



# ZeroPM Alternatives database: Contribution of Stockholm University to the public consultation on the restriction on uses of per- and polyfluoroalkyl substances (PFAS)

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## Background information

As part of the ZeroPM project ([www.zeropm.eu](http://www.zeropm.eu)), Stockholm University is building a database of alternatives to persistent, mobile and toxic (PMT) substances, and to per- and polyfluoroalkyl substances (PFAS).

This document succinctly presents how the database has been built and its general structure. In the second part, we summarise the information contained in the database for each specific use discussed in the restriction proposal.

The beta-version of this database will be publicly available on the ZeroPM website (<https://zeropm.eu/alternative-assessment-database/>) from the 30th of September 2023, and will be continuously updated as we get more information. We hope that this resource will support the development of the restriction on uses of PFAS, by providing an information repository of where researchers, innovators and business can consider alternatives to PFAS before the restriction targets.

### 1. General information on the ZeroPM alternatives database

#### 1.1. The functional substitution: the core of the database

The database has been built by following the functional substitution approach as defined by Tickner et al. (2015) in order to be able to identify all types of alternatives to substances of concern. Therefore, for each use of substances of concern, the database provides its chemical function, end-use function, and function as a service, as defined below.

- **Chemical function:** The chemical function is the actual technical function of the substance of concern, generally determined by its physico-chemical properties. In the database, the chemical function was defined following the OECD internationally harmonised functional, product and article use categories (OECD, 2017).
- **End-use function:** The end-use function specifies the specific purpose provided by the substance of concern in a product or process. In other words, what does the substance of concern bring to the product or process.
- **Function as service:** The service relates to the broad service provided by the substance of concern in a product or process. In other words, what are the services provided by the specific end use of the substance of concern.

#### 1.2. General structure of the database for the specific case of PFAS

In the case of PFAS, it is not feasible to build such a database substance-by-substance. Instead, the database has been built around the use categories of PFAS, which are being defined and discussed in the restriction proposal. For each use category, the database provides:

- A list of sub-use(s) and application(s) of PFAS;
- The chemical function(s), end-use function(s), and service(s) provided by PFAS for all applications identified;
- A non-exhaustive list of substances used for each application, along with their CAS number and INCHI key if available;



- A non-exhaustive list of potential alternatives to PFAS for each application, along with their CAS number (if available), the type of alternative, and some basic information on the suitability of the alternative of the specific application, and whether it is already available/in use on the market. At the moment, the main source of information to identify alternatives was the restriction dossier and the ChemSec marketplace (ChemSec, 2023). We aim to deepen the search for alternatives for specific use cases of PFAS in the future.

Figure 1 below illustrates the general structure of the database by taking the examples of fluorinated gases and food contact materials.

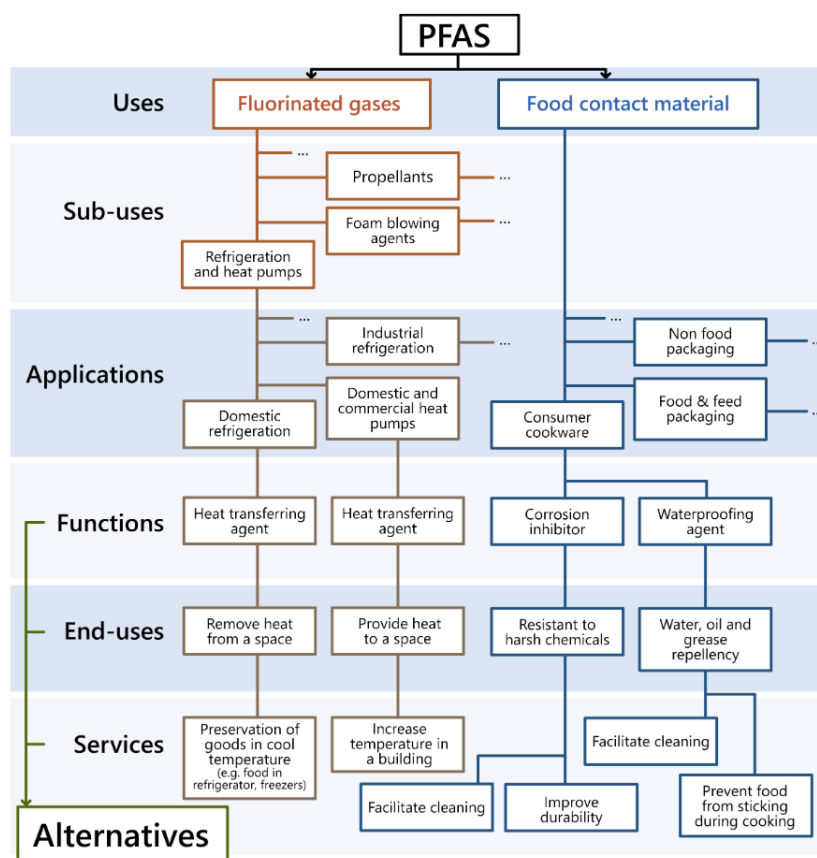


Figure 1 General structure of the ZeroPM alternatives database for PFAS - Examples of fluorinated gases and food contact material

### 1.3. Intended use of the database

We do not state that all alternatives listed in the database are technically feasible for all applications, but we hope to provide a convenient for users to search and sort information on uses of PFAS and their potential alternatives to guide companies in their substitution activities. Essentially, it will serve as a starting point for deeper analysis, including by members of ZeroPM. We believe it is the responsibility of users of the database to further assess whether the alternatives can be suitable for their particular products or processes.

Furthermore, we do not provide an in-depth hazard characterisation of the alternatives at the moment, so we cannot confirm that the alternatives listed in the database are safer than PFAS. However, in future iterations it will be linked with the ZeroPM database, which will contain



information about the persistent and mobility of alternatives. There will nevertheless be clear disclaimers that further assessment on the potential alternatives should be done by the user of the database to avoid potential regrettable substitution.

At last, over time the aim is to develop the database further to make it more “user friendly”.

## 2. Summary of the information contained in the database

### 2.1. List of uses currently in the database

Currently we have the following use categories in the database:

- Active Pharmaceutical Ingredients
- Biocidal product
- Building and construction products
- Consumer mixtures
- Cosmetics
- Electronics and semiconductors
- Energy sector
- Fluorinated gases
- Food contact materials
- Lubricant
- Medical devices
- Metal products manufacture and metal plating
- Petroleum and mining
- Plant Protection Products
- Ski wax
- Transport
- Textile, upholstery, leather, apparel, and carpets (TULAC)

### 2.2. Functions of PFAS and potential alternatives identified

The annex of this document summarises the information contained in the database for every use category discussed in the restriction dossier. For each application identified, it provides:

- The number of technical function(s), end use function(s) and service(s) provided by PFAS – We hope that this data could help the dossier submitter to identify those cases where substitution of PFAS could be difficult as they provide many different functions to the product or process;
- The number of alternatives included in the database;
- A list of potential alternatives we have identified but which were not included in the database, to the best of our knowledge – In this way the ZeroPM Alternatives database will provide new knowledge related to the availability of potential alternatives to PFAS.





### Specific case of cosmetic products

In the particular case of cosmetics, ingredients providing a certain function which can be used in cosmetic formulations are listed in the CosIng database (European Commission, 2023). When building the database, we assumed that any chemical substance which is listed in the CosIng database for the same function(s) as PFAS could be considered as potential suitable alternatives, as it has been done by van Dijk et al. (2023). For some functions (e.g. skin conditioning), it results in thousands of substances which could be potential substitute. As the approach for cosmetic products was slightly different than for the other uses, the number of potential alternatives to PFAS in cosmetic products is not provided in the Excel file provided. However, they will be included in the database once it is published.

### Specific case of active ingredients – Active Pharmaceutical Ingredients, Biocide products, and Plant Protection Products

Similarly, active ingredients in pharmaceutical, biocide products and plant production products are registered in different databases (WHO (2023); ECHA (2023a); ECHA (2023b)). We assumed that any other substances listed in those databases for the same function(s) as PFAS could be considered as potential suitable alternatives

## 2.3. Overview of the database

Table 1 and 2 below summarise the number of different technical functions, end-use functions and services provided by PFAS, and the number of alternatives that we identified, per type of alternatives (i.e. alternative substance, alternative material, alternative product, alternative process, or alternative technology). Please note that the numbers related to the alternatives to PFAS used as active substances (i.e. in active pharmaceutical ingredients, biocide products, and plant protection products) and as ingredients in cosmetic products are not included in this overview for the reasons explained above.





Table 1 Number of technical functions, end use functions and services of PFAS per use categories

| Use categories                               | Technical functions | End-use functions | Services   |
|----------------------------------------------|---------------------|-------------------|------------|
| Active Pharmaceutical ingredients            | 1                   | 24                | 21         |
| Biocidal product                             | 1                   | 4                 | 1          |
| Building and construction products           | 14                  | 18                | 40         |
| Consumer mixtures                            | 5                   | 8                 | 7          |
| Cosmetics                                    | 10                  | 13                | 6          |
| Electronics and semiconductors               | 17                  | 27                | 56         |
| Energy sector                                | 18                  | 22                | 39         |
| Firefighting foams                           | 1                   | 1                 | 3          |
| Fluorinated gases                            | 8                   | 14                | 29         |
| Food contact materials                       | 4                   | 5                 | 10         |
| Lubricant                                    | 11                  | 13                | 19         |
| Medical devices                              | 13                  | 18                | 35         |
| Metal products manufacture and metal plating | 8                   | 11                | 15         |
| Petroleum and mining                         | 10                  | 14                | 15         |
| Plant Protection Products                    | 1                   | 4                 | 1          |
| Ski waxe                                     | 1                   | 1                 | 1          |
| Transport                                    | 18                  | 39                | 90         |
| TULAC                                        | 9                   | 13                | 28         |
| <b>Total</b>                                 | <b>38</b>           | <b>140</b>        | <b>275</b> |

Table 2 Number of alternatives identified per type of alternative\*

| Type of alternative    | Count      |
|------------------------|------------|
| Alternative material   | 142        |
| Alternative process    | 33         |
| Alternative product    | 129        |
| Alternative substance  | 185        |
| Alternative technology | 38         |
| <b>Total</b>           | <b>520</b> |

\*: The numbers indicated do not include the alternatives to PFAS used as active substance and as ingredients in cosmetic products



### 3. References

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- WHO (2023), ATC/DDD Index 2023. [https://www.whocc.no/atc\\_ddd\\_index/](https://www.whocc.no/atc_ddd_index/). Last accessed: 2023.07.10



## Appendix

The appendix provides the number of technical function(s), end use function(s) and service(s) provided by PFAS for every application identified. It also provides the number of potential alternatives identified, and a list of alternatives which are not included in the restriction dossier, to the best of our knowledge.

### 1. Active Pharmaceutical Ingredients

| Sub-uses                 | Applications                                                         | Technical functions | End-use functions | Services | Nb. Of alternatives | Alternatives not listed the restriction                                 |
|--------------------------|----------------------------------------------------------------------|---------------------|-------------------|----------|---------------------|-------------------------------------------------------------------------|
| Human health application | Alimentary tract and metabolism                                      | 1                   | 5                 | 5        | 80                  | <a href="#">Alimentary tract and metabolism API</a>                     |
|                          | Antiinfectives for systemic use                                      | 1                   | 1                 | 2        | 48                  | <a href="#">Antiinfectives for systematic use API</a>                   |
|                          | Antineoplastic and immunomodulating agents                           | 1                   | 3                 | 2        | 120                 | <a href="#">Antineoplastic and immunomodulating agents API</a>          |
|                          | Antiparasitic products, insecticides and repellents                  | 1                   | 1                 | 1        | 9                   | <a href="#">Antiparasitic products, insecticides and repellents API</a> |
|                          | Blood and blood forming organs                                       | 1                   | 1                 | 1        | 24                  | <a href="#">Blood and blood forming organs API</a>                      |
|                          | Cardiovascular system                                                | 1                   | 4                 | 1        | 64                  | <a href="#">Cardiovascular system API</a>                               |
|                          | Genito Urinary System and Sex hormones                               | 1                   | 1                 | 1        | 9                   | <a href="#">Genito Urinary System and Sex hormones API</a>              |
|                          | Musculo-skeletal system                                              | 1                   | 1                 | 1        | 10                  | <a href="#">Musculo-skeletal system API</a>                             |
|                          | Nervous system                                                       | 1                   | 3                 | 3        | 21                  | <a href="#">Nervous system API</a>                                      |
|                          | Respiratory system                                                   | 1                   | 1                 | 1        | 3                   | <a href="#">Respiratory system API</a>                                  |
|                          | Sensory organs                                                       | 1                   | 1                 | 1        | 5                   | <a href="#">Sensory organs API</a>                                      |
|                          | Systemic Hormonal Preparations (excluding sex hormones and insulins) | 1                   | 1                 | 1        | 4                   | <a href="#">Systemic hormonal preparations API</a>                      |

|                               |                |   |   |   |    |                                    |
|-------------------------------|----------------|---|---|---|----|------------------------------------|
|                               | Various        | 1 | 1 | 1 | 4  | <a href="#">Other</a>              |
| <i>Veterinary application</i> | Nervous system | 1 | 2 | 2 | 11 | <a href="#">Nervous system API</a> |

## 2. Biocidal products

| <i>Sub-uses</i>         | <b>Applications</b>                                               | <b>Technical functions</b> | <b>End-use functions</b> | <b>Services</b> | <b>Nb. Of alternatives</b> | <b>Alternatives not listed the restriction</b> |
|-------------------------|-------------------------------------------------------------------|----------------------------|--------------------------|-----------------|----------------------------|------------------------------------------------|
| <i>Biocidal product</i> | Antifouling products                                              | 1                          | 1                        | 1               | 9                          | <a href="#">Authorised biocidal products</a>   |
|                         | Insecticides, acaricides and products to control other arthropods | 1                          | 1                        | 1               | 39                         | <a href="#">Authorised biocidal products</a>   |
|                         | Rodenticides                                                      | 1                          | 1                        | 1               | 12                         | <a href="#">Authorised biocidal products</a>   |
|                         | Wood preservatives                                                | 1                          | 1                        | 1               | 27                         | <a href="#">Authorised biocidal products</a>   |

### 3. Building and construction products



| Sub-uses                     | Applications                                  | Technical functions | End-use functions | Services | Nb. Of alternatives | Alternatives not listed the restriction |
|------------------------------|-----------------------------------------------|---------------------|-------------------|----------|---------------------|-----------------------------------------|
| Architectural membranes      | Architectural membranes                       | 4                   | 4                 | 3        | 7                   | Not applicable                          |
| Building and bridge bearings | Building and bridge bearings                  | 1                   | 1                 | 2        | 1                   | Not applicable                          |
| Coating and paint            | Architectural paint and coating               | 6                   | 6                 | 5        | 5                   | Not applicable                          |
|                              | Coating of wind turbine blades                | 7                   | 7                 | 6        | 1                   | Not applicable                          |
|                              | Coil coating (coted steel and aluminium coil) | 6                   | 6                 | 5        | 5                   | Not applicable                          |
|                              | Cotaing of solar panels                       | 6                   | 6                 | 7        | 2                   | Not applicable                          |
|                              | Levelling agent                               | 1                   | 1                 | 2        | 8                   | Not applicable                          |

|                                        |                                                                       |   |   |   |    |                                                                                                                            |
|----------------------------------------|-----------------------------------------------------------------------|---|---|---|----|----------------------------------------------------------------------------------------------------------------------------|
| Foam blowing agents                    | Extruded polystyrene foam (XPS)                                       | 1 | 1 | 1 | 16 | Fiber glass; Mineral wool; Cellulose; Cotton; Sheep's wool; Straw; Hemp; Cementitious foam (Exponent International (2021)) |
|                                        | Rigid polyurethane boardstock and panels                              | 1 | 1 | 1 | 14 | Fiber glass; Mineral wool; Cellulose; Cotton; Sheep's wool; Straw; Hemp; Cementitious foam (Exponent International (2021)) |
|                                        | Rigid polyurethane spray foam                                         | 1 | 1 | 1 | 6  | Not applicable                                                                                                             |
| Glass protection                       | Film/foil for greenhouses                                             | 5 | 5 | 5 | 0  | Not applicable                                                                                                             |
|                                        | Window film manufacture                                               | 1 | 1 | 1 | 0  | Not applicable                                                                                                             |
| Production of non-PFAS polymer/plastic | Processing aids                                                       | 5 | 6 | 4 | 2  | Not applicable                                                                                                             |
| Sealing and adhesives                  | Levelling agent                                                       | 1 | 1 | 2 | 8  | Not applicable                                                                                                             |
|                                        | Sealants for porous materials, and concrete                           | 3 | 3 | 4 | 9  | Not applicable                                                                                                             |
|                                        | Thread sealing tape (e.g. for pipe connections for liquids and gases) | 2 | 2 | 1 | 0  | Not applicable                                                                                                             |

|                  |                                      |   |   |   |   |                |
|------------------|--------------------------------------|---|---|---|---|----------------|
| Wires and cables | Electrical cable and wire insulation | 5 | 5 | 6 | 5 | Not applicable |
|------------------|--------------------------------------|---|---|---|---|----------------|

#### 4. Consumer mixtures

| Sub-uses  | Applications                                                       | Technical functions | End-use functions | Services | Nb. Of alternatives | Alternatives not listed the restriction                                                             |
|-----------|--------------------------------------------------------------------|---------------------|-------------------|----------|---------------------|-----------------------------------------------------------------------------------------------------|
| Cleaners  | Cleaners                                                           | 1                   | 1                 | 2        | 8                   | <a href="#">Lutensit - PFAS free emulsion polymerization process additive - ChemSec marketplace</a> |
|           | Cleaners for glass, metal, ceramic, plastic, carpet and upholstery | 1                   | 1                 | 1        | 0                   | Not applicable                                                                                      |
|           | Cleaning of optical devices                                        | 1                   | 1                 | 2        | 0                   | Not applicable                                                                                      |
|           | Dishwashing products/rinse aid                                     | 1                   | 1                 | 2        | 2                   | Not applicable                                                                                      |
|           | Drycleaning products                                               | 1                   | 1                 | 1        | 0                   | Not applicable                                                                                      |
| Coating   | Waxes and polishes (e.g. for floors, cars)                         | 2                   | 3                 | 3        | 5                   | Not applicable                                                                                      |
|           | Windscreen treatments                                              | 2                   | 2                 | 1        | 11                  | Not applicable                                                                                      |
| Lubricant | Lubricant additives (e.g. for bike chains)                         | 1                   | 1                 | 1        | 9                   | <a href="#">PTFE-Free Water-based phenolic-melamine gold lacquer - ChemSec marketplace</a>          |
| Other     | Anti fog agent                                                     | 1                   | 1                 | 1        | 0                   | Not applicable                                                                                      |

|                           |                                 |   |   |   |   |                                                                                                    |
|---------------------------|---------------------------------|---|---|---|---|----------------------------------------------------------------------------------------------------|
|                           | Musical instruments             | 1 | 1 | 1 | 6 |  Not applicable |
| Textile cleaning products | Aftermarket carpet care product | 2 | 2 | 1 | 7 | Not applicable                                                                                     |

## 5. Cosmetic products

| Sub-uses   | Applications                                    | Technical functions | End-use functions | Services | Nb. Of alternatives | Alternatives not listed the restriction |
|------------|-------------------------------------------------|---------------------|-------------------|----------|---------------------|-----------------------------------------|
| Decorative | Blush/highlighter                               | 1                   | 3                 | 2        | See separate note   | <a href="#">CosIng database</a>         |
|            | Brow products                                   | 1                   | 3                 | 2        | See separate note   | <a href="#">CosIng database</a>         |
|            | Concealer/Corrector                             | 1                   | 3                 | 2        | See separate note   | <a href="#">CosIng database</a>         |
|            | Eye cream/Eye shadow                            | 3                   | 5                 | 3        | See separate note   | <a href="#">CosIng database</a>         |
|            | Highlighter                                     | 1                   | 3                 | 2        | See separate note   | <a href="#">CosIng database</a>         |
|            | Lip balm/lip stick/lip gloss                    | 2                   | 4                 | 3        | See separate note   | <a href="#">CosIng database</a>         |
|            | Mascara/lashes                                  | 1                   | 3                 | 2        | See separate note   | <a href="#">CosIng database</a>         |
|            | Powder                                          | 1                   | 3                 | 2        | See separate note   | <a href="#">CosIng database</a>         |
|            | Primer/fixer                                    | 2                   | 2                 | 2        | See separate note   | <a href="#">CosIng database</a>         |
|            | Sunscreen makeup                                | 1                   | 3                 | 2        | See separate note   | <a href="#">CosIng database</a>         |
|            | Unknown                                         | 3                   | 4                 | 3        | See separate note   | <a href="#">CosIng database</a>         |
| General    | Cosmetics and personal care products in general | 3                   | 4                 | 3        | See separate note   | <a href="#">CosIng database</a>         |

|            |                                        |   |   |   |                   |                                 |
|------------|----------------------------------------|---|---|---|-------------------|---------------------------------|
| Hair care  | Hair creams, rinses, and conditioner   | 1 | 1 | 1 | See separate note | <a href="#">CosIng database</a> |
|            | Hair shampoo                           | 1 | 1 | 1 | See separate note | <a href="#">CosIng database</a> |
|            | Hair spray/Mousse                      | 1 | 1 | 1 | See separate note | <a href="#">CosIng database</a> |
|            | Unknown                                | 3 | 3 | 3 | See separate note | <a href="#">CosIng database</a> |
| Skin care  | Anti-aging cream                       | 2 | 2 | 2 | See separate note | <a href="#">CosIng database</a> |
|            | BB/CC cream, foundation                | 3 | 5 | 3 | See separate note | <a href="#">CosIng database</a> |
|            | Body lotion/ body cream/ body oil      | 3 | 5 | 3 | See separate note | <a href="#">CosIng database</a> |
|            | Cream/lotion                           | 2 | 4 | 3 | See separate note | <a href="#">CosIng database</a> |
|            | Face cream                             | 2 | 4 | 3 | See separate note | <a href="#">CosIng database</a> |
|            | Mask                                   | 2 | 2 | 2 | See separate note | <a href="#">CosIng database</a> |
|            | Moisturer                              | 4 | 4 | 3 | See separate note | <a href="#">CosIng database</a> |
|            | Sunscreen                              | 2 | 2 | 2 | See separate note | <a href="#">CosIng database</a> |
|            | Unknown                                | 4 | 4 | 3 | See separate note | <a href="#">CosIng database</a> |
| Toiletries | Makeup remover/ facial cleaner         | 2 | 2 | 2 | See separate note | <a href="#">CosIng database</a> |
|            | Shaving cream/shaving foam/shaving gel | 1 | 3 | 2 | See separate note | <a href="#">CosIng database</a> |

## 6. Electronic and semiconductor industry

| Sub-uses             | Applications                     | Technical functions | End-use functions | Services | Nb. Of alternatives | Alternatives not listed the restriction |
|----------------------|----------------------------------|---------------------|-------------------|----------|---------------------|-----------------------------------------|
| Electronics industry | Carrier solvent & lubricants     | 1                   | 1                 | 1        | 11                  | Not applicable                          |
|                      | Coating of electronic components | 7                   | 7                 | 7        | 0                   | Not applicable                          |
|                      | Electronic components            | 7                   | 7                 | 6        | 1                   | Not applicable                          |
|                      | Fire protection fluid            | 2                   | 2                 | 2        | 8                   | Not applicable                          |
|                      | Flow batteries                   | 3                   | 3                 | 3        | 1                   | Not applicable                          |
|                      | Heat transfer fluids             | 1                   | 1                 | 2        | 6                   | Not applicable                          |
|                      | Lithium-ion batteries            | 2                   | 2                 | 2        | 3                   | Not applicable                          |

|                              |                                                                            |   |   |   |    |                                                                             |
|------------------------------|----------------------------------------------------------------------------|---|---|---|----|-----------------------------------------------------------------------------|
|                              | Lubricant and lubricant additives                                          | 4 | 4 | 5 | 9  | Not applicable                                                              |
|                              | PEM fuel cells                                                             | 7 | 7 | 5 | 4  | Not applicable                                                              |
|                              | Precision & electronics cleaning, commercial & industrial cleaning         | 1 | 2 | 3 | 17 | Not applicable                                                              |
|                              | Sealing for electronic components                                          | 4 | 4 | 2 | 1  | Not applicable                                                              |
|                              | Wires and cables                                                           | 7 | 7 | 6 | 5  | Not applicable                                                              |
| Semiconductor products and   | Fluoroelastomers                                                           | 1 | 1 | 1 | 0  | Not applicable                                                              |
|                              | Lubricant and lubricant additives                                          | 4 | 4 | 5 | 9  | Not applicable                                                              |
|                              | Photoresist                                                                | 3 | 3 | 3 | 1  | <a href="#">PFOS &amp; PFAS-free KrF photoresists - ChemSec marketplace</a> |
|                              | Plastics                                                                   | 1 | 1 | 1 | 2  | Not applicable                                                              |
| Semiconductors manufacturing | Data centres                                                               | 4 | 4 | 5 | 0  | Not applicable                                                              |
|                              | Heat transfer fluids                                                       | 1 | 1 | 1 | 8  | Fluorine-free alternative patented (Glüge et al. 2021)                      |
|                              | Nanoimprint lithography                                                    | 1 | 1 | 1 | 0  | Not applicable                                                              |
|                              | Photolithography                                                           | 7 | 7 | 6 | 6  | Not applicable                                                              |
|                              | Plasma etch and wafer cleaning                                             | 1 | 1 | 1 | 0  | Not applicable                                                              |
|                              | Release sheet for thermocompression bonding process of semiconductor chips | 2 | 2 | 2 | 0  | Not applicable                                                              |
|                              | Semiconductor manufacturing equipments                                     | 4 | 4 | 4 | 1  | Not applicable                                                              |
|                              | Semiconductor packaging                                                    | 3 | 3 | 3 | 0  | Not applicable                                                              |
|                              | Thermal testing of semiconductor devices                                   | 2 | 2 | 2 | 0  | Not applicable                                                              |
|                              | Usage of high purity chemicals                                             | 1 | 1 | 1 | 0  | Not applicable                                                              |
|                              | Vacuum fluid in vacuum pump                                                | 3 | 3 | 3 | 0  | Not applicable                                                              |

## 7. Energy sector



| <b>Sub-uses</b>                  | <b>Applications</b>                                                                             | <b>Technical functions</b> | <b>End-use functions</b> | <b>Services</b> | <b>Nb. Of alternatives</b> | <b>Alternatives not listed the restriction</b> |
|----------------------------------|-------------------------------------------------------------------------------------------------|----------------------------|--------------------------|-----------------|----------------------------|------------------------------------------------|
| <i>Coal based power plants</i>   | Heat exchanger tubing and filters                                                               | 5                          | 5                        | 4               | 0                          | Not applicable                                 |
| <i>Electrolysis technologies</i> | Gasket, tubes, inline of pipes/tanks                                                            | 2                          | 2                        | 2               | 0                          | Not applicable                                 |
| <i>Flow batteries</i>            | Ionomer membranes, Ion exchange membranes                                                       | 3                          | 3                        | 3               | 1                          | Not applicable                                 |
| <i>Lithium-ion batteries</i>     | Seals, electrode binders, films/coatings, electrolyte additives, thermal management pack/module | 2                          | 2                        | 2               | 3                          | Not applicable                                 |

|                         |                                   |   |   |   |    |                                                                                            |
|-------------------------|-----------------------------------|---|---|---|----|--------------------------------------------------------------------------------------------|
| Nuclear power plant     | Gasket material                   | 1 | 1 | 1 | 0  | Not applicable                                                                             |
|                         |                                   |   |   |   |    |                                                                                            |
| Oil and gas application | Aqueous surface film              | 1 | 1 | 1 | 13 | Not applicable                                                                             |
|                         | Drilling fluid                    | 1 | 1 | 1 | 0  | Not applicable                                                                             |
|                         | Equipment                         | 4 | 4 | 4 | 12 | Not applicable                                                                             |
|                         | Lubricant and lubricant additives | 4 | 4 | 4 | 12 | <a href="#">PTFE-Free Water-based phenolic-melamine gold lacquer - ChemSec marketplace</a> |
|                         | Production chemicals              | 1 | 1 | 1 | 8  | Not applicable                                                                             |
|                         | Stimulation chemicals             | 1 | 1 | 1 | 20 | Not applicable                                                                             |
|                         | Water and gas tracers             | 1 | 1 | 1 | 17 | Not applicable                                                                             |
| Other                   | Switchgears High Voltage          | 4 | 4 | 4 | 1  | Not applicable                                                                             |
| PEM electrolyser        | Sealing materials                 | 1 | 1 | 1 | 5  | Not applicable                                                                             |
| PEM fuel cells          | Membrane electrode assemblies     | 7 | 7 | 5 | 4  | Not applicable                                                                             |
|                         | Microporous layer                 | 7 | 7 | 5 | 0  | Not applicable                                                                             |
|                         | Sealant                           | 6 | 6 | 4 | 2  | Not applicable                                                                             |
| Photovoltaic cells      | Film/coating tape                 | 8 | 8 | 8 | 2  | Not applicable                                                                             |

|                 |                                 |   |   |   |    |                                                                                            |
|-----------------|---------------------------------|---|---|---|----|--------------------------------------------------------------------------------------------|
| Solar collector |                                 | 1 | 1 | 1 | 0  | Not applicable                                                                             |
| Wind energy     | Film/coating and cable          | 6 | 6 | 5 | 0  | Not applicable                                                                             |
|                 | Lubricant & lubricant additives | 2 | 2 | 4 | 12 | <a href="#">PTFE-Free Water-based phenolic-melamine gold lacquer - ChemSec marketplace</a> |

## 8. Fluorinated gases

| Sub-uses            | Applications                             | Technical functions | End-use functions | Services | Nb. Of alternatives | Alternatives not listed the restriction                                                                                    |
|---------------------|------------------------------------------|---------------------|-------------------|----------|---------------------|----------------------------------------------------------------------------------------------------------------------------|
| Cover gases         | Magnesium casting                        | 1                   | 1                 | 1        | 3                   | Not applicable                                                                                                             |
| Fire suppressants   | Streaming agent                          | 2                   | 2                 | 2        | 8                   | Not applicable                                                                                                             |
|                     | Total flooding agent                     | 2                   | 2                 | 2        | 8                   | Not applicable                                                                                                             |
| Foam blowing agents | Extruded polystyrene foam (XPS)          | 1                   | 1                 | 1        | 16                  | Fiber glass; Mineral wool; Cellulose; Cotton; Sheep's wool; Straw; Hemp; Cementitious foam (Exponent International (2021)) |
|                     | Phenolic foam                            | 1                   | 1                 | 1        | 0                   | Not applicable                                                                                                             |
|                     | Polyurethane integral skin               | 1                   | 1                 | 1        | 0                   | Not applicable                                                                                                             |
|                     | Rigid polyurethane boardstock and panels | 1                   | 1                 | 1        | 14                  | Fiber glass; Mineral wool; Cellulose; Cotton; Sheep's wool; Straw; Hemp; Cementitious foam (Exponent International (2021)) |
|                     | Rigid polyurethane foam                  | 1                   | 1                 | 1        | 14                  | Fiber glass; Mineral wool; Cellulose; Cotton; Sheep's wool; Straw; Hemp; Cementitious foam (Exponent International (2021)) |

|                              |                                                      |   |   |   |    |                |
|------------------------------|------------------------------------------------------|---|---|---|----|----------------|
|                              | Rigid polyurethane pipe-in-pipe and block foam       | 1 | 1 | 1 | 6  | Not applicable |
|                              | Rigid polyurethane spray foam                        | 1 | 1 | 1 | 6  | Not applicable |
| Other                        | Electronics and semiconductors manufacture           | 2 | 2 | 2 | 0  | Not applicable |
|                              | Immersion cooling of electronics                     | 1 | 1 | 1 | 0  | Not applicable |
|                              | Insulation gas in Electrical switchgear              | 1 | 1 | 1 | 1  | Not applicable |
|                              | Plasma coating of HDPE                               | 1 | 1 | 1 | 0  | Not applicable |
|                              | Preservation of cultural paper-based materials       | 1 | 1 | 1 | 0  | Not applicable |
|                              |                                                      |   |   |   |    |                |
| Propellants                  | Commercial and industrial uses                       | 1 | 1 | 1 | 11 | Not applicable |
|                              | Consumer propellant                                  | 1 | 1 | 1 | 11 | Not applicable |
| Refrigeration and heat pumps | Commercial refrigeration                             | 1 | 1 | 1 | 7  | Not applicable |
|                              | Domestic and commercial heat pumps                   | 1 | 1 | 1 | 5  | Not applicable |
|                              | Domestic refrigeration                               | 1 | 1 | 1 | 5  | Not applicable |
|                              | Domestic, commercial and industrial air conditioning | 1 | 1 | 1 | 7  | Not applicable |
|                              | Electronics cooling, heat exchanger part             | 1 | 1 | 1 | 7  | Not applicable |
|                              | Heat pumps for clothes dryers                        | 1 | 1 | 1 | 7  | Not applicable |
|                              | Industrial refrigeration                             | 1 | 1 | 1 | 7  | Not applicable |
|                              | Mobile air conditioning                              | 1 | 1 | 1 | 4  | Not applicable |
|                              | Transport refrigeration                              | 1 | 1 | 1 | 6  | Not applicable |
|                              |                                                      |   |   |   |    |                |
| Solvent                      | 3D printing processing liquid                        | 1 | 1 | 1 | 0  | Not applicable |
|                              | Carrier solvent & lubricants                         | 1 | 1 | 1 | 11 | Not applicable |

|  |                                                                    |   |   |   |    |                |
|--|--------------------------------------------------------------------|---|---|---|----|----------------|
|  | Heat transfer agent                                                | 1 | 1 | 1 | 0  | Not applicable |
|  | Precision & electronics cleaning, commercial & industrial cleaning | 1 | 1 | 1 | 17 | Not applicable |

## 9. Food contact materials

| Sub-uses              | Applications          | Technical functions | End-use functions | Services | Nb. Of alternatives | Alternatives not listed the restriction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------|-----------------------|---------------------|-------------------|----------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Consumer cookware     | Consumer cookware     | 4                   | 4                 | 3        | 9                   | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Food & feed packaging | Food & feed packaging | 2                   | 2                 | 4        | 48                  | <a href="#">PFC-free food packaging tray   ChemSec Marketplace</a><br><a href="#">FluoroFree papers   ChemSec Marketplace</a><br><a href="#">PFC-free packaging for microwave popcorn   ChemSec Marketplace</a><br><a href="#">Uncoated paper plates free from PFAS   ChemSec Marketplace</a><br><a href="#">PFAS-free Kuraray Poval™ and Exceval™   ChemSec Marketplace</a><br><a href="#">Paraflex Nowax   ChemSec Marketplace</a><br><a href="#">Contour - PFAS-free oil &amp; grease resistant technology   ChemSec Marketplace</a><br><a href="#">PFAS-free Paper Barrier Coatings   ChemSec Marketplace</a><br><a href="#">TopScreen™ water repellent barrier coatings   ChemSec Marketplace</a><br><a href="#">TopScreen™ oil &amp; grease resistant barrier coatings   ChemSec Marketplace</a><br><a href="#">PROTEAN® technologies   ChemSec Marketplace</a><br><a href="#">PFAS-free food containers   ChemSec Marketplace</a> |

|                                        |                                                                     |   |   |   |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------|---------------------------------------------------------------------|---|---|---|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                        |                                                                     |   |   |   |   | <a href="#">ConFlex Repel Pure – grease-repellent the natural way   ChemSec Marketplace</a><br><a href="#">Ulterion® Paper Coatings   ChemSec Marketplace</a><br><a href="#">The Vanguard line - PFAS-free food packaging   ChemSec Marketplace</a><br><a href="#">VerdeCoat® -Food Packaging Coatings   ChemSec Marketplace</a><br><a href="#">PFAS-free alternative: Enshield®   ChemSec Marketplace</a><br><a href="#">Cartaseal® barrier coatings   ChemSec Marketplace</a> |
| Industrial food and feed production    | Industrial food and feed production equipment                       | 4 | 4 | 3 | 7 | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Non food packaging                     | Non food packaging                                                  | 2 | 2 | 2 | 8 | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Processing and polymerisation aids for | Processing and polymerisation aids for plastic thin film production | 2 | 2 | 3 | 1 | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## 10. Lubricants



| <i>Sub-uses</i>        | <b>Applications</b>                                    | <b>Technical functions</b> | <b>End-use functions</b> | <b>Services</b> | <b>Nb. Of alternatives</b> | <b>Alternatives not listed the restriction</b> |
|------------------------|--------------------------------------------------------|----------------------------|--------------------------|-----------------|----------------------------|------------------------------------------------|
| <i>Base oil/grease</i> | Automotive                                             | 4                          | 4                        | 5               | 3                          | Not applicable                                 |
|                        | Aviation and aerospace                                 | 4                          | 4                        | 5               | 3                          | Not applicable                                 |
|                        | Bulk gas industry                                      | 2                          | 2                        | 2               | 3                          | Not applicable                                 |
|                        | Chemical industry                                      | 3                          | 3                        | 3               | 3                          | Not applicable                                 |
|                        | Consumer products (e.g. music instruments)             | 1                          | 1                        | 1               | 6                          | Not applicable                                 |
|                        | Diving equipment                                       | 1                          | 1                        | 2               | 3                          | Not applicable                                 |
|                        | Electronics and semiconductors                         | 3                          | 3                        | 4               | 3                          | Not applicable                                 |
|                        | Food sector                                            | 3                          | 3                        | 3               | 3                          | Not applicable                                 |
|                        | Hearing loss applications                              | 4                          | 4                        | 4               | 3                          | Not applicable                                 |
|                        | Hospital equipments                                    | 1                          | 1                        | 2               | 3                          | Not applicable                                 |
|                        | Laboratory supplies, equipment, and instrument actions | 2                          | 2                        | 2               | 3                          | Not applicable                                 |
|                        | Metal working industry                                 | 2                          | 2                        | 2               | 3                          | Not applicable                                 |
|                        | Nuclear powerplants                                    | 3                          | 3                        | 4               | 3                          | Not applicable                                 |
|                        | Oil & gas                                              | 4                          | 4                        | 4               | 3                          | Not applicable                                 |
|                        | Paper                                                  | 3                          | 3                        | 3               | 3                          | Not applicable                                 |
|                        | Pharmaceutical industry                                | 1                          | 1                        | 1               | 3                          | Not applicable                                 |
|                        | Plastics                                               | 2                          | 2                        | 2               | 3                          | Not applicable                                 |
|                        | Renewable energy                                       | 2                          | 2                        | 4               | 3                          | Not applicable                                 |
|                        | Rubber/Tire industry                                   | 2                          | 2                        | 2               | 3                          | Not applicable                                 |
|                        | Steel industry                                         | 2                          | 2                        | 2               | 3                          | Not applicable                                 |
|                        | Textile                                                | 2                          | 2                        | 2               | 3                          | Not applicable                                 |

|                    |                                                        |   |   |   |    |                                                                                                    |
|--------------------|--------------------------------------------------------|---|---|---|----|----------------------------------------------------------------------------------------------------|
|                    | Trains                                                 | 3 | 3 | 3 | 3  |  Not applicable |
|                    | Wastewater treatment                                   | 2 | 2 | 2 | 3  | Not applicable                                                                                     |
|                    | Watch making                                           | 3 | 3 | 4 | 3  | Not applicable                                                                                     |
| Carrier solvent    | Carrier solvent & lubricants                           | 1 | 1 | 1 | 11 | Not applicable                                                                                     |
| Lubricant additive | Automotive                                             | 5 | 5 | 5 | 5  | Not applicable                                                                                     |
|                    | Aviation and aerospace                                 | 3 | 3 | 3 | 9  | <a href="#">PTFE-Free Water-based phenolic-melamine gold lacquer - ChemSec marketplace</a>         |
|                    | Chemical industry                                      | 2 | 2 | 2 | 9  | <a href="#">PTFE-Free Water-based phenolic-melamine gold lacquer - ChemSec marketplace</a>         |
|                    | Consumer products (e.g. bike chain lubricant)          | 1 | 1 | 1 | 9  | <a href="#">PTFE-Free Water-based phenolic-melamine gold lacquer - ChemSec marketplace</a>         |
|                    | Diving equipment                                       | 1 | 1 | 1 | 9  | <a href="#">PTFE-Free Water-based phenolic-melamine gold lacquer - ChemSec marketplace</a>         |
|                    | Electronics and semiconductors                         | 3 | 3 | 3 | 6  | Not applicable                                                                                     |
|                    | Food sector                                            | 3 | 3 | 3 | 7  | <a href="#">PTFE-Free Water-based phenolic-melamine gold lacquer - ChemSec marketplace</a>         |
|                    | Handicap assistant equipment                           | 5 | 5 | 5 | 9  | <a href="#">PTFE-Free Water-based phenolic-melamine gold lacquer - ChemSec marketplace</a>         |
|                    | Hearing loss applications                              | 3 | 3 | 3 | 9  | <a href="#">PTFE-Free Water-based phenolic-melamine gold lacquer - ChemSec marketplace</a>         |
|                    | Hospital equipments                                    | 1 | 1 | 1 | 9  | <a href="#">PTFE-Free Water-based phenolic-melamine gold lacquer - ChemSec marketplace</a>         |
|                    | Laboratory supplies, equipment, and instrument actions | 1 | 1 | 1 | 9  | <a href="#">PTFE-Free Water-based phenolic-melamine gold lacquer - ChemSec marketplace</a>         |
|                    | Nuclear powerplants                                    | 2 | 2 | 2 | 9  | <a href="#">PTFE-Free Water-based phenolic-melamine gold lacquer - ChemSec marketplace</a>         |
|                    | Oil & gas                                              | 4 | 4 | 4 | 9  | <a href="#">PTFE-Free Water-based phenolic-melamine gold lacquer - ChemSec marketplace</a>         |

|  |                  |   |   |   |   |                                                                                            |
|--|------------------|---|---|---|---|--------------------------------------------------------------------------------------------|
|  | Paper            | 1 | 1 | 1 | 9 | <a href="#">PTFE-Free Water-based phenolic-melamine gold lacquer - ChemSec marketplace</a> |
|  | Plastics         | 1 | 1 | 1 | 9 | <a href="#">PTFE-Free Water-based phenolic-melamine gold lacquer - ChemSec marketplace</a> |
|  | Renewable energy | 3 | 3 | 4 | 9 | <a href="#">PTFE-Free Water-based phenolic-melamine gold lacquer - ChemSec marketplace</a> |
|  | Trains           | 2 | 2 | 2 | 9 | <a href="#">PTFE-Free Water-based phenolic-melamine gold lacquer - ChemSec marketplace</a> |

## 11. Medical devices

| <i>Sub-uses</i>                                      | <i>Applications</i>           | <i>Technical functions</i> | <i>End-use functions</i> | <i>Services</i> | <i>Nb. Of alternatives</i> | <i>Alternatives not listed the restriction</i>                                                 |
|------------------------------------------------------|-------------------------------|----------------------------|--------------------------|-----------------|----------------------------|------------------------------------------------------------------------------------------------|
| <i>Cleaning and heat transfer: engineered fluids</i> | Carrier solvent & lubricants  | 1                          | 1                        | 1               | 15                         | Aqueous cleaning; Semi-aqueous cleaning; Alcoholic solvents; Chlorinated solvents (UNEP, 2018) |
|                                                      | Cleaning                      | 1                          | 1                        | 1               | 21                         | Aqueous cleaning; Semi-aqueous cleaning; Alcoholic solvents; Chlorinated solvents (UNEP, 2018) |
|                                                      | Heat transfer agent           | 1                          | 1                        | 1               | 0                          | Not applicable                                                                                 |
| <i>Diagnostic laboratory testing</i>                 | Diagnostic laboratory testing | 4                          | 4                        | 3               | 0                          | Not applicable                                                                                 |

|                             |                                       |   |   |   |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------|---------------------------------------|---|---|---|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Electronic equipment        | Electronic components                 | 7 | 7 | 6 | 1  | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                             | Wires and cables                      | 7 | 7 | 6 | 5  | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Implantable medical devices | Implantable medical devices           | 4 | 4 | 3 | 6  | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Lubricant & additives       | Hospital equipments                   | 1 | 1 | 2 | 12 | <a href="#">PTFE-Free Water-based phenolic-melamine gold lacquer - ChemSec marketplace</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Medical textiles            | e.g. surgical drapes, gowns, curtains | 4 | 4 | 3 | 19 | <a href="#">NEOSEED® Series: Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">MLSE® - Multiplexed Laser Surface Enhancement for Textile   ChemSec Marketplace</a><br><a href="#">BIONIC-FINISH® ECO   ChemSec Marketplace</a><br><a href="#">Sciessent Curb® Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">Unidyne XF - fluorine-free, water-based polymer emulsion   ChemSec Marketplace</a><br><a href="#">Crypton C-Zero fluorine-free performance technology   ChemSec Marketplace</a><br><a href="#">Reapret - fluorine-free water repellent   ChemSec Marketplace</a> |

|                                               |                                               |   |   |   |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------------|-----------------------------------------------|---|---|---|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                               |                                               |   |   |   |   | <a href="#">Permutex® WR 43-064 - PFC-free water repellence   ChemSec Marketplace</a><br><a href="#">Bioguard Zero – flourine-free water repellency   ChemSec Marketplace</a><br><a href="#">APGLO - Plasma Dry Technology free of PFOA   ChemSec Marketplace</a><br><a href="#">Texfin HTF   ChemSec Marketplace</a><br><a href="#">HYDROSIN NF-01 - Textile flourine-free water repellence   ChemSec Marketplace</a><br><a href="#">GreenShield ZERO - Fluorine Free Finish for Water-Based Stain Resistance   ChemSec Marketplace</a><br><a href="#">Fluorine free DWR: HC303 and NIA   ChemSec Marketplace</a><br><a href="#">EVORAL NFP – PFC-free water repellent (Textile)   ChemSec Marketplace</a><br><a href="#">Aqualpel™ - PFAS free DWR   ChemSec Marketplace</a> |
| Membranes used for venting of medical devices | Membranes used for venting of medical devices | 4 | 4 | 2 | 0 | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Meshes and wound treatment                    | Hernia meshes                                 | 4 | 4 | 2 | 2 | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                               | Wound treatment products                      | 4 | 4 | 2 | 0 | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

|                              |                                         |   |   |   |    |                |
|------------------------------|-----------------------------------------|---|---|---|----|----------------|
| Metered Dose Inhalers        | Coatings                                | 4 | 4 | 3 | 4  | Not applicable |
|                              | Propellants                             | 1 | 1 | 1 | 12 | Not applicable |
| Packaging of medical devices | Flash-spun non-woven packaging material | 4 | 4 | 3 | 6  | Not applicable |
|                              | Packaging for medical preparation       | 4 | 4 | 3 | 6  | Not applicable |
|                              | Packaging of ophthalmic solutions       | 4 | 4 | 3 | 6  | Not applicable |
|                              | Packaging of sterilised medical devices | 4 | 4 | 3 | 6  | Not applicable |
| Sterilization gases          | Cleaning                                | 1 | 1 | 1 | 13 | Not applicable |
| Tubes and catheters          | Tubes and catheters                     | 4 | 4 | 5 | 2  | Not applicable |
| Vision applications          | Contact lenses                          | 3 | 3 | 2 | 3  | Not applicable |
|                              | Ophthalmic lenses                       | 3 | 3 | 2 | 1  | Not applicable |

## 12. Metal product manufacture and metal plating



| Sub-uses                      | Applications                  | Technical functions | End-use functions | Services | Nb. Of alternatives | Alternatives not listed the restriction |
|-------------------------------|-------------------------------|---------------------|-------------------|----------|---------------------|-----------------------------------------|
| Manufacture of metal products | Lubricant                     | 2                   | 2                 | 2        | 3                   | Not applicable                          |
|                               | Manufacture of metal products | 6                   | 8                 | 10       | 0                   | Not applicable                          |
| Metal plating                 | Chrome plating                | 1                   | 2                 | 5        | 17                  | Not applicable                          |
|                               | Plating of other metal        | 2                   | 3                 | 6        | 0                   | Not applicable                          |

## 13. Petroleum and mining

| Sub-uses                             | Applications                      | Technical functions | End-use functions | Services | Nb. Of alternatives | Alternatives not listed the restriction                                                    |
|--------------------------------------|-----------------------------------|---------------------|-------------------|----------|---------------------|--------------------------------------------------------------------------------------------|
| Mining applications                  | Equipment                         | 3                   | 3                 | 3        | 12                  | Not applicable                                                                             |
|                                      | Extraction of ores and minerals   | 3                   | 4                 | 4        | 0                   | Not applicable                                                                             |
| Petroleum exploration and production | Aqueous surface film              | 1                   | 1                 | 1        | 13                  | Not applicable                                                                             |
|                                      | Drilling fluid                    | 1                   | 1                 | 1        | 0                   | Not applicable                                                                             |
|                                      | Equipment                         | 4                   | 4                 | 4        | 12                  | Not applicable                                                                             |
|                                      | Lubricant and lubricant additives | 4                   | 4                 | 4        | 12                  | <a href="#">PTFE-Free Water-based phenolic-melamine gold lacquer - ChemSec marketplace</a> |
|                                      | Production chemicals              | 1                   | 1                 | 1        | 8                   | Not applicable                                                                             |
|                                      | Stimulation chemicals             | 1                   | 1                 | 1        | 20                  | Not applicable                                                                             |

|  |                       |   |   |   |    |                |
|--|-----------------------|---|---|---|----|----------------|
|  | Water and gas tracers | 1 | 1 | 1 | 17 | Not applicable |
|--|-----------------------|---|---|---|----|----------------|

## 14. Plant Protection Products

| <i>Sub-uses</i>                  | <i>Applications</i> | <i>Technical functions</i> | <i>End-use functions</i> | <i>Services</i> | <i>Nb. Of alternatives</i> | <i>Alternatives not listed the restriction</i>                          |
|----------------------------------|---------------------|----------------------------|--------------------------|-----------------|----------------------------|-------------------------------------------------------------------------|
| <i>Plant Protection Products</i> | Acaricide           | 1                          | 1                        | 1               | 25                         | <a href="#">Approved active substances for plant protection product</a> |
|                                  | Fungicide           | 1                          | 1                        | 1               | 66                         | <a href="#">Approved active substances for plant protection product</a> |
|                                  | Herbicide           | 1                          | 1                        | 1               | 58                         | <a href="#">Approved active substances for plant protection product</a> |
|                                  | Insecticide         | 1                          | 1                        | 1               | 50                         | <a href="#">Approved active substances for plant protection product</a> |

## 15. Ski waxes

| <i>Sub-uses</i>  | <i>Applications</i> | <i>Technical functions</i> | <i>End-use functions</i> | <i>Services</i> | <i>Nb. Of alternatives</i> | <i>Alternatives not listed the restriction</i> |
|------------------|---------------------|----------------------------|--------------------------|-----------------|----------------------------|------------------------------------------------|
| <i>Ski waxes</i> | Ski waxes           | 1                          | 1                        | 1               | 55                         | Not applicable                                 |



| Sub-uses                                | Applications                                                                                                | Technical functions | End-use functions | Services | Nb. Of alternatives | Alternatives not listed the restriction |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------|---------------------|-------------------|----------|---------------------|-----------------------------------------|
| Body-, hull-, and fuselage construction | Manufacture of plastic parts                                                                                | 7                   | 8                 | 9        | 0                   | Not applicable                          |
|                                         | Plating process during body-, hull-, or fuselage construction                                               | 3                   | 4                 | 4        | 17                  | Not applicable                          |
| Coating and finishes                    | Antifouling application                                                                                     | 1                   | 1                 | 2        | 0                   | Not applicable                          |
|                                         | Coating of diesel and gasoline particle filter hoses                                                        | 6                   | 6                 | 7        | 0                   | Not applicable                          |
|                                         | Gas turbine engine for aircrafts                                                                            | 7                   | 7                 | 8        | 0                   | Not applicable                          |
|                                         | Glass surfaces                                                                                              | 2                   | 2                 | 1        | 2                   | Not applicable                          |
|                                         | High voltage insulators                                                                                     | 6                   | 6                 | 6        | 0                   | Not applicable                          |
|                                         | Insulation material                                                                                         | 1                   | 1                 | 1        | 0                   | Not applicable                          |
|                                         | Lubrication free bearings (e.g. belt tensioners, dual mass flywheels, seat soldering mechanism, pedal work) | 2                   | 2                 | 2        | 4                   | Not applicable                          |



|  |                                         |   |   |   |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--|-----------------------------------------|---|---|---|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Textiles inside transportation vehicles | 3 | 3 | 4 | 51 | <a href="#">Zelan™ R3 finish: Non-fluorinated, bio-based, durable water repellent finish   ChemSec Marketplace</a><br><a href="#">NEOSEED® Series: Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">MLSE® - Multiplexed Laser Surface Enhancement for Textile   ChemSec Marketplace</a><br><a href="#">miDori® evoPel – state of the art durable water repellent “DWR”   ChemSec Marketplace</a><br><a href="#">BIONIC-FINISH® ECO   ChemSec Marketplace</a><br><a href="#">Evo Protect D - Fluorine-free Water Repellency   ChemSec Marketplace</a><br><a href="#">ecorepel – PFC-free water and mud repellent   ChemSec Marketplace</a><br><a href="#">Sciessent Curb® Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">Unidyne XF - fluorine-free, water-based polymer emulsion   ChemSec Marketplace</a><br><a href="#">Crypton C-Zero fluorine-free performance technology   ChemSec Marketplace</a><br><a href="#">Nanoman™ - Nanotechnology-based treatment products   ChemSec Marketplace</a><br><a href="#">Reapret - flourine-free water repellent   ChemSec Marketplace</a><br><a href="#">Permutex® WR 43-064 - PFC-free water repellence   ChemSec Marketplace</a><br><a href="#">Bioguard Zero – flourine-free water repellency   ChemSec Marketplace</a><br><a href="#">APGLO - Plasma Dry Technology free of PFOA   ChemSec Marketplace</a><br><a href="#">Texfin HTF   ChemSec Marketplace</a><br><a href="#">HYDROSIN NF-01 - Textile flourine-free water repellence   ChemSec Marketplace</a><br><a href="#">GreenShield ZERO - Fluorine Free Finish for Water-Based Stain Resistance   ChemSec Marketplace</a> |
|--|-----------------------------------------|---|---|---|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                          |                                                                                                                                |   |   |   |   |                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                          |                                                                                                                                |   |   |   |   | <a href="#">Fluorine free DWR: HC303 and NIA   ChemSec Marketplace</a><br><a href="#">EVORAL NFP – PFC-free water repellent (Textile)   ChemSec Marketplace</a><br><a href="#">DropelTech Cotton - water and stain repellent fabric made with natural fibers   ChemSec Marketplace</a><br><a href="#">Aquapel™ - PFAS free DWR   ChemSec Marketplace</a> |
|                          | Trim material inside transportation vehicles                                                                                   | 1 | 1 | 2 | 6 | Not applicable                                                                                                                                                                                                                                                                                                                                           |
|                          | UV stable coatings for protection of paint of transportation vehicles                                                          | 6 | 6 | 6 | 6 | Not applicable                                                                                                                                                                                                                                                                                                                                           |
|                          | Windshield wipers                                                                                                              | 1 | 1 | 1 | 0 | Not applicable                                                                                                                                                                                                                                                                                                                                           |
|                          | Wires and cables                                                                                                               | 7 | 7 | 7 | 5 | Not applicable                                                                                                                                                                                                                                                                                                                                           |
| Combustion engine system | Gas turbine engine for aircrafts                                                                                               | 3 | 3 | 4 | 0 | Not applicable                                                                                                                                                                                                                                                                                                                                           |
|                          | Mono-wall tubes and hoses (not coatings) in turbo charges, exhaust gas recirculation, diesel particulate filters, engine brake | 3 | 3 | 3 | 0 | Not applicable                                                                                                                                                                                                                                                                                                                                           |

|                                                   |                                                 |    |    |    |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------------------------|-------------------------------------------------|----|----|----|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                   | Non-woven textiles covering the engine bay area | 5  | 5  | 5  | 1  | <a href="#">Unidyne XF - fluorine-free, water-based polymer emulsion   ChemSec Marketplace</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Electrical engineering and information technology | Electronic components                           | 7  | 7  | 6  | 0  | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                                   | Lithium-ion batteries                           | 2  | 2  | 2  | 3  | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                                   | PEM fuel cells                                  | 7  | 7  | 5  | 4  | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                                   | Semiconductor products and components           | 4  | 4  | 4  | 2  | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                                   | Semiconductors manufacturing                    | 12 | 12 | 10 | 2  | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Fire protection                                   | Firefighting foams                              | 1  | 1  | 3  | 24 | <p>Respondol ATF 3/6 (ECHA, 2022)</p> <p>RE-Healing RF3x6 ATC (ECHA, 2022)</p> <p>RE-Healing RF1% (ECHA, 2022)</p> <p>Orchidex BlueFoam 3x3 (ECHA, 2022)</p> <p>Moussol-FF 3/6 F-5 (ECHA, 2022)</p> <p>Foamousse 3% F-15 (ECHA, 2022)</p> <p>Ecopol 3 Premium (ECHA, 2022)</p> <p><a href="#">FireEx® C-M firefighting foam concentrate - ChemSec marketplace</a></p> <p><a href="#">FireEx® C-Marine firefighting foam concentrate - ChemSec marketplace</a></p> <p><a href="#">National Foam Synthetic Fluorine Free foam concentrates - ChemSec marketplace</a></p> <p><a href="#">FireRein Eco-Gel™ - Firefighting gel - ChemSec marketplace</a></p> <p><a href="#">X-Fog: more effective fire extinguishing - also suitable for wood and textiles - ChemSec marketplace</a></p> |

|               |                                  |   |   |   |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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|               |                                  |   |   |   |    | <a href="#">Chemguard NFF 3x3 UL 201 - ChemSec marketplace</a><br><a href="#">Hydral NFF 3x3 UL 201 - ChemSec marketplace</a><br><a href="#">T-Storm NFF 3x3 UL 201 - ChemSec marketplace</a><br><a href="#">Auxquimia Unipol-FF 3/3S - Fluorine-free Foam Concentrate (3X3) - ChemSec marketplace</a><br><a href="#">Solberg® Versagard™ AS-100 - Multi-purpose 3x3 Fluorine-free Foam Concentrate - ChemSec marketplace</a><br><a href="#">Enviro 3x3 Ultra - Fluorine free firefighting foam - ChemSec marketplace</a><br><a href="#">Ansul NFF 3x3 UL 201 - ChemSec marketplace</a><br><a href="#">Dwight's Shield Series AR-Synthetic 3x3% - ChemSec marketplace</a><br><a href="#">Eco-Safe 3% Protein - Fluorine-free (F3) foam - ChemSec marketplace</a><br><a href="#">Enviro 3x3 Plus - Fluorine free firefighting foam - ChemSec marketplace</a><br><a href="#">Enviro 3% ICAO - Fluorine free firefighting foam - ChemSec marketplace</a><br><a href="#">Fluorine-free foams: Jetfoam ICAO-C 3% &amp; Jetfoam ICAO-C 6% - ChemSec marketplace</a> |
| HVACR systems | Blowing agents                   | 1 | 1 | 1 | 14 | Fiber glass; Mineral wool; Cellulose; Cotton; Sheep's wool; Straw; Hemp; Cementitious foam (Exponent International (2021))                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|               | Immersion cooling of electronics | 1 | 1 | 1 | 7  | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|               | Mobile air conditioning          | 1 | 1 | 1 | 4  | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|               | Precision & electronics          | 1 | 1 | 1 | 17 | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

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|                                   | cleaning, commercial & industrial cleaning                           |   |   |   |    |                                                                                            |
|                                   | Transport refrigeration                                              | 1 | 1 | 1 | 7  | Not applicable                                                                             |
| Lifesaving systems                | E.g. Life jackets, life rafts, airbags, seatbelts etc.               | 2 | 2 | 2 | 0  | Not applicable                                                                             |
| Lubricant and lubricant additives | Automotive                                                           | 4 | 4 | 5 | 8  | Not applicable                                                                             |
|                                   | Aviation and aerospace                                               | 4 | 4 | 5 | 12 | <a href="#">PTFE-Free Water-based phenolic-melamine gold lacquer - ChemSec marketplace</a> |
|                                   | Rubber/Tire industry                                                 | 2 | 2 | 2 | 3  | Not applicable                                                                             |
|                                   | Trains                                                               | 3 | 3 | 3 | 12 | <a href="#">PTFE-Free Water-based phenolic-melamine gold lacquer - ChemSec marketplace</a> |
| Sealing application               | E.g. Valves, gaskets, piston, electronic devices, battery electrodes | 3 | 3 | 4 | 4  | Not applicable                                                                             |
| Hydraulic fluids                  | Steering systems                                                     | 1 | 1 | 1 | 0  | Not applicable                                                                             |
|                                   | Brake systems                                                        | 1 | 1 | 1 | 0  | Not applicable                                                                             |
|                                   | Systems for lifting and lowering of vehicle parts                    | 1 | 1 | 1 | 0  | Not applicable                                                                             |
| Other                             | Flotation fluids in gyroscope                                        | 1 | 1 | 1 | 0  | Not applicable                                                                             |





## 17. Textile, upholstery, leather, apparel and carpets

| Sub-uses         | Applications | Technical functions | End-use functions | Services | Nb. Of alternatives | Alternatives not listed the restriction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------|--------------|---------------------|-------------------|----------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Consumer apparel | Accessories  | 1                   | 1                 | 2        | 52                  | <a href="#">PFC Free Water- and Windproof Membrane   ChemSec Marketplace</a><br><a href="#">Zelan™ R3 finish: Non-fluorinated, bio-based, durable water repellent finish   ChemSec Marketplace</a><br><a href="#">High IQ® Repel non-Fluorinated Durable Water Repellents - ChemSec marketplace</a><br><a href="#">NEOSEED® Series: Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">MLSE® - Multiplexed Laser Surface Enhancement for Textile   ChemSec Marketplace</a><br><a href="#">miDori® evoPel – state of the art durable water repellent “DWR”   ChemSec Marketplace</a><br><a href="#">BIONIC-FINISH® ECO   ChemSec Marketplace</a><br><a href="#">Evo Protect D - Fluorine-free Water Repellency   ChemSec Marketplace</a><br><a href="#">ecorepel – PFC-free water and mud repellent   ChemSec Marketplace</a><br><a href="#">Sciessent Curb® Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">Unidyne XF - fluorine-free, water-based polymer emulsion   ChemSec Marketplace</a><br><a href="#">Nanoman™ - Nanotechnology-based treatment products   ChemSec Marketplace</a><br><a href="#">Reapret - flourine-free water repellent   ChemSec Marketplace</a><br><a href="#">Permutex® WR 43-064 - PFC-free water repellence   ChemSec Marketplace</a><br><a href="#">Fluorine-free HDF™   ChemSec Marketplace</a><br><a href="#">Bioguard Zero – flourine-free water repellency   ChemSec Marketplace</a><br><a href="#">APGLO - Plasma Dry Technology free of PFOA   ChemSec Marketplace</a><br><a href="#">Texfin HTF   ChemSec Marketplace</a> |

|  |          |   |   |   |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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|  |          |   |   |   |    | <a href="#">HYDROSIN NF-01 - Textile flourine-free water repellence   ChemSec Marketplace</a><br><a href="#">GreenShield ZERO - Fluorine Free Finish for Water-Based Stain Resistance   ChemSec Marketplace</a><br><a href="#">Fluorine free DWR: HC303 and NIA   ChemSec Marketplace</a><br><a href="#">EVORAL NFP – PFC-free water repellent (Textile)   ChemSec Marketplace</a><br><a href="#">Aqualpel™ - PFAS free DWR   ChemSec Marketplace</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|  | Footwear | 5 | 5 | 5 | 78 | <a href="#">HeiQ Eco Dry – Durable water repellency (DWR) without fluorine (non-PFC)   ChemSec Marketplace</a><br><a href="#">PFC Free Water- and Windproof Membrane   ChemSec Marketplace</a><br><a href="#">Zelan™ R3 finish: Non-fluorinated, bio-based, durable water repellent finish   ChemSec Marketplace</a><br><a href="#">High IQ® Repel non-Fluorinated Durable Water Repellents - ChemSec marketplace</a><br><a href="#">NEOSEED® Series: Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">MLSE® - Multiplexed Laser Surface Enhancement for Textile   ChemSec Marketplace</a><br><a href="#">miDori® evoPel – state of the art durable water repellent “DWR”   ChemSec Marketplace</a><br><a href="#">BIONIC-FINISH® ECO   ChemSec Marketplace</a><br><a href="#">Evo Protect D - Fluorine-free Water Repellency   ChemSec Marketplace</a><br><a href="#">Sciessent Curb® Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">ORGANOTEX® is a fluorocarbon-free water repellent technology for textiles   ChemSec Marketplace</a><br><a href="#">Unidyne XF - fluorine-free, water-based polymer emulsion   ChemSec Marketplace</a><br><a href="#">Crypton C-Zero fluorine-free performance technology   ChemSec Marketplace</a><br><a href="#">LIFA INFINITY PRO™   ChemSec Marketplace</a> |



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|             |   |   |   |    | <a href="#">Nanoman™ - Nanotechnology-based treatment products   ChemSec Marketplace</a><br><a href="#">Reapret - flourine-free water repellent   ChemSec Marketplace</a><br><a href="#">Permutex® WR 43-064 - PFC-free water repellence   ChemSec Marketplace</a><br><a href="#">Fluorine-free HDF™   ChemSec Marketplace</a><br><a href="#">Bioguard Zero – flourine-free water repellency   ChemSec Marketplace</a><br><a href="#">APGLO - Plasma Dry Technology free of PFOA   ChemSec Marketplace</a><br><a href="#">Texfin HTF   ChemSec Marketplace</a><br><a href="#">HYDROSIN NF-01 - Textile flourine-free water repellence   ChemSec Marketplace</a><br><a href="#">GreenShield ZERO - Fluorine Free Finish for Water-Based Stain Resistance   ChemSec Marketplace</a><br><a href="#">Fluorine free DWR: HC303 and NIA   ChemSec Marketplace</a><br><a href="#">EVORAL NFP – PFC-free water repellent (Textile)   ChemSec Marketplace</a><br><a href="#">Aquapel™ - PFAS free DWR   ChemSec Marketplace</a> |
| Indoor wear | 1 | 1 | 2 | 56 | <a href="#">PFC Free Water- and Windproof Membrane   ChemSec Marketplace</a><br><a href="#">Zelan™ R3 finish: Non-fluorinated, bio-based, durable water repellent finish   ChemSec Marketplace</a><br><a href="#">High IQ® Repel non-Fluorinated Durable Water Repellents - ChemSec marketplace</a><br><a href="#">NEOSEED® Series: Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">MLSE® - Multiplexed Laser Surface Enhancement for Textile   ChemSec Marketplace</a><br><a href="#">miDori® evoPel – state of the art durable water repellent “DWR”   ChemSec Marketplace</a><br><a href="#">BIONIC-FINISH® ECO   ChemSec Marketplace</a><br><a href="#">Evo Protect D - Fluorine-free Water Repellency   ChemSec Marketplace</a><br><a href="#">Sciessent Curb® Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">ORGANOTEX® is a fluorocarbon-free water repellent technology for textiles   ChemSec Marketplace</a>                                  |

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|  |              |   |   |   |    | <a href="#">Unidyne XF - fluorine-free, water-based polymer emulsion   ChemSec Marketplace</a><br><a href="#">Nanoman™ - Nanotechnology-based treatment products   ChemSec Marketplace</a><br><a href="#">Reapret - fluorine-free water repellent   ChemSec Marketplace</a><br><a href="#">Permutex® WR 43-064 - PFC-free water repellence   ChemSec Marketplace</a><br><a href="#">Fluorine-free HDF™   ChemSec Marketplace</a><br><a href="#">Bioguard Zero – fluorine-free water repellency   ChemSec Marketplace</a><br><a href="#">APGLO - Plasma Dry Technology free of PFOA   ChemSec Marketplace</a><br><a href="#">Texfin HTF   ChemSec Marketplace</a><br><a href="#">HYDROSIN NF-01 - Textile fluorine-free water repellence   ChemSec Marketplace</a><br><a href="#">GreenShield ZERO - Fluorine Free Finish for Water-Based Stain Resistance   ChemSec Marketplace</a><br><a href="#">Fluorine free DWR: HC303 and NIA   ChemSec Marketplace</a><br><a href="#">Porelle Dry - waterproof and breathable membrane   ChemSec Marketplace</a><br><a href="#">Intrepid - breathable waterproof membrane   ChemSec Marketplace</a><br><a href="#">EVORAL NFP – PFC-free water repellent (Textile)   ChemSec Marketplace</a><br><a href="#">Waterproof fluorine-free membrane   ChemSec Marketplace</a><br><a href="#">DropelTech Cotton - water and stain repellent fabric made with natural fibers   ChemSec Marketplace</a><br><a href="#">AquaPel™ - PFAS free DWR   ChemSec Marketplace</a> |
|  | Outdoor wear | 3 | 3 | 3 | 85 | <a href="#">HeiQ Eco Dry – Durable water repellency (DWR) without fluorine (non-PFC)   ChemSec Marketplace</a><br><a href="#">PFC Free Water- and Windproof Membrane   ChemSec Marketplace</a><br><a href="#">Zelan™ R3 finish: Non-fluorinated, bio-based, durable water repellent finish   ChemSec Marketplace</a><br><a href="#">High IQ® Repel non-Fluorinated Durable Water Repellents - ChemSec marketplace</a><br><a href="#">NEOSEED® Series: Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

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|  |  |  |  |  | <a href="#">MLSE® - Multiplexed Laser Surface Enhancement for Textile   ChemSec Marketplace</a><br><a href="#">miDori® evoPel – state of the art durable water repellent “DWR”   ChemSec Marketplace</a><br><a href="#">BIONIC-FINISH® ECO   ChemSec Marketplace</a><br><a href="#">Evo Protect D - Fluorine-free Water Repellency   ChemSec Marketplace</a><br><a href="#">ecorepel – PFC-free water and mud repellent   ChemSec Marketplace</a><br><a href="#">Sciessent Curb® Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">HyperDRY™ Fluorocarbon Free Water Resistant Down Insulation   ChemSec Marketplace</a><br><a href="#">ORGANOTEX® is a fluorocarbon-free water repellent technology for textiles   ChemSec Marketplace</a><br><a href="#">Unidyne XF - fluorine-free, water-based polymer emulsion   ChemSec Marketplace</a><br><a href="#">Crypton C-Zero fluorine-free performance technology   ChemSec Marketplace</a><br><a href="#">LIFA INFINITY PRO™   ChemSec Marketplace</a><br><a href="#">PFC-free Eco DWR impregnation   ChemSec Marketplace</a><br><a href="#">Nanoman™ - Nanotechnology-based treatment products   ChemSec Marketplace</a><br><a href="#">Reapret - flourine-free water repellent   ChemSec Marketplace</a><br><a href="#">Permutex® WR 43-064 - PFC-free water repellence   ChemSec Marketplace</a><br><a href="#">Fluorine-free HDF™   ChemSec Marketplace</a><br><a href="#">Bioguard Zero – flourine-free water repellency   ChemSec Marketplace</a><br><a href="#">APGLO - Plasma Dry Technology free of PFOA   ChemSec Marketplace</a><br><a href="#">Texfin HTF   ChemSec Marketplace</a><br><a href="#">HYDROSIN NF-01 - Textile flourine-free water repellence   ChemSec Marketplace</a><br><a href="#">GreenShield ZERO - Fluorine Free Finish for Water-Based Stain Resistance   ChemSec Marketplace</a><br><a href="#">Fluorine free DWR: HC303 and NIA   ChemSec Marketplace</a> |
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|            |   |   |   |    | <a href="#">Porelle Dry - waterproof and breathable membrane   ChemSec Marketplace</a><br><a href="#">Intrepid - breathable waterproof membrane   ChemSec Marketplace</a><br><a href="#">EVORAL NFP – PFC-free water repellent (Textile)   ChemSec Marketplace</a><br><a href="#">Waterproof fluorine-free membrane   ChemSec Marketplace</a><br><a href="#">Dermizax - laminate without PFCs   ChemSec Marketplace</a><br><a href="#">Aquapel™ - PFAS free DWR   ChemSec Marketplace</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Sportswear | 5 | 5 | 6 | 85 | <a href="#">HeiQ Eco Dry – Durable water repellency (DWR) without fluorine (non-PFC)   ChemSec Marketplace</a><br><a href="#">PFC Free Water- and Windproof Membrane   ChemSec Marketplace</a><br><a href="#">Zelan™ R3 finish: Non-fluorinated, bio-based, durable water repellent finish   ChemSec Marketplace</a><br><a href="#">High IQ® Repel non-Fluorinated Durable Water Repellents - ChemSec marketplace</a><br><a href="#">NEOSEED® Series: Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">MLSE® - Multiplexed Laser Surface Enhancement for Textile   ChemSec Marketplace</a><br><a href="#">miDori® evoPel – state of the art durable water repellent “DWR”   ChemSec Marketplace</a><br><a href="#">BIONIC-FINISH® ECO   ChemSec Marketplace</a><br><a href="#">Evo Protect D - Fluorine-free Water Repellency   ChemSec Marketplace</a><br><a href="#">ecorepel – PFC-free water and mud repellent   ChemSec Marketplace</a><br><a href="#">Sciessent Curb® Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">HyperDRY™ Fluorocarbon Free Water Resistant Down Insulation   ChemSec Marketplace</a><br><a href="#">ORGANOTEX® is a fluorocarbon-free water repellent technology for textiles   ChemSec Marketplace</a><br><a href="#">Unidyne XF - fluorine-free, water-based polymer emulsion   ChemSec Marketplace</a><br><a href="#">Crypton C-Zero fluorine-free performance technology   ChemSec Marketplace</a> |

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|               |                  |   |   |   |    | <a href="#">LIFA INFINITY PRO™   ChemSec Marketplace</a><br><a href="#">PFC-free Eco DWR impregnation   ChemSec Marketplace</a><br><a href="#">Nanoman™ - Nanotechnology-based treatment products   ChemSec Marketplace</a><br><a href="#">Reapret - flourine-free water repellent   ChemSec Marketplace</a><br><a href="#">Permutex® WR 43-064 - PFC-free water repellence   ChemSec Marketplace</a><br><a href="#">Fluorine-free HDF™   ChemSec Marketplace</a><br><a href="#">Bioguard Zero – flourine-free water repellency   ChemSec Marketplace</a><br><a href="#">APGLO - Plasma Dry Technology free of PFOA   ChemSec Marketplace</a><br><a href="#">Texfin HTF   ChemSec Marketplace</a><br><a href="#">HYDROSIN NF-01 - Textile flourine-free water repellence   ChemSec Marketplace</a><br><a href="#">GreenShield ZERO - Fluorine Free Finish for Water-Based Stain Resistance   ChemSec Marketplace</a><br><a href="#">Fluorine free DWR: HC303 and NIA   ChemSec Marketplace</a><br><a href="#">Porelle Dry - waterproof and breathable membrane   ChemSec Marketplace</a><br><a href="#">Intrepid - breathable waterproof membrane   ChemSec Marketplace</a><br><a href="#">EVORAL NFP – PFC-free water repellent (Textile)   ChemSec Marketplace</a><br><a href="#">Waterproof fluorine-free membrane   ChemSec Marketplace</a><br><a href="#">Dermizax - laminate without PFCs   ChemSec Marketplace</a><br><a href="#">Aqualpel™ - PFAS free DWR   ChemSec Marketplace</a> |
| Home textiles | Carpets and rugs | 3 | 3 | 4 | 73 | <a href="#">Zelan™ R3 finish: Non-fluorinated, bio-based, durable water repellent finish   ChemSec Marketplace</a><br><a href="#">NEOSEED® Series: Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">MLSE® - Multiplexed Laser Surface Enhancement for Textile   ChemSec Marketplace</a><br><a href="#">miDori® evoPel – state of the art durable water repellent “DWR”   ChemSec Marketplace</a><br><a href="#">BIONIC-FINISH® ECO   ChemSec Marketplace</a><br><a href="#">Evo Protect D - Fluorine-free Water Repellency   ChemSec Marketplace</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

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|                     |   |   |   |    | <a href="#">ecorepel – PFC-free water and mud repellent   ChemSec Marketplace</a><br><a href="#">Sciessent Curb® Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">Unidyne XF - fluorine-free, water-based polymer emulsion   ChemSec Marketplace</a><br><a href="#">Crypton C-Zero fluorine-free performance technology   ChemSec Marketplace</a><br><a href="#">Nanoman™ - Nanotechnology-based treatment products   ChemSec Marketplace</a><br><a href="#">Reapret - flourine-free water repellent   ChemSec Marketplace</a><br><a href="#">Permutex® WR 43-064 - PFC-free water repellence   ChemSec Marketplace</a><br><a href="#">Bioguard Zero – flourine-free water repellency   ChemSec Marketplace</a><br><a href="#">APGLO - Plasma Dry Technology free of PFOA   ChemSec Marketplace</a><br><a href="#">Texfin HTF   ChemSec Marketplace</a><br><a href="#">HYDROSIN NF-01 - Textile flourine-free water repellence   ChemSec Marketplace</a><br><a href="#">GreenShield ZERO - Fluorine Free Finish for Water-Based Stain Resistance   ChemSec Marketplace</a><br><a href="#">Fluorine free DWR: HC303 and NIA   ChemSec Marketplace</a><br><a href="#">EVORAL NFP – PFC-free water repellent (Textile)   ChemSec Marketplace</a><br><a href="#">DropelTech Cotton - water and stain repellent fabric made with natural fibers   ChemSec Marketplace</a><br><a href="#">Aquapel™ - PFAS free DWR   ChemSec Marketplace</a> |
| Curtains and blinds | 3 | 3 | 4 | 51 | <a href="#">Zelan™ R3 finish: Non-fluorinated, bio-based, durable water repellent finish   ChemSec Marketplace</a><br><a href="#">NEOSEED® Series: Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">MLSE® - Multiplexed Laser Surface Enhancement for Textile   ChemSec Marketplace</a><br><a href="#">miDori® evoPel – state of the art durable water repellent “DWR”   ChemSec Marketplace</a><br><a href="#">BIONIC-FINISH® ECO   ChemSec Marketplace</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

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|  |                         |   |   |   |    | <a href="#">Evo Protect D - Fluorine-free Water Repellency   ChemSec Marketplace</a><br><a href="#">ecorepel – PFC-free water and mud repellent   ChemSec Marketplace</a><br><a href="#">Sciessent Curb® Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">Unidyne XF - fluorine-free, water-based polymer emulsion   ChemSec Marketplace</a><br><a href="#">Crypton C-Zero fluorine-free performance technology   ChemSec Marketplace</a><br><a href="#">Nanoman™ - Nanotechnology-based treatment products   ChemSec Marketplace</a><br><a href="#">Reapret - fluorine-free water repellent   ChemSec Marketplace</a><br><a href="#">Permutex® WR 43-064 - PFC-free water repellence   ChemSec Marketplace</a><br><a href="#">Bioguard Zero – fluorine-free water repellency   ChemSec Marketplace</a><br><a href="#">APGLO - Plasma Dry Technology free of PFOA   ChemSec Marketplace</a><br><a href="#">Texfin HTF   ChemSec Marketplace</a><br><a href="#">HYDROSIN NF-01 - Textile fluorine-free water repellence   ChemSec Marketplace</a><br><a href="#">GreenShield ZERO - Fluorine Free Finish for Water-Based Stain Resistance   ChemSec Marketplace</a><br><a href="#">Fluorine free DWR: HC303 and NIA   ChemSec Marketplace</a><br><a href="#">EVORAL NFP – PFC-free water repellent (Textile)   ChemSec Marketplace</a><br><a href="#">DropelTech Cotton - water and stain repellent fabric made with natural fibers   ChemSec Marketplace</a><br><a href="#">Aqualpel™ - PFAS free DWR   ChemSec Marketplace</a> |
|  | Textile based coverings | 3 | 3 | 4 | 51 | <a href="#">Zelan™ R3 finish: Non-fluorinated, bio-based, durable water repellent finish   ChemSec Marketplace</a><br><a href="#">NEOSEED® Series: Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">MLSE® - Multiplexed Laser Surface Enhancement for Textile   ChemSec Marketplace</a><br><a href="#">miDori® evoPel – state of the art durable water repellent “DWR”   ChemSec Marketplace</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

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|                      |          |   |   |   |    | <a href="#">BIONIC-FINISH® ECO   ChemSec Marketplace</a><br><a href="#">Evo Protect D - Fluorine-free Water Repellency   ChemSec Marketplace</a><br><a href="#">ecorepel – PFC-free water and mud repellent   ChemSec Marketplace</a><br><a href="#">Sciessent Curb® Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">Unidyne XF - fluorine-free, water-based polymer emulsion   ChemSec Marketplace</a><br><a href="#">Crypton C-Zero fluorine-free performance technology   ChemSec Marketplace</a><br><a href="#">Nanoman™ - Nanotechnology-based treatment products   ChemSec Marketplace</a><br><a href="#">Reapret - fluorine-free water repellent   ChemSec Marketplace</a><br><a href="#">Permutex® WR 43-064 - PFC-free water repellence   ChemSec Marketplace</a><br><a href="#">Bioguard Zero – fluorine-free water repellency   ChemSec Marketplace</a><br><a href="#">APGLO - Plasma Dry Technology free of PFOA   ChemSec Marketplace</a><br><a href="#">Texfin HTF   ChemSec Marketplace</a><br><a href="#">HYDROSIN NF-01 - Textile fluorine-free water repellence   ChemSec Marketplace</a><br><a href="#">GreenShield ZERO - Fluorine Free Finish for Water-Based Stain Resistance   ChemSec Marketplace</a><br><a href="#">Fluorine free DWR: HC303 and NIA   ChemSec Marketplace</a><br><a href="#">EVORAL NFP – PFC-free water repellent (Textile)   ChemSec Marketplace</a><br><a href="#">DropeTech Cotton - water and stain repellent fabric made with natural fibers   ChemSec Marketplace</a><br><a href="#">Aqual™ - PFAS free DWR   ChemSec Marketplace</a> |
| Leather applications | Footwear | 4 | 4 | 4 | 69 | <a href="#">PFC Free Water- and Windproof Membrane   ChemSec Marketplace</a><br><a href="#">Zelan™ R3 finish: Non-fluorinated, bio-based, durable water repellent finish   ChemSec Marketplace</a><br><a href="#">NEOSEED® Series: Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">MLSE® - Multiplexed Laser Surface Enhancement for Textile   ChemSec Marketplace</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

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|  |                         |   |   |   |    | <a href="#">miDori® evoPel – state of the art durable water repellent “DWR”   ChemSec Marketplace</a><br><a href="#">BIONIC-FINISH® ECO   ChemSec Marketplace</a><br><a href="#">Sciessent Curb® Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">Unidyne XF - fluorine-free, water-based polymer emulsion   ChemSec Marketplace</a><br><a href="#">Crypton C-Zero fluorine-free performance technology   ChemSec Marketplace</a><br><a href="#">Nanoman™ - Nanotechnology-based treatment products   ChemSec Marketplace</a><br><a href="#">Reapret - fluorine-free water repellent   ChemSec Marketplace</a><br><a href="#">Permutex® WR 43-064 - PFC-free water repellence   ChemSec Marketplace</a><br><a href="#">Bioguard Zero – fluorine-free water repellency   ChemSec Marketplace</a><br><a href="#">APGLO - Plasma Dry Technology free of PFOA   ChemSec Marketplace</a><br><a href="#">HYDROSIN NF-01 - Textile fluorine-free water repellence   ChemSec Marketplace</a><br><a href="#">GreenShield ZERO - Fluorine Free Finish for Water-Based Stain Resistance   ChemSec Marketplace</a><br><a href="#">Fluorine free DWR: HC303 and NIA   ChemSec Marketplace</a><br><a href="#">EVORAL NFP – PFC-free water repellent (Textile)   ChemSec Marketplace</a><br><a href="#">Aquapel™ - PFAS free DWR   ChemSec Marketplace</a><br><a href="#">Nanooki textile &amp; Nanooki Leather - Free from PFC, PFOA, PFAS   ChemSec Marketplace</a> |
|  | Indoor and outdoor wear | 4 | 4 | 4 | 69 | <a href="#">PFC Free Water- and Windproof Membrane   ChemSec Marketplace</a><br><a href="#">Zelan™ R3 finish: Non-fluorinated, bio-based, durable water repellent finish   ChemSec Marketplace</a><br><a href="#">NEOSEED® Series: Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">MLSE® - Multiplexed Laser Surface Enhancement for Textile   ChemSec Marketplace</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

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|                     |   |   |   |    | <a href="#">miDori® evoPel – state of the art durable water repellent “DWR”   ChemSec Marketplace</a><br><a href="#">BIONIC-FINISH® ECO   ChemSec Marketplace</a><br><a href="#">Sciessent Curb® Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">Unidyne XF - fluorine-free, water-based polymer emulsion   ChemSec Marketplace</a><br><a href="#">Crypton C-Zero fluorine-free performance technology   ChemSec Marketplace</a><br><a href="#">Nanoman™ - Nanotechnology-based treatment products   ChemSec Marketplace</a><br><a href="#">Reapret - flourine-free water repellent   ChemSec Marketplace</a><br><a href="#">Permutex® WR 43-064 - PFC-free water repellence   ChemSec Marketplace</a><br><a href="#">Bioguard Zero – flourine-free water repellency   ChemSec Marketplace</a><br><a href="#">APGLO - Plasma Dry Technology free of PFOA   ChemSec Marketplace</a><br><a href="#">HYDROSIN NF-01 - Textile flourine-free water repellence   ChemSec Marketplace</a><br><a href="#">GreenShield ZERO - Fluorine Free Finish for Water-Based Stain Resistance   ChemSec Marketplace</a><br><a href="#">Fluorine free DWR: HC303 and NIA   ChemSec Marketplace</a><br><a href="#">EVORAL NFP – PFC-free water repellent (Textile)   ChemSec Marketplace</a><br><a href="#">Aquapel™ - PFAS free DWR   ChemSec Marketplace</a><br><a href="#">Nanooki textile &amp; Nanooki Leather - Free from PFC, PFOA, PFAS   ChemSec Marketplace</a> |
| Leather based goods | 2 | 2 | 3 | 69 | <a href="#">PFC Free Water- and Windproof Membrane   ChemSec Marketplace</a><br><a href="#">Zelan™ R3 finish: Non-fluorinated, bio-based, durable water repellent finish   ChemSec Marketplace</a><br><a href="#">NEOSEED® Series: Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">MLSE® - Multiplexed Laser Surface Enhancement for Textile   ChemSec Marketplace</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

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|  |                                      |   |   |   |    | <a href="#">miDori® evoPel – state of the art durable water repellent “DWR”   ChemSec Marketplace</a><br><a href="#">BIONIC-FINISH® ECO   ChemSec Marketplace</a><br><a href="#">Sciessent Curb® Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">Unidyne XF - fluorine-free, water-based polymer emulsion   ChemSec Marketplace</a><br><a href="#">Crypton C-Zero fluorine-free performance technology   ChemSec Marketplace</a><br><a href="#">Nanoman™ - Nanotechnology-based treatment products   ChemSec Marketplace</a><br><a href="#">Reapret - fluorine-free water repellent   ChemSec Marketplace</a><br><a href="#">Permutex® WR 43-064 - PFC-free water repellence   ChemSec Marketplace</a><br><a href="#">Bioguard Zero – fluorine-free water repellency   ChemSec Marketplace</a><br><a href="#">APGLO - Plasma Dry Technology free of PFOA   ChemSec Marketplace</a><br><a href="#">HYDROSIN NF-01 - Textile fluorine-free water repellence   ChemSec Marketplace</a><br><a href="#">GreenShield ZERO - Fluorine Free Finish for Water-Based Stain Resistance   ChemSec Marketplace</a><br><a href="#">Fluorine free DWR: HC303 and NIA   ChemSec Marketplace</a><br><a href="#">EVORAL NFP – PFC-free water repellent (Textile)   ChemSec Marketplace</a><br><a href="#">Aquapel™ - PFAS free DWR   ChemSec Marketplace</a><br><a href="#">Nanooki textile &amp; Nanooki Leather - Free from PFC, PFOA, PFAS   ChemSec Marketplace</a> |
|  | Professional sportswear and footwear | 4 | 4 | 5 | 69 | <a href="#">PFC Free Water- and Windproof Membrane   ChemSec Marketplace</a><br><a href="#">Zelan™ R3 finish: Non-fluorinated, bio-based, durable water repellent finish   ChemSec Marketplace</a><br><a href="#">NEOSEED® Series: Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">MLSE® - Multiplexed Laser Surface Enhancement for Textile   ChemSec Marketplace</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

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|              |                                                         |   |   |   |    | <a href="#">miDori® evoPel – state of the art durable water repellent “DWR”   ChemSec Marketplace</a><br><a href="#">BIONIC-FINISH® ECO   ChemSec Marketplace</a><br><a href="#">Sciessent Curb® Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">Unidyne XF - fluorine-free, water-based polymer emulsion   ChemSec Marketplace</a><br><a href="#">Crypton C-Zero fluorine-free performance technology   ChemSec Marketplace</a><br><a href="#">Nanoman™ - Nanotechnology-based treatment products   ChemSec Marketplace</a><br><a href="#">Reapret - fluorine-free water repellent   ChemSec Marketplace</a><br><a href="#">Permutex® WR 43-064 - PFC-free water repellence   ChemSec Marketplace</a><br><a href="#">Bioguard Zero – fluorine-free water repellency   ChemSec Marketplace</a><br><a href="#">APGLO - Plasma Dry Technology free of PFOA   ChemSec Marketplace</a><br><a href="#">HYDROSIN NF-01 - Textile fluorine-free water repellence   ChemSec Marketplace</a><br><a href="#">GreenShield ZERO - Fluorine Free Finish for Water-Based Stain Resistance   ChemSec Marketplace</a><br><a href="#">Fluorine free DWR: HC303 and NIA   ChemSec Marketplace</a><br><a href="#">EVORAL NFP – PFC-free water repellent (Textile)   ChemSec Marketplace</a><br><a href="#">Aquapel™ - PFAS free DWR   ChemSec Marketplace</a><br><a href="#">Nanooki textile &amp; Nanooki Leather - Free from PFC, PFOA, PFAS   ChemSec Marketplace</a> |
| Other        | Non-woven textiles covering the engine bay area in cars | 5 | 5 | 5 | 1  | <a href="#">Unidyne XF - fluorine-free, water-based polymer emulsion   ChemSec Marketplace</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Professional | Professional protective                                 | 6 | 7 | 7 | 69 | <a href="#">PFC Free Water- and Windproof Membrane   ChemSec Marketplace</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

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|  | equipment<br>for industrial<br>and<br>professional<br>use |  |  |  |  | <p><a href="#">Zelan™ R3 finish: Non-fluorinated, bio-based, durable water repellent finish   ChemSec Marketplace</a></p> <p><a href="#">NEOSEED® Series: Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a></p> <p><a href="#">MLSE® - Multiplexed Laser Surface Enhancement for Textile   ChemSec Marketplace</a></p> <p><a href="#">BIONIC-FINISH® ECO   ChemSec Marketplace</a></p> <p><a href="#">Evo Protect D - Fluorine-free Water Repellency   ChemSec Marketplace</a></p> <p><a href="#">Sciessent Curb® Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a></p> <p><a href="#">Unidyne XF - fluorine-free, water-based polymer emulsion   ChemSec Marketplace</a></p> <p><a href="#">Crypton C-Zero fluorine-free performance technology   ChemSec Marketplace</a></p> <p><a href="#">Reapret - fluorine-free water repellent   ChemSec Marketplace</a></p> <p><a href="#">Permutex® WR 43-064 - PFC-free water repellence   ChemSec Marketplace</a></p> <