listed under numbers 5 and 6 must be selected according to the level of risk with the aim of minimising skin contact with hazardous substances in accordance with the state of the art.

(6) The following conditions must be considered in addition in the risk assessment:

1. Physical conditions:
  - a) for work in heat, in the presence of thermal radiation or in the case of physical work it must be expected that the risk will be higher due to increased blood supply to the skin and greater perspiration,
  - b) in the case of skin contact with hazardous substances and subsequent occlusion (e.g. where there is contamination of hands under protective gloves) an increased risk must be assumed,
  - c) in the case of skin contact with hazardous substances during or after an activity which experience shows can cause mechanical damage to skin with micro-injuries an increased risk must be assumed.

## 2. Chemical conditions:

- a) where there is the simultaneous or prior action of degreasing substances on skin (soaps, tensides, solvents) an increased risk must be assumed since the degreasing of skin may cause a greater intake of hazardous substances,
- b) where there is the simultaneous or prior action of, for example, cosmetics or skin protection/care products the result may be a greater intake of hazardous substances through the skin,
- c) if a low-solubility substance is transformed into a soluble form (e.g. by means of solvents such as alcohol or acetone), the risk may increase.

## 3. Repository formation

Since with skin-resorptive substances the horny layer of the skin may act as a repository, skin-resorptive substances may continue to be released into the body from this repository after the end of the exposure. Intensive skin cleaning measures, such as cleaning with skin cleaning agents containing solvents, mechanical cleaning or cleaning with hot water, can result in a greater release of hazardous substances from this repository. It is therefore advisable as an initial measure to clean the skin with cold or lukewarm water using suitable skin cleaning products (see number 6.1).

(7) The result of the risk assessment must be documented. If a result deviates from number 4.2, the reasons must be given.

## 4.2 Allocation of the risk categories

(1) The risk categories are obtained as a function of:

1. the danger features (for example R-phrases, danger symbols),
2. the danger features assumed in accordance with number 3.2 paras 3 and 4 where there are gaps in the data,
3. the nature and extent of the skin contact and
4. the working conditions.

All R-phrases must invariably be considered and the highest risk category is the crucial one.

(2) Annex 4 contains the allocation of the danger features to the risk categories as a function of the extent and duration of exposure.

#### 4.2.1 Contaminated work clothing, work equipment and work surfaces

With short-duration and small-area skin contact with work clothing, work equipment or work surfaces which are contaminated with hazardous substances in the meaning of the present TRGS there is at least a low risk. With longer lasting skin contact there is at least a moderate risk.

#### 4.2.2 Hazardous substances which are harmful to skin

(1) A low risk due to skin contact is present:

1. in activities involving
  - a) small-area and short-duration skin contact or
  - b) small-area and longer lasting skin contact or
  - c) large-area and short-duration skin contactwith hazardous substances with R 66,
2. in activities involving small-area and short-duration skin contact with hazardous contacts with
  - a) R 38,
  - b) sensitising properties (R 43, hazardous substances according to Annex 3 and according to number 3.2.1 para. 2 or 3) or
  - c) other properties harmful to skin according to Section 3 Subs. 1 No. 4 GefStoffV,
3. where there is short-duration and small-area skin contact with articles which contain or can release a sensitising agent (e.g. vulcanisation accelerator in polymers and elastomers, nickel, residual monomer fractions in not completely cured synthetic resins, .....

(2) A moderate risk due to skin contact is present:

1. in activities involving large-area and longer lasting skin contact with hazardous substances with
  - a) R 38 or
  - b) R 66,
2. in activities involving small-area and short-duration skin contact with hazardous substances with
  - a) R 34,
  - b) R 35 or
  - c) pH values  $\leq 2$  or  $\geq 11.5$

3. in activities involving
  - a) large-area and short-duration skin contact or
  - b) small-area and longer lasting skin contact  
with hazardous substances with
  - c) R 34, R 38,
  - d) sensitising properties (R 43, hazardous substances according to Annex 3 and according to number 3.2.1 para. 2 or 3),
  - e) pH values  $\leq 2$  or  $\geq 11.5$  or
  - f) other properties which are harmful to skin according to Section 3 Subs. 1 No. 4 GefStoffV.
- (3) A high risk due to skin contact is present:
  1. in activities involving large-area and longer lasting skin contact with hazardous substances with
    - a) R 34,
    - b) sensitising properties (R 43, hazardous substances according to Annex 3 and according to number 3.2.1 para. 2 or 3) or
    - c) pH values  $\leq 2$  or  $\geq 11.5$  or
    - d) other properties which are harmful to skin according to Section 3 Subs. 1 No. 4 GefStoffV.
  2. in activities involving
    - a) large-area and short-duration or
    - b) small-area and longer lasting or
    - c) large-area and longer lasting skin contact  
with hazardous substances with R 35.
- (4) As a deviation from paragraphs 1 to 3, for all activities with dermal risk due to substances where practical experience shows that such substances or preparations may cause sensitisation in a considerable number of workers through skin contact (e.g. uncured epoxy resin systems) there is a high risk.

#### 4.2.3 Skin-resorptive hazardous substances and other substance properties

- (1) There is a low risk due to skin contact in activities involving small-area and short-duration skin contact with hazardous substances with R 21.
- (2) A moderate risk due to skin contact is present:
  1. in activities involving
    - a) small-area and short-duration skin contact or

- b) large-area and short-duration skin contact or
  - c) small-area and longer lasting skin contact,  
with hazardous substances with
  - d) R 24 or
  - e) R 40, R 68, if skin-resorptive or
  - f) R 21 (not small-area and short-duration skin contact) or
2. in all activities with R 62, R 63, if skin-resorptive.
- (3) There is a high risk due to skin contact:
- 1. in all activities involving hazardous substances with skin contact with
    - a) R 27 or
    - b) R 24, if labelled in addition with R 34 or R 35,
  - 2. in activities involving large-area and longer lasting skin contact with hazardous substances with
    - a) R 21, R 24 or
    - b) R 40, R 68, if skin-resorptive,
  - 3. in all activities involving hazardous substances with skin contact with R 45, R 46, R 60 or R 61, if skin-resorptive.

#### 4.2.4 Wet work

Wet work cannot be allocated with the criteria of number 4.2 para. 1 to a risk category for systematic reasons. In the case of wet work the measures according to number 5.3 must therefore be taken to minimise the risk.

## 5 Establishment of the protective measures

- (1) The systematic procedure to be adopted when establishing protective measures is shown in Annex 5.
- (2) With protective measures the order of priority to be followed is substitution, technical, organisational and personal protective measures.

### 5.1 Protective measures with low risk

If the result of the risk assessment indicated a low risk, general hygiene measures according to number 6.1 of the present TRGS must be taken.

## **5.2 Additional protective measures where there is moderate to high risk**

### **5.2.1 Substitution**

(1) If there is skin contact on account of the activity or the working process and if, according to the risk assessment according to number 4 there is a moderate or high risk, substitution must be applied as a matter of priority. If substitution is not practicable, the reasons must be given in the risk assessment (see also TRGS 600 "Substitution").

(2) If there are no substitute substances available, a check must be made to establish whether products or preparations can be obtained which contain the hazardous substances within the meaning of the present TRGS in lower concentration. Similarly a check should be made to establish whether the substances or preparations envisaged can be used in a low-exposure form.

(3) Skin contact can also be prevented or reduced with the use of suitable substitute procedures, using for example tools, instruments or devices.

### **5.2.2 Closed system with high risk**

If substitution is not possible, a closed system should – where technically feasible – be provided for if there is a high risk according to the risk assessment under number 4.

### **5.2.3 Technical, organisational and personal protective measures where there is moderate and high risk**

(1) If the application of closed systems is not technically feasible, technical and organisational measures according to numbers 6.2 and 6.3 must be taken in addition to the general hygiene measures under number 6.1 to reduce exposure according to the state of the art.

(2) If technical and organisational measures are not sufficient, personal protective measures under number 6.4 must be taken in addition.

(3) The effectiveness of the protective measures must be monitored under number 6.5.

## **5.3 Protective measures in wet work**

In wet work the employer must take the additional measures under numbers 6.2 to 6.5 over and above the hygiene measures according to number 6.1. In addition he must ensure by means of organisational measures that unavoidable wet work is distributed as far as possible among a number of workers to reduce exposure of the individual. The aim should be to alternate wet and dry work, the proportion of wet work being limited as far as possible.

## **6 Protective measures**

### **6.1 General hygiene measures**

(1) The following general hygiene measures are of special importance with respect to skin hazards:

1. For workers washing facilities (as far as possible with temperature-regulated water connection) as well as suitable and, if possible, mild skin cleaning products must be provided, as must suitable means to dry hands.
2. Skin contaminated with hazardous substances must be cleaned immediately. Care must be taken to ensure that aqueous solutions containing substances or preparations which are harmful to skin or skin-resorptive do not dry on the skin, but are removed because as the water evaporates the concentration of the hazardous substance on the skin will increase rapidly. Cleaning must be as gentle as possible. The skin must be dried carefully.
3. The frequency with which skin is cleaned must be reduced to what is necessary and the intensity of the cleaning and the choice of cleaning product must be adjusted to the degree of contamination.
4. Arm and hand jewellery (rings) may not be worn at work because pathological changes to the skin will be encouraged to a particular degree under the jewellery through the intensive action of moisture or hazardous substances.

(2) Skin care products are used to promote regeneration of the skin. Their use is essential after the end of the work and after the skin has been cleaned.

(3) Other general hygiene measures can be found under number 4 in TRGS 500 "Protective measures".

### **6.2 Technical protective measures**

(1) Technical protective measures include

1. the use of devices which avoid skin contact and
2. enclosures, extraction systems or ventilation systems.

(2) If technical protective measures cannot be used or only partly, for example during sampling or maintenance work, organisational and personal protective measures must be taken which ensure protection of the workers.

(3) Annex 6 lists examples of technical and organisational protective measures.

(4) To clean the body after work shower and changing facilities should be provided in the case of activities involving aerosol-forming, harmful-to-skin or skin-resorptive substances, if there is a need in the light of the risk assessment.

### **6.3 Organisational protective measures**

The following protective measures must always be arranged for by the employer:

1. Work clothing contaminated by or soaked in hazardous substances within the meaning of the present TRGS must be changed immediately. For such cases the employer must ensure that the clothing can be changed immediately. The employer must arrange proper cleaning at his expense. Where there is regular contamination the employer must provide and clean work clothing.
2. Equipment and work surfaces contaminated by hazardous substances must be regularly cleaned.
3. It must be ensured that the cleaning cloths for the machines are not used at the same time to clean hands since hazardous substance residues may damage skin and metal or other chips, for example, may cause micro-injuries.
4. In working areas where sensitising substances are being handled, only the tools and devices needed there should be stored there. To avoid any entrainment of sensitising substances into other working areas, contaminated devices may only be used in other working areas after prior cleaning. Where possible disposable items of equipment must be used (e.g. cloths, suitable gloves and containers).
5. Products manufactured using sensitising substances should only be processed further, where technically feasible, after the chemical reaction is complete (e.g. curing of plastics).
6. Workplaces and working areas at which sensitising substances are being handled must be separated off spatially from other working areas and identified accordingly, where the nature of the establishment permits.

### **6.4 Individual-related protective measures**

#### **6.4.1 General**

(1) If the risk assessment reveals that the hazard to the skin cannot be prevented by additional measures given the state of the art, the employer must arrange for individual-related protective measures which have to be implemented by the workers.

(2) Individual-related protective measures normally encompass in the present TRGS protective equipment, protective gloves and skin protection products. They are explained with regard to the protective gloves and skin protection products in numbers 6.4.2, 6.4.3 and 6.4.4.

(3) The individual-related protective measures of the present TRGS relate to contact with skin and lower arms. For skin contact with other parts of the body (especially feet and legs) specific protective measures, such as the wearing of working aprons, protective shoes of suitable material or a chemical protection suit, must be taken. Examples of such activities are given in Annex 7. The suitable protective equipment can be found in the safety data sheet or must be obtained by enquiring of the manufacturer/supplier of the hazardous substance.

- (4) The use of individual-related protective measures minimises skin contact, but it cannot normally preclude it completely.
- (5) Since there may be a possible interaction between skin protection and car products and gloves, the employer must take this into account when selecting the personal protective equipment (see also number 6.4.4 para. 6).
- (6) The employer must make available in adequate quantities the suitable personal protective equipment needed and he must ensure that workers use them in accordance with working instructions. Contaminated protective equipment must be cleaned and/or disposed of by the employer.
- (7) A possible risk from the use of personal protective equipment must be considered in selecting such equipment, e.g. allergens in protective gloves and wet work in which liquid-tight gloves are worn for an extended period, as well as in the area of machines with rotating parts.
- (8) In exceptional cases not wearing gloves may represent the lesser load after consideration of the risks than occupational, small-area and short-durations skin contact, provided immediate washing of the skin areas affected is guaranteed. This assessment must be made by the company doctor and must be documented in the risk assessment.

#### 6.4.2 Protective gloves

- (1) Protective gloves may not be worn for longer than necessary.
- (2) When liquid-tight gloves are worn, the aim should be to have an appropriate alternation of activities because the extended wearing of liquid-tight gloves may lead to the formation of perspiration and skin damage (wet work). The frequency with which gloves are changed must normally be laid down in the risk assessment. It is recommended that gloves be changed at least every hour or that cotton glove liners be worn. The requisite number of protective gloves and the times for a change of gloves must be considered in the work organisation.
- (3) The wearing of liquid-tight gloves without change for more than four hours a day must be regarded as a burden within the meaning of Section 9 Subs. 3 Sentence 2 GefStoffV and may not be permitted as a constant measure, and it may not replace technical and organisational measures.
- (4) When the gloves are put on and taken off, care must be taken to ensure that any contaminants which may adhere to the outside do not get into the inside of the glove or onto the skin. The correct method for putting gloves on and taking them off must be practised in the course of instruction (see Annex 4a of BG Information 868 "Chemikalienschutzhandschuhe" [Chemical Gloves] (BGI 868)).
- (5) When protective gloves are being used, attention must be paid prior to commencement of the activity to any visible damage in the glove, such as cracks or changes in material, hardening and swelling, which may arise after storage and re-use.
- (6) If the gloves are defective or they are worn beyond the time specified (see number 6.4.3 paras 4 and 5), the gloves must be disposed of. Where the protective gloves are contaminated with chemical agents, the instructions of the chemical

manufacturer concerning disposal of the chemicals used must also be applied with respect to protective gloves.

(7) Where chemical protective gloves are kept at the workplace or stored in the establishment the relevant instructions given in the manufacturer's informative documents must be observed. When chemical protective gloves are kept in storage, special attention must be paid to the fact that the glove material may change under the influence of ultraviolet rays, ozone or higher temperatures over the period of storage.

(8) When selecting protective gloves, account must also be taken of any existing sensitisation of the worker. For example, the list of allergens ([www-GISBAU.de](http://www-GISBAU.de)) indicates allergens present in protective gloves. Indications as to the allergens present in disposable medical gloves can be found in the information from the institutions for statutory accident insurance and prevention in the health and welfare services entitled "Achtung Allergiegefahr" [Caution, risk of allergy] (Themenheft M 621) and the information from the public accident insurance institutions entitled "Allergiegefahr durch Latex-Einmalhandschuhe" [Risk of allergy due to disposable latex gloves] (GUV-I 8584).

(9) Disposable medical gloves which only meet the requirements of DIN EN 455 are not chemical protective gloves.

(10) If disposable gloves of latex are used for hygienic reasons, the protein content may not exceed 30 µg/g glove material. Disposable gloves of latex may not be powdered.

(11) Leather gloves are not chemical protective gloves.

(12) If leather gloves are used – e.g. because of a mechanical risk – they must be chromate-free and they may not give rise to additional risks (e.g. due to biocidal products and production auxiliaries). The maximum chromate content is geared to the detection limit evaluated (analytical procedure according to DIN EN ISO 17075) and must be below 3 mg/kg glove material. Details of the constituents can be found in the information provided by the manufacturer of the protective gloves, or the manufacturer must be asked.

(13) If polyurethane-coated gloves are used, it must be ensured that they not release any N,N dimethylformamide (DMF). The maximum DMF content must be less than 10 mg/kg glove material.

#### 6.4.3 Selection of suitable chemical protective gloves

(1) The selection of protective gloves must be geared to agents and work processes. In addition to protection against chemicals, mechanical and ergonomic requirements must be considered. Depending on the activity and the agents used the glove selected must be adequately resistant for the specific intended use.

(2) Where there is a risk from hazardous substances the employer may only select CE-labelled chemical protective gloves which as a minimum meet the requirements according to DIN EN 374 Part 3 for the protection index class 2 (break-through time > 30 minutes). In deviation from this, for activities of up to ten minutes a protection index of class 1 is also possible.

(3) Chemical protective gloves marked with an Erlenmeyer flask offer an extended protection against chemical hazards; from a group of twelve test chemicals these chemical protective gloves achieved class 2 at least for three of them (break-through time > 30 min). Appropriate letters standing for the test chemical selected then become a component of the gloves' labelling. This can be seen in the following symbol (DIN EN 374-1:2003):



AKL

Beispiel

Prüfchemikalien:

A = Methanol

K = Natronlauge 40%

L = Schwefelsäure 96%

Erlenmeyer flask:

Protection against chemical risks according to DIN EN 374, protection against permeation according to EN 374-3: protection index classes 1-6 (the higher the better);

in the test at least class 2 must be attained with three of the test chemicals specified.

For further details of the labelling of chemical protective gloves see number 4 of the BG information document "Chemikalienschutzhandschuhe" [Chemical protective gloves] BGI 868.

(4) The break-through time is the time at which, in the test to DIN / EN 374 Part 3, break-through of the chemical can be seen on the unexposed side of the glove material. The test to DIN EN 374 Part 3 is performed at 23 °C. Since the break-through time is temperature-dependent and higher temperatures may arise in the glove when they are being worn, the break-through time may fall under practical conditions (max. wearing time or penetration time) down to 1/3 of that determined under DIN EN 374 Part 3. To determine the maximum wearing time (penetration time) it therefore makes sense and is necessary for certain uses to indicate the break-through time on the basis of a test at 33 °C.

(5) The maximum wearing time (penetration time) of a protective glove is reached when chemicals penetrate through the glove under certain use conditions. The maximum wearing time (penetration time) of a protective glove is normally shorter than the break-through time determined according to DIN EN 374 Part 3 and is determined by the following parameters:

1. glove material and material thickness,
2. chemical and work process used,
3. other substances, preparations used,
4. break-through time based on a test at 33 °C according to DIN EN 374 Part 3,
5. duration and intensity of the contact with chemicals per shift,
6. influence of temperature due to heating or cooling,
7. mechanical load on the glove due to the activity.

(6) The following information (parameters A and B) can be obtained by the employer from section 8 of the safety data sheet (Annex 2 REACH Regulation or number 6.8.2.1.2 of the notice 220 of the AGS) or he must enquire of the supplier of the hazardous substances in accordance with Section 7 Subs. 2 of GefStoffV:

Parameter A: the glove material

Parameter B: penetration time (which should be taken to mean the max. wearing time) of the glove material as a function of intensity and duration of skin exposure

Note: The penetration time is highly temperature-dependent. When the break-through time has been determined according to the standard DIN EN 374 Part 3 at 23°C, the maximum wearing time under practical conditions (at 33°C) must be shortened to one third.

(7) Where relevant, the safety data sheet also contains further information:

Parameter C: the glove material and the minimum material thickness required for it with indication of the related maximum wearing time under the conditions of use specified by the chemical supplier, such as work process, agents, etc.,

Parameter D: a specific make of glove naming the glove manufacturer or distributor and with indication of the related maximum wearing time under the conditions of use specified by the chemical supplier, such as work process, agents, etc.

(8) In addition, the following parameters E must be determined by the employer for the specific workplace to adjust the operational conditions of use to the intended use given in the safety data sheet and they must be taken into account in the selection process:

1. other substances, preparations, products or articles used,
2. work processes,
3. mechanical loading of the glove,
4. thermal loading of the glove,
5. ergonomic requirements (size and fit) and
6. requirements regarding tactile sense.

(9) When selecting the suitable protective glove the following procedure must be adopted (see flow chart, Annex 8):

1. If a make of glove is indicated in the safety data sheet, the employer must check, while taking account of the workplace-specific parameters E determined, whether the intended use and the conditions of use envisaged conform to the intended use and conditions of use given in the safety data sheet and whether no other hazardous substances are used. If the use conforms to the manufacturer's information, the make indicated can be used.
2. If the safety data sheet does not give a make of glove, however, the glove material, material thickness and maximum wearing time under conditions of use (parameters A to C) are known, the employer must check, while taking account of the workplace-specific parameters E determined, whether the intended use and the conditions of use envisaged conform to the intended use and conditions of use given in the safety data sheet and whether no other hazardous substances are used. If the use conforms to the manufacturer's information, the make indicated can be used.
3. If there is a different intended use or different conditions of use (e.g. dilutions, mixtures with other chemicals, shorter exposure time etc.) or if in addition other hazardous substances are being handled, it will be necessary to determine the suitable protective glove, including the maximum wearing time, autonomously. If the employer does not have the necessary knowledge, he must determine the protective gloves in co-operation with the glove manufacturer and/or chemical supplier.
4. If a smaller material thickness than that given in the safety data sheet is to be used, the maximum wearing time must be corrected by the glove manufacturer or chemical supplier. If it is ascertained in the risk assessment that small-area contact, e.g. through splashes of liquid, is possible but not envisaged, gloves with other layer thicknesses may be used provided it is ensured that the gloves are changed shortly after contact with the chemical. Gloves used in this way are normally to be regarded as disposable. The break-through time attained by these gloves for a certain chemical should correspond at least to the protection index class 1 (> 10 minutes, tested according to DIN EN 374 Part 3 at 23° C).
5. If no details of parameters A to C are given in the safety data sheet or if they are only available in incomplete form, the employer must request them from the chemical supplier or he must ask for the name of a make of glove suitable for his intended use which meets the requirements, including the related maximum wearing time.

#### 6.4.4 Skin protection agents

(1) Skin protection agents are agents which are applied externally to the skin in accordance with PPE User Directive 89/656/EEC (incorporated in national law in the form of the PPE User Ordinance). Skin protection agents should be used with the involvement of a skilled occupational safety and health specialist, in particular the company doctor. If skin protection agents are used as a personal protective measure at the workplace, they must satisfy the further requirements specified in the following paragraphs.

(2) Skin protection agents within the meaning of the present TRGS are preparations to be applied externally and which are intended to protect the skin from irritations. They can only be used if there is repeated and extended contact with mild irritants (R 21, R 38, R 66) and in the case of wet work. Skin protection agents do not provide protection against the action of burning, toxic, sensitising and skin-resorptive, mutagenic, carcinogenic hazardous substances and those which are toxic to reproduction (see Annex 9).

(3) Only skin protection agents may be used which have undergone an effectiveness test by the manufacturer according to the scientific and medical recommendations (see the Guidelines of the Arbeitsgemeinschaft für Berufs- und Umweltdermatologie (ABD): "Berufliche Hautmittel" (Occupational Skin Agents)). This effectiveness is preferably to be demonstrated by an in vivo method (e.g. ROIT, repetitive occlusive irritation test). The effectiveness should be tested at least using the BUS model (bovine udder skin) or a 3D skin culture model.

(4) The employer needs the following information to select suitable skin protection agents:

1. clear and easily identifiable labelling as skin protection agents,
2. concrete details of the products' area of application and
3. details of the verified effectiveness with description of the methodology or the verification procedure for the use advertised. Preference should be given to skin protection agents whose effectiveness has been verified on humans (in-vivo).

(5) When selecting skin protection agents, attention must also be paid to possible hazards which may emanate from the skin protection agent, e.g. allergic reactions to constituents of skin protection agents. Preference must be given to the use of skin protection agents which are free of odorants and preservatives.

(6) It is pointed out that skin protection agents, especially fatty ones, may adversely affect the protective effect of protective gloves (see also number 6.4.1 para. 5).

(7) The application of skin protection agents must be matched with the working procedures since these agents may, with certain agents (e.g. polycyclic aromatic hydrocarbons and solvents), may result in an increased intake of substances through the skin.

(8) Skin protection agents must be applied to clean and dry skin before every activity that places a burden on the skin, e.g. at the commencement of work, after breaks, after every cleaning of the skin during the activity or at the latest following a period specified by the manufacturer of the skin protection agent. The times required for an effective application of the skin protection agents must be considered in the work organisation.

## **6.5 Monitoring of the effectiveness of the protective measures**

(1) The effectiveness of the protective measures must be checked regularly. The effectiveness of the technical protective measures must be checked at least every three years and when there is a change in the working procedure. This should be done in particular by testing the serviceability of technical protective equipment. If the occupational health care reveals indications of inadequate effectiveness in the

protective measures, the risk assessment must be repeated.

(2) Any deficiencies found must be rectified without delay.

(3) The employer must monitor the proper implementation of the protective measures taken and the appropriate application of protective gloves, skin protection agents and the cleaning of skin. The workers are obliged to use the technical and organisational protective measures and the personal protective equipment as intended.

## **7 Information for workers**

### **7.1 Working instructions and courses of instruction for workers**

(1) The result of the risk assessment, information on the hazardous substances arising at the workplace and their effect on contact with skin, including the measures laid down, must be incorporated in the working instructions and taught at oral courses of instruction to be held at least once a year in relation to the specific activity (Section 14 GefStoffV, TRGS 555 "Working Instructions and Information for Workers"). It is recommended that the skin cleaning, skin care and skin protection agents be laid down in a skin protection plan and that this be posted at suitable locations, e.g. at hand washing facilities.

(2) Instruction must be given on appropriate precautionary measures for avoiding skin contact, on hygiene regulations, on first aid measures and on the correct application of the specified protective measures (correct use of personal protective equipment provided, such as protective gloves, skin protection agents or similar). Then proper application of skin protection agents or effective skin cleaning can be practised under ultraviolet light using fluorescent preparations.

(3) If the success of the measures depends to a major extent on the organisational and personal protective measures when the working conditions change or skin disorders appear due to the activity, it may be necessary to conduct the course of instruction several times a year.

(4) If the risk assessment reveals that the use of protective gloves can be dispensed with, specific reference must be made in the course of instruction to special rules of conduct in such a case.

(5) The employer should call on the workers to indicate to him company-specific dangers to the skin and to propose protective measures.

(6) The employer must ensure that occupational-medical toxicological advice be given in the course of instruction.

### **7.2 Occupational-medical toxicological advice**

(1) Within the framework of the occupational-medical toxicological advice the workers must be told about the health hazards that may arise. It includes a description, understandable to the laymen, of the skin changes caused by irritant, sensitising substances or wet work (especially contact eczema on the hands or lower

arms). An indication should be given of special activity-related or substance-related features (irritation or sensitisation due to aerosols or gases, soiled clothing). In the case of activities involving skin-resorptive substances the effects of these substances must be explained.

(2) The content of the occupation-medical toxicological advice must also be a description of pathological conditions (e.g. endogenic eczema, disposition to suffer from skin disorders, extra-occupational sensitisation) the presence of which may mean for the worker a special risk of skin disorder. Possible impairments and side-effects from personal protective equipment (e.g. wearing gloves for extended periods) must be pointed out. In addition workers must be informed about voluntary examinations available under Section 16 Subs. 3 and 4 GefStoffV.

(3) If it is necessary for occupational-medical reasons, the occupational-medical toxicological advice should be conducted with the involvement of a specialist physician for occupational medicine or a doctor with the additional title "occupational medicine".

## **8 Precautionary occupational medical examinations**

### **8.1 Voluntary examinations**

(1) The workers must be offered precautionary occupational medical examinations under Section 16 GefStoffV where

1. activities are carried out with the hazardous substances given in Annex V No. 1 GefStoffV if there is exposure,
2. activities listed in Annex V No. 2.2 GefStoffV are carried out, which includes
3. regular wet work for more than two hours per day.

(2) The worker is not obliged to accept the examinations offered. The examination is not a prerequisite for carrying out the activity. If such voluntary examinations are performed, the employer will also not be given a copy of the result.

### **8.2 Mandatory examinations**

(1) If the risk assessment reveals a high health risk for activities involving the skin-resorptive hazardous substances listed in Annex V No. 1 GefStoffV in number 4.2.3, the employer must arrange for special precautionary occupational medical examinations according to Section 16 Subs. 1 No. 2 GefStoffV. The following substances of Annex V No. 1 of GefStoffV are skin-resorptive:

1. acrylonitrile (R24),
2. aromatic nitro- and amino compounds<sup>\*</sup>,
3. benzene (R24),
4. tetraethyl lead and tetramethyl lead<sup>\*</sup> (R27),
5. dimethylformamide<sup>\*</sup> (R21),

6. glycerin trinitrate\* and glycol dinitrate\*,
7. carbon disulphide\*,
8. methanol\*,
9. polycyclic aromatic hydrocarbons,
10. tetrachloroethene\*,
11. toluene\* and
12. xylene\*.

(2) When performing wet work from four hours a day and more, carrying out activities involving exposure to uncured epoxy resins or isocyanates or when wearing natural rubber latex gloves with an allergen content of more than 30 µg protein per g glove material, the employer must arrange for special precautionary occupational medical examinations in accordance with Section 16 in combination with Annex V No. 2.1 GefStoffV.

(3) The conduct of the examinations according to paragraphs 1 and 2 is a precondition for being employed or continuing to be employed on these activities.

(4) If biomonitoring is conducted within the context of the precautionary occupational medical examinations, TRGS 710 "Biomonitoring" must be complied with. Concerning the substances marked \* in paragraph 1 biological limit values are published in TRGS 903.

## **9 Documentation**

For requirements for the documentation of the risk assessment see TRGS 400.

## 10 Literature

- [1] Notice on hazardous substances 220 "Sicherheitsdatenblatt" [Safety data sheet]
- [2] BG Information "Hautschutz in Metallbetrieben" [Skin protection in metal works] (BGI 658), August 2008
- [3] BG Information "Chemikalienschutzhandschuhe – Informationsschrift für Unternehmer und Versicherte zur Auswahl, Bereitstellung und Benutzung von Chemikalienschutzhandschuhen" [Chemical protective gloves – Information for employers and insured persons on the selection, provision and use of chemical protective gloves] (BGI 868)
- [4] Deutsche Forschungsgemeinschaft: MAK- und BAT-Werte-Liste. Abschnitt VII. Hautresorption. [List of MAK and BAT values. Section VII. Skin resorption] Wiley-VCH-Verlag
- [5] DIN EN 374 Parts 1-3 "Schutzhandschuhe gegen Chemikalien und Mikroorganismen" [Protective gloves against chemicals and micro-organisms]
- [6] DIN EN 455 "Handschuhe zum einmaligen Gebrauch" [Medical gloves for single use]
- [7] DIN EN ISO 17075 "Leder – Chemische Prüfung – Bestimmung des Chrom (VI)-Gehaltes" [Chemical tests. Determination of chromium(VI) content]
- [8] GUV-I 8584 "Merkblatt - Allergiegefahr durch Latexhandschuhe" [Specification – Allergy risk due to latex gloves]
- [9] Information of the public accident insurance institutions GUV-I 8584 "Allergiegefahr durch Latex-Einmalhandschuhe", [Allergy risk due to disposable latex gloves] May 2005, ([http://regelwerk.unfallkassen.de/regelwerk/data/regelwerk/inform/I\\_8584.pdf](http://regelwerk.unfallkassen.de/regelwerk/data/regelwerk/inform/I_8584.pdf))
- [10] Cosmetics Ordinance
- [11] Foodstuffs, utensils and animal feed code
- [12] Guidelines "Sicheres Arbeiten mit chemischen Stoffen in der Pathologie – Handlungshilfe zur Gefährdungsbeurteilung für Tätigkeiten mit Gefahrstoffen" [Safe working with chemical substances in pathology – Practical aid to the risk assessment for activities involving hazardous substances] Berufsgenossenschaft für Gesundheitsdienst und Wohlfahrtspflege, 2006
- [13] Guidelines of the Arbeitsgemeinschaft für Berufs- und Umweltdermatologie (ABD): "Berufliche Hautmittel" [Occupational skin agents], 3.5.2008 ([http://abd.dermis.net/content/e03abd/e10diensteinfo/e993/Hautschutzleitlinie\\_05\\_2008.pdf](http://abd.dermis.net/content/e03abd/e10diensteinfo/e993/Hautschutzleitlinie_05_2008.pdf))
- [14] List according Annex 1 of the Directive 67/548/EEC
- [15] List of allergens in protective gloves: (<http://www.GISBAU.de>)
- [16] Directive 89/656/EEC "Minimum health and safety requirements for the use by workers of personal protective equipment at the workplace"
- [17] Booklet M 621 of the Berufsgenossenschaft für Gesundheitsdienst und Wohlfahrtspflege (BGW) "Achtung Allergiegefahr" [Caution! Allergy risk.], March

2006, ([http://www.bgw-online.de/internet/generator/Inhalt/OnlineInhalt/Medientypen/bgw\\_20themen/M621\\_Achtung\\_20Allergiegefahr.property=pdfDownload.pdf](http://www.bgw-online.de/internet/generator/Inhalt/OnlineInhalt/Medientypen/bgw_20themen/M621_Achtung_20Allergiegefahr.property=pdfDownload.pdf))

- [18] TRGS 400 "Risk assessment for activities involving hazardous substances "
- [19] TRBA/TRGS 406 "Sensitising substances for respiratory tracts "
- [20] TRGS 420 "Process- and substance-specific criteria for the risk assessment"
- [21] TRGS 500 "Protective measures"
- [22] TRGS 530 "Hairdressing trade"
- [23] TRGS 600 "Substitution"
- [24] TRGS 710 "Biomonitoring"
- [25] TRGS 900 "Occupational exposure limits"
- [26] TRGS 903 "Biological limit values"
- [27] TRGS 905 "List of carcinogenic, mutagenic and reproduction-toxic substances "
- [28] TRGS 906 " List of carcinogenic activities or processes according to Section 3 Subs. 2 No. 3 of the Hazardous Substances Ordinance"
- [29] TRGS 907 "List of sensitising substances "
- [30] Regulation (EC) No. 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)
- [31] Ordinance concerning protection against hazardous substances (Hazardous Substances Ordinance) of 23 December 2004 (BGBl. I P. 3758)

## Annex 1 to TRGS 401

### Activity-related and sector-related applications of the TRGS "Hazard due to skin contact"

Below is a list of activity-related and sector-related applications of the TRGS "Hazard from skin contact". On the basis of the information given there the employer must determine specific makes of glove and skin protection agents himself according to this TRGS, numbers 6.4.3 and 6.4.4.

The list is added to.

1. TRGS 530 "Hairdressing trade",
2. Branchenregelung Säureschutzbau [Code for acid-proof construction], date: 11 May 2006 ([www.gisbau.de/service/saeure/BranchenregSaeureMai2006.pdf](http://www.gisbau.de/service/saeure/BranchenregSaeureMai2006.pdf)),
3. Guidelines "Sicheres Arbeiten mit chemischen Stoffen in der Pathologie – Handlungshilfe zur Gefährdungsbeurteilung für Tätigkeiten mit Gefahrstoffen" [Safe working with chemical substances in pathology – Practical aid for the risk assessment of activities involving hazardous substances], December 2006 ([http://www.bgw-online.de/internet/generator/Inhalt/OnlineInhalt/Medientypen/bgw\\_20themen/EP-GfPath\\_Sicheres\\_Arbeiten\\_mit\\_chemischen\\_Stoffen\\_in\\_der\\_Pathologie.property=pdfDownload.pdf](http://www.bgw-online.de/internet/generator/Inhalt/OnlineInhalt/Medientypen/bgw_20themen/EP-GfPath_Sicheres_Arbeiten_mit_chemischen_Stoffen_in_der_Pathologie.property=pdfDownload.pdf))
4. BG Information 658 "Hautschutz in Metallbetrieben" [Skin protection in metal works] (BGI 658), Stand August 2008 (<http://www.vmbg.de/service/druckschriften/bgi658.pdf>).

On-line sector-based guides:

1. BASIS – Branchen- und Arbeitsschutz-Informationssystem der Druck- und papier-verarbeitenden Industrie: Modul Hand- und Hautschutz (Sector and occupational safety and health information system of the paper-processing industry: hand and skin protection module) (<http://www.basis-dp.de/als>),
2. WINGIS-online – Gefahrstoff-Informationssystem der Berufsgenossenschaft der Bauwirtschaft [Hazardous substances information system of the Berufsgenossenschaft for the construction industry] (<http://www.wingis-online.de/wingisonline/>), also available on CD-ROM,
3. GisChem – Branchenspezifisches Gefahrstoffinformationssystem der Berufsgenossenschaft der chemischen Industrie [Sector-specific hazardous substances information system of the Berufsgenossenschaft for the chemical industry] (<http://www.gischem.de/>).

## **Annex 2 to TRGS 401**

### **Skin-resorptive substances**

#### **1 Substances which are taken in to a major extent via the vapour phase through the skin (non-exhaustive list)**

Below are examples of substances for which intake via the gas/vapour phase is an additional relevant intake path.

1. 2-butoxyethanol,
2. 2-methoxyethanol,
3. 2-ethoxyethanol and
4. polycyclic aromatic hydrocarbons in hot state.

#### **2 Substances and substance groups for which it must be assumed from experience that there is a health-impairing effect due to intake through the skin (non-exhaustive list)**

Below are examples of substance groups for which from experience it must be assumed that there is a health-impairing effect due to intake through the skin:

1. aromatic and aliphatic amino- and nitro-compounds such as aniline, toluidine, nitrobenzene, triethylamine or anisidine,
2. numerous phenol compounds such as phenol, cresol or hydrochinon,
3. special solvents such as dimethylformamide (DMF), glycolether, ethylbenzene,
4. halogenated hydrocarbons such as chlorobenzene, chloroform, tetrachlorocarbon,
5. numerous pesticides, especially organophosphates, e.g. parathion,
6. many metal-organic compounds, especially the highly toxic methyl mercury compounds,
7. hydrofluoric acid, nitric acid,
8. dimethylsulphoxide and
9. petrol, antifreeze, brake fluid.

### 3 Skin-resorptive substances labelled with R45, R46, R60 or R61 (non-exhaustive list)

Name	Classification	Symbol	R-phrases
Acrylic nitrile	F; R11 Carc.Cat.2; R45 T; R23/24/25 Xi; R37/38-41 R43 N; R51/53	F; T; N	45-11-23/24/25-37/38-41-43-51/53
Benzene	F; R11 Carc.Cat.1; R45 Muta.Cat.2; R46 T; R48/23/24/25 Xn; R65 Xi; R36/38	F; T	45-46-11-36/38-48/23/24/25-65
Diethyleneglycoldimethylether	R10 R19 Repr.Cat.2; R60-61	T	60-61-10-19
Diethyl sulphate	Carc.Cat.2; R45 Muta.Cat.2; R46 Xn; R20/21/22 C; R34	T	45-46-20/21/22-34
N,N-dimethylacetamide	Repr.Cat.2; R61 Xn; R20/21	T	61-20/21
N,N-dimethylformamide	Repr.Cat.2; R61 Xn; R20/21 Xi; R36	T	61-20/21-36
Ethyleneglycolmonoethylether	R10 Repr.Cat.2; R60-61 Xn; R20/21/22	T	60-61-10-20/21/22
2-ethoxyethylacetate	Repr.Cat.2; R60-61 Xn; R20/21/22	T	60-61-20/21/22
Ethyleneglycolmono-methylether	R10 Repr.Cat.2; R60-61 Xn; R20/21/22	T	60-61-10-20/21/22
2-methoxyethyl acetate	Repr.Cat.2; R60-61 Xn; R20/21/22	T	60-61-20/21/22
2-methoxy-1-propyl acetate	R10 Repr.Cat.2; R61 Xi; R37	T	61-10-37
2-nitrotoluene	Carc.Cat.2; R45 Muta.Cat.2; R46 Repr.Cat.3; R62 Xn; R22 N; R51/53	T; N	45-46-22-62-51/53
Propyleneglycol-2-methylether	R10 Repr.Cat.2; R61 Xi; R37/38-41	T	61-10-37/38-41
$\alpha,\alpha,\alpha,4$ -tetrachlorotoluene	Carc.Cat.2; R45 Repr.Cat.3; R62 T; R48/23 Xn; R21/22 Xi; R37/38	T	45-21/22-37/38-48/23-62
Tetraethyl lead	Repr.Cat.1; R61 Repr.Cat.3; R62 T+; R26/27/28 R33 N; 50/53	T+; N	61-26/27/28-33-50/53-62

Name	Classification	Symbol	R-phrases
Tetramethyl lead	Repr.Cat.1; R61 Repr.Cat.3; R62 T+; R26/27/28 R33 N; R50/53	T+; N	61-26/27/28-33-50/53-62

## Annex 3 to TRGS 401

### Substances/substance groups with known risk for the development of an allergic contact eczema

The agents listed here are examples of sensitising substances which may be significant from a medical point of view for the development of an allergic contact eczema. The list of substances and substance groups is not the equivalent of a classification or a list of substitute substances. The list is not exhaustive and there are many more substances which are classified as "sensitising on contact with skin".

Sensitising substances/substance groups	Represented by	Occurs in	Examples of occupations/occupational sectors/activities in which the substances are used
<b>1. Plastics/synthetic resins/components such as:</b>			
Acrylate resins and methacrylate resins (uncured)	methyl-, ethyl-, butylacrylate/ ethyleneglycoldiacrylate etc.; methyl-, ethyl-, hydroxyethyl-, hydroxypropylmethacrylate/ ethyleneglycoldimethacrylate etc	single- and multi-component adhesives and fillers	plastic processing, assembly work, restorers, material testers
		varnishes	painters, varnishers
		UV-hardening varnishes, adhesives and plastics	printers, varnishers, cosmeticians, dentists
		dental prosthesis material (especially methacrylates)	dental technicians
Amine components of epoxy resins (amine hardener)	1,2 diaminoethane/ diethylentriamine/ triethylentetramine/ m-xylendiamine/ isophorondiamine etc.	laminating materials, casting resins  two-component adhesives. screw fixative	plastic processing (e.g. boat-building, rotor manufacture for wind turbines), construction industry (e.g. floorers, restorer, electrical and electronics industry, modelling)  metal workers
Epoxy resins (uncured) on a base of bisphenol a and bisphenol F diglycidylether and reactive dilutants	reactive dilutants: phenylglycidylether/ p-tert-butylphenylglycidylether/ cresylglycidylether/ 1,4-butanedioldiglycidylether/ 1,6-hexanedioldiglycidylether etc.	laminating materials, casting resins	plastic processing, construction industry, floorers, electrical and electronics industry, modelling
		two-component adhesives, screw fixatives	metal workers
		varnishes	varnishers

Formaldehyde condensation products (low-molecular) with p-tert-butylphenol	4-tert-butyl-2-(hydroxymethyl)phenol/ 4-tert-butyl-2,6-bis(hydroxymethyl)phenol/ 4-tert-butyl-2-(5-tert-butyl-2-hydroxybenzyloxymethyl)-6-(hydroxymethyl)phenol etc.	(leather) adhesives	leather occupations
Formaldehyde condensation products (low-molecular) with phenol, melamine or urea	2-(hydroxymethyl)phenol/ 4-[(4-hydroxy-3,5-bis(hydroxymethyl)phenyl)methyl]-2-(hydroxymethyl)phenol etc.	numerous uncured synthetic resins and plastics, high finishing agents for textiles (non-crease equipment)	plastic processing, coatings, binding agents for chipboards, textile finishing industry
Isocyanates	diphenylmethane-4,4'-diisocyanate/isophorondiisocyanate / 2,4-toluylendiisocyanate etc.	polyurethane production, components for coatings, adhesives, casting resins, assembly foams, varnishes	processors of uncured PUR products
<b>2. Rubber constituents/auxiliaries in rubber production, such as:</b>			
p-tert-butylbrenzkatechin		stabiliser for synthetic caoutchouc	rubber production
Dithiocarbamates	sodium or zinc salts of dibenzyl-, dibutyl- or diethyldithiocarbamate etc. dithiocarbamates	rubber gloves and other rubber articles of natural and synthetic	health occupations and other protective glove wearers
IPPD and other aromatic (di-)amino compounds	N,N'-diphenyl-p-phenyldiamine/ N-isopropyl-N'-phenyl-p-phenylen-diamine (IPPD) etc.	technical rubber grades ("black rubber")	rubber production, cable industry, occupations involving contact with tyres or other technical rubber articles printers, milkers
Colophonium		modified colophonium as emulsifier in the rubber industry	rubber production
Mercaptobenzothiazol (MBT) and MBT derivates	N-Cyclohexyl-2-benzothiazyl-sulfenamide/Mercaptobenzothiazol/ morpholinylmercaptobenzothiazol	raw rubber, rubber gloves and other rubber articles of natural and synthetic rubber	rubber production and processing, printers, building occupations, health occupations and other protective glove wearers
Thiurams	dipentamethylthiuramdisulphide, tetraethylthiuramdisulphide (disulfiram), tetramethylthiuramdisulphide, tetramethylthiurammonosulfide etc.	raw rubber, rubber gloves and other rubber articles of natural and synthetic rubber	rubber production and processing, health occupations and other protective glove wearers

<b>3. Biocides (preservatives / disinfectants), such as</b>			
1,2-benzisothiazol-3(2H)-on		aqueous solutions such as dispersion adhesives and dispersion paints	printers
		water mixed cooling lubricants	metal cutting
Benzylalcoholmono (poly)hemiformal		water mixed cooling lubricants	metal cutting and other sectors
2-Brom-2-nitropropane-1,3-diol		body cleaning and care agents, damping solution, dispersion adhesives	hairdresser, geriatric nursing print industry construction
Chloracetamide, N-methylolchloracetamide		paints	painters, printers
Chlorkresols		leather preservation	leather-processing industry
(Chlor-) methylisothiazolinon (CMI/MI)		aqueous solutions, lotions and emulsions	printers, masseurs, medical bath attendants, health occupations, cleaning occupations
		water mixed cooling lubricants	metal cutting
		wallpaper paste, wall paints	painters, varnishers
Formaldehyde and formaldehyde splitters	Formaldehyde splitters: benzylalcoholmono(poly)hemiformal; N,N-methylene-bis-(5-methyloxazolidine); N-methylolchloracetamide; N,N',N''-tris( $\beta$ -hydroxyethyl)hexahydro-1,3,5-triazine etc.	disinfectants fixatives	health occupations, cleaning occupations, preparers, anatomists, pathologists, animal husbandry
		preservatives used in aqueous solutions, e.g. in water mixed cooling lubricants	metal cutting
Glutardialdehyde		disinfectants and preservatives	health occupations, cleaning occupations, animal husbandry
		Tannin	leather manufacture
Glyoxal		disinfectants and preservatives	health occupations, cleaning occupations
N,N-methylen-bis-(5-methyloxazolidin)		water mixed cooling lubricants	metal cutting
N,N',N''-tris( $\beta$ -hydroxyethyl)-hexahydro-1,3,5-triazine		water mixed cooling lubricants	metal cutting

<b>4. Aromatic and perfume oils</b>			
	atranol and chloratranol in oakmoss extracts /citral/eugenol/ hydroxycitronellal/isoegenol/ hydroxymethylpentylcyclohexenecarboxaldehyde/cinnamaldehyde/cinnamalcohol etc.	perfumed agents (e.g. care products), perfumed skin care, skin cleaning, skin protection agents	hairdressers, cosmeticians, masseurs, medical bath attendants, nursing occupations, cleaning occupations, users of skin protection, skin cleaning and skin care agents
<b>5. Metal ions (metal compounds)</b>			
Chromium(VI)-compounds		galvanic baths	glavanizers, intaglio printing
		cement, mortar, fresh concrete	construction workers, bricklayers, insulators, tilers, screed layers
		yellow chromated metals	metal working and processing
Cobalt and cobalt compounds		cement, fresh concrete	bricklayers, construction workers, screed layers
		hard metals	hard metal manufacture and hard metal working and processing
		paint additives	porcelain and ceramic occupations
		cobalt accelerators (siccatives, "drying agents")	artistic painters, varnishers, plastic processing (polyester resins), wood finishing (natural oils)
Nickel (certain nickel alloys) and soluble nickel compounds		solutions (e.g. galvanic baths)	galvanizers
		nickel from surfaces from which more than 0.5 µg nickel/cm <sup>2</sup> /week is released (positive dimethylglyoxime test)	activities involving intensive and extended skin contact, especially during wet work
<b>6. Hairdressing chemicals</b>			
Glycerylmonothio-glycolate		so-called "acid permanent wave"	hairdressers (formerly)
Persulfates		blonding agents	hairdressers
p-phenylendiamine, p-toluyldiamine, 4-aminophenol and numerous other aromatic mono- and diamono-compounds		oxidation hair colouring and toning agents	hairdressers, make-up artists

<b>7. Other relevant substances / substance groups</b>			
Abietin acid: constituent of colophonium and tall oil distillates		resin components in adhesives and fixing agents, solder auxiliaries; constituent of conifers colophonium; paper, printing inks, in waxes, polishes, cosmetics, water-mixed cooling lubricants	electronic engineers (soldering activities); carpenters,  florists, foresters  musicians; printing and paper processing;  metal cutting
2-aminoethanol (monoethanolamine)		water-mixed cooling lubricants	metal working and processing
Polyfunctional aziridine wettters		wetting agents for 2-component dispersion varnishes and paints (coating substances)	leather manufacture (dressing), trimmings manufacture, screen/intaglio printing
Dithiocarbamates	sodium diethyldithiocarbamate etc.	additive in cooling lubricants	metal cutting
Glutardialdehyde		tannin	leather manufacture
Some tropical woods	chlorophora excelsa (iroco, kambala), dalbergia types (e.g. East Indian palisander, rosewood, Honduras rosewood), Khaya anotheca (African mahoggany), machaerium scleroxylon (Santos rosewood), mansonia altissima (mansonia bété), paratecoma peroba (Peroba do campo, trumpet tree), tectona grandis teak), thuja plicata (giant tree of life, red cedar, western red cedar), triplochiton scleroxylon <sup>1</sup> (abachi, ayous, obeche, samba, wawa) etc.		carpenters, wood industry, instrument makers, musicians, upholstered furniture industry
Colophonium (see abietin acid)		(see abietin acid)	(see abietin acid)

Limes (and similar unsaturated terpenes)		solvents, cleaning agents	painters, varnishers, cleaning occupations, wood finishing (natural oils)
Mercaptobenzothiazol		corrosion-proofing agents	metal working
Plant constituents (primine, tulipaline and some sesquiterpenlactones)	sesquiterpenlactones: alantolactone, anthecotulide, arteglin A, carabron, costunolide, dehydrocostus lactone, helenalin, isoalantolactone, lactucin, laurenobiolide, parthenin, parthenolide, $\alpha$ -peroxyachifolide, pyrethrosin	primine in primulas; tulipaline in alstromeria, tulips; sesquiterpenlactones in types of composite flower (e.g. types of chrysanthemum) and some other plants (e.g. laurel (laurus nobilis))	gardeners, florists
Tall oil distillates (see abietine acid)		(see abietin acid)	(see abietin acid)
Turpentine oil (natural)		solvents	restorers, artistic painters, porcelain painters, wood finishing (natural oils)
Animal and vegetable proteins <sup>2</sup>		hair and excrement from farm and laboratory animals, fishes, shellfish natural caoutchouc latex	food production, processing and sale, agriculture, animal care, veterinary surgeons, fishermen, laboratory workers, wearers of disposable gloves of latex
Formaldehyde		PCB galvanisation	galvanizers

<sup>2</sup> Intensive skin contact to proteins of animal or vegetable origin may indicate an IgE-induced allergy of type I (immediate type). Specific antibodies are evident in the blood. After repeated contact there occur after a short time itching, reddening and wheals (contact urticaria) on the skin and occasionally also reactions of the mucous membrane (shortage of breath, swallowing difficulties) as well as general disorders through to shock. People with a disposition to develop atopy are more frequently affected. Consequently a protein contact dermatitis may arise at the contact location with the appearance of an allergic contact eczema. Other substances such as persulphates and antibiotics may also cause type I allergies.

## Annex 4 to TRGS 401

### Risk matrix

Where there are gaps in the data the hazard features assumed according to number 3.2 paras 3 and 4 must be taken into account.

Feature	Labelling of the substances/preparations with	Duration/extent of skin contact			
		short-term (< 15 minutes)		longer-term (> 15 minutes)	
		small-area (e.g. splashes)	large-area	small-area (e.g. splashes)	large-area
	R 66	g	G	g	M
skin-irritating	R 38	g	M	m	M
corrosive	pH ≤ 2 or pH ≥ 11,5	m	M	m	H
	R 34	m	M	m	H
	R 35	m	H	h	H
skin-resorptive	R 21	g	M	m	H
	R 24	m	M	m	H
	R 24 (in combination with R 34 or R 35)	h	H	h	H
	R 27	h	H	h	H
skin-resorptive and other properties	R 40 (*), R 68 (*)	m	m	m	H
	R 62 (*), R 63 (*)	m	m	m	m
	R 45 (*), R 46 (*), R 60 (*), R 61 (*)	h	h	h	h
sensitising	R 43, (R 42/43), sensitising hazardous substances acc. to annex 3 and acc. to 3.2.1 (2) or (3)**	g	m	m	h

(\*) = if skin-resorptive;

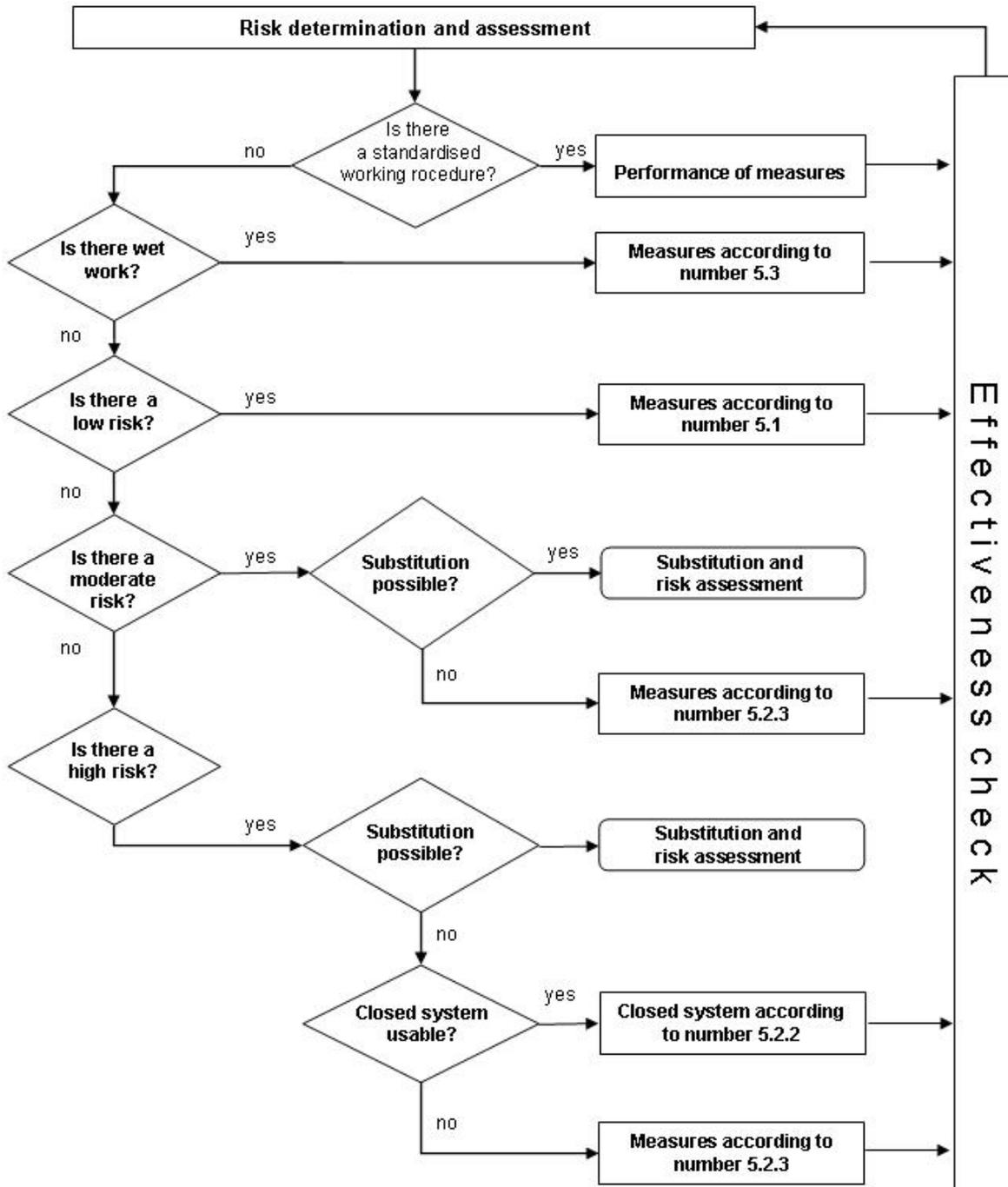
g = low risk,

m = medium risk;

h = high risk

\*\* As a deviation, for all activities with dermal risk due to substances where practical experience shows that these substances or preparations may cause sensitisation among a large number of workers as a result of skin contact (e.g. uncured epoxy resin systems), there is a high risk.

**Annex 5 to TRGS 401**  
**Procedure for laying down protective measures where there is skin contact**



**Annex 6 to TRGS 401****Examples of solutions for the reduction or prevention of skin contact**

Operation	Sector	Technical/organisational solution
Cleaning	General	<p>Workplaces and working areas where it is necessary to expect the release of or contamination by substances within the meaning of the present TRGS (e.g. filling and bottling stations, weighing and mixing workplaces, storage rooms) must be designed so that they can be easily cleaned.</p> <p>Suitable adsorbents and/or industrial vacuum cleaners of at least dust class M must be kept ready and used. The type of cleaning, the cleaning agent(s) and the cleaning procedure must be laid down in writing, e.g. in a work instruction.</p>
	Print industry: offset printing, intaglio printing, screen printing, label printing, flexo printing	Use of automatic installations, e.g. cylinder washing machine, parts washing installations, screen washing and decoating installations
	Various industrial sectors	Cleaning of screens and filters by means of automatic counterflow (instead of manual drawing of screen and cleaning)
	Bottling installations	Barrel and bottle cleaning installations in fully automated, closed design
Filling/bottling/decanting, mixing/storage of substances	General	<p>Use of substances and preparations in low-exposure form. This includes: pellets, granulates, pasty compounds, solutions, portion bags, plastic sheathing, as well as dispensing in lost packagings which can be incorporated directly in the processing operation.</p> <p>During the production (mixing) of ready-to-use solutions (e.g. cooling lubricants, disinfectants, preservatives and cleaning agents, it must be ensured that the correct dosage is used.</p> <p>To fill containers with liquids (acids, lyes and solvents) or solids closed and/or automated filling systems must be used as far as possible (barrel tipping devices instead of barrel pumps, closed metering screws, cellular wheel sluices, pneumatic conveying installations, the operation of bag opening machines in an airlock, automated bag filling, for example, by taking plastic bags from a sheeting roll, filling, weld-sealing, stacking).</p> <p>Where partial quantities are removed, resealable containers must be used. Immediately after use the containers must be sealed tight again.</p> <p>Big bags may only be emptied of solids using a specially sealed docking system.</p> <p>Product residues from the container must be avoided, and where necessary these must be cleaned at the point of removal.</p> <p>In storage rooms no bottling, decanting and similar activities may be performed. If it is necessary to deviate from this for operational reasons, protective measures must be taken (see filling systems).</p> <p>In the case of storage care must be taken to ensure the correct stacking height and prevent any falls. As far as possible original</p>

		containers should be used.
	Pharmacies, medical/veterinary practices	Use of safe transfer systems with pressure equalization in the preparation of pharmaceuticals
	Pharmacies	Use of stirring systems where the mixing vessel is at the same time the dispensing vessel, for the individual recipe of ointments
	Hairdressers	Use of mixing applicators and portion dispensers to dilute concentrates
	Construction industry, electrical industry	Provision of multi-component coatings and adhesives in combination with containers instead of in separate containers, use of multichamber bags
	Laboratory	Use of pipetting aids and dispensers for laboratory flasks
	Laboratory	Handling of especially dangerous substances in a glove box
	Laboratory	To avoid overfilling use vessels and containers with filling level indicators.
	Laboratory	Storage of chemical substances in the laboratory in tightly sealed threaded flasks (instead of ground flasks with glass, cork or rubber stoppers)
	Laboratory	Sampling systems in closed design (instead of open sampling taps, scoops etc.), e.g. use of specimen flasks with rubber septum, injection of the liquid sample using a cannula, where necessary in addition within a closed cabinet (possibly with extractor)
Process control	Chemical industry	On-line measurements for quality monitoring instead of manual sampling
Special work procedures	Painting/varnishing	Automated paint mixing installation
	Print industry Rotary printing processes	Use of automated paint supply system
	Print industry Offset printing	Use of an automated wetting agent metering station to mix and meter the wetting agent
	Print industry Bookbinding shop	Use of closed jet glueing machines when working with PUR adhesives
	Print industry Bookbinding shop	Use of coated adhesive basins and coated rollers in roller-type glueing installations
	Galvanizing shop	Use of wetting agents in the case of electrolytes in surface treatment and use of ready-prepared electrolyte
	Dental technology	Use of hydrofluoric-acid-containing gels instead of hydrofluoric acid
	PCB production	Use of solid adhesives instead of pasty adhesives
	Painting/varnishing	Coatings with application devices/calenders (instead of manual application)
	Painting/varnishing	Electrostatic powder coating (instead of manual application/spraying of varnishes containing solvents)
	Painting/varnishing	Varnishing in spray cabins with effective extraction
	Painting/varnishing	Immersion baths with automatic hoist and drip facility

Painting/varnishing	Use of adhesion glues with separation foil
Painting/varnishing	Application of coatings with rollers of large diameter to minimise the rolling speed and hence the risk of splashing
Construction industry	Use of industrially prefabricated construction elements (instead of conventional bricklaying)
Construction industry	Smoothing of silicon joints with a tool instead of a finger
Metal working	Use of encapsulated machines in metal working (instead of open machines with possible direct contact with cooling lubricants)  Manufacture of glass-fibre-reinforced plastic components using Resin Transfer Moulding (RTM method) instead of manual lamination
Metal working	Automated soldering stations (instead of manual soldering)
Metal working	Monitoring of set values for water-mixed cooling lubricants (e.g. concentration, pH, perceivable changes) and appropriate measures
Metal working	Minimum quantity lubrication instead of cooling lubricant circulation systems
Metal working	Automated adhesive processes (robots) in automobile manufacture
Pathology	Use of automated dyeing lines
Pathology	Use of special object mountings for manual dyeing
Miscellaneous	Inspection systems using remote-controlled probes (instead of entry into or dismantling of lines, ducts and tanks)

## **Annex 7 to TRGS 401**

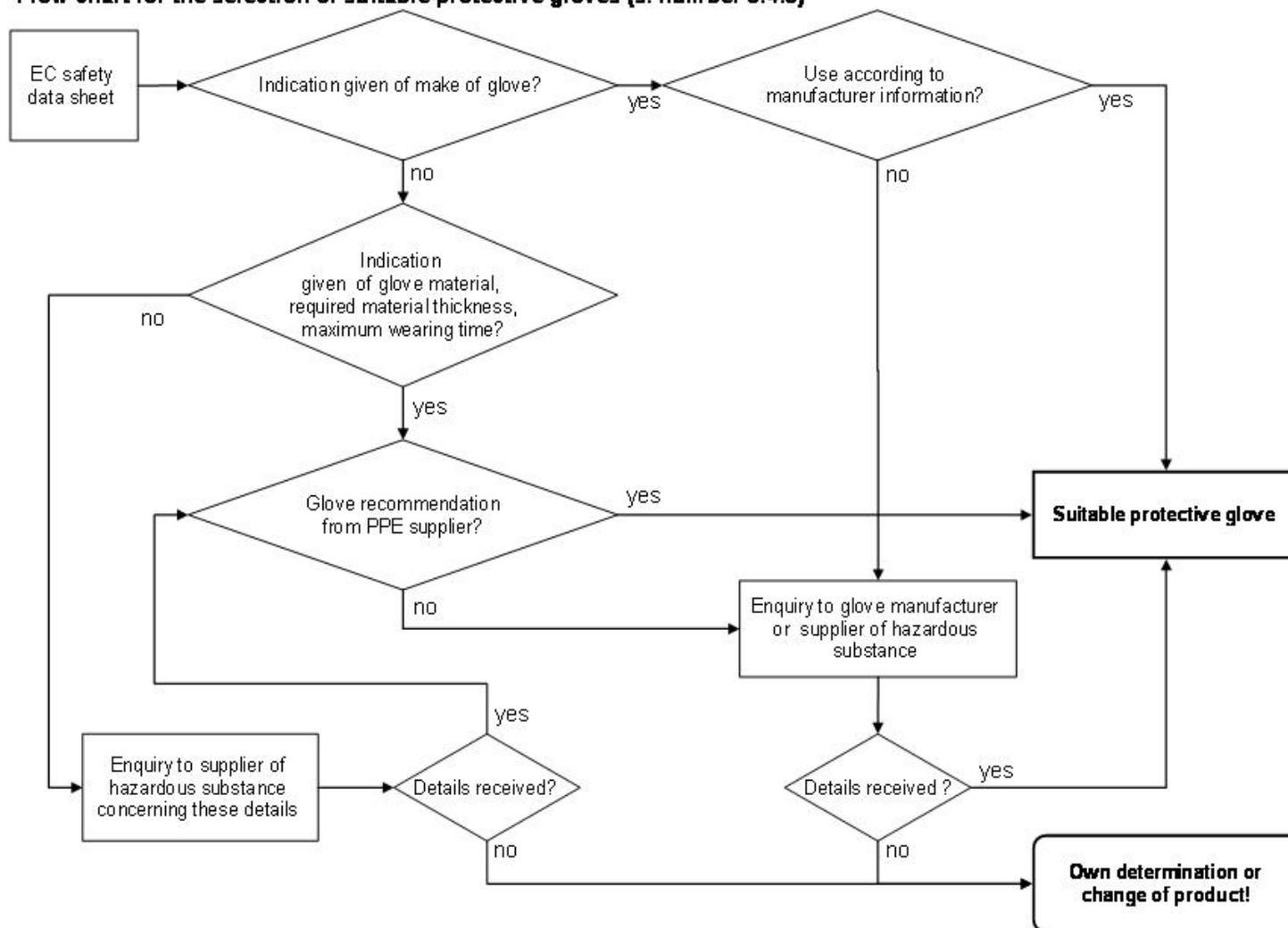
### **Activities involving skin contact beyond the hands (non-exhaustive list)**

Below examples of activities are given where skin contact may occur in parts of the body beyond hands:

1. kneeling activities with skin contact (e.g. screed layers, tilers),
2. mixing with free-running agitator (mixing and "clean-running" of multi-component products and soiling of clothing),
3. internal cleaning of vessels and tanks,
4. skin contact on the face involving vapours when handling epoxy resins,
5. working with products which are sprayed e.g. spray loaders when spraying pesticides),
6. activities involving exposure to cooling lubricants,
7. repair work on machines and installations,
8. oil change in automotive workshops.

**Annex 8 to TRGS 401**

**Flow chart for the selection of suitable protective gloves (s. number 6.4.3)**



**Annex 9 to TRGS 401****Selection of skin protection agents**

	Duration/extent of skin contact			
	short-term		longer-term	
	small-area	large-area	small-area	large-area
unclassified substances	depending on the risk assessment			
working in a wet environment	+			
R 66	+	+	+	+
R 38	+	+	+	-
R 21	+	-	-	-
R 34, R 35	-	-	-	-
H	-	-	-	-
R 24, R 27	-	-	-	-
R 40, R 45, R 46, R 48	-	-	-	-
R 60, R 61, R 62, R 63	-	-	-	-
R 68	-	-	-	-
R 43, R 42/43	-	-	-	-
Sh, Sah	-	-	-	-
+	use of skin protection agents possible			
-	use of skin protection agents not possible			

## **Annex 10 to TRGS 401**

### **R-phrases quoted in the text of the TRGS 401**

1. R-phrases in the text of the TRGS 401 of substance with skin relevance:
  - R 21: Harmful in contact with skin
  - R 24: Toxic in contact with skin
  - R 27: Very toxic in contact with skin
  - R 34: Causes burns
  - R 35: Causes severe burns
  - R 38: Irritating to skin
  - R 43: May cause sensitisation by skin contact
  - R 66: Repeated exposure may cause skin dryness or cracking
  
2. Other R-phrases in the text of the TRGS 401 of substances which have skin-resorptive properties in addition and, if legally classified, are labelled with H:
  - R 39: Danger of very serious irreversible effects
  - R 40: Limited evidence of a carcinogenic effect
  - R 45: May cause cancer
  - R 46: May cause heritable genetic damage
  - R 48: Danger of serious damage to health by prolonged exposure
  - R 60: May impair fertility
  - R 61: May cause harm to the unborn child
  - R 62: Possible risk of impaired fertility
  - R 63: Possible risk of harm to the unborn child
  - R 68: Possible risk of irreversible effects
  
3. Other R-phrases in the text of the TRGS 401 of substances which have skin-endangering properties in addition and/or are combined with R-phrases of group (A) and/or (B):
  - R 20: Harmful by inhalation
  - R 22: Harmful if swallowed
  - R 23: Toxic by inhalation
  - R 25: Toxic if swallowed
  - R 26: Very toxic by inhalation
  - R 28: Very toxic if swallowed
  - R 36: Irritating to eyes

R 37: Irritating to respiratory system

R 39: Danger of very serious irreversible effects

R 41: Danger of very serious irreversible effects

R 42: May cause sensitisation by inhalation

R 48: Danger of serious damage to health by prolonged exposure

R 68: Possible risk of irreversible effects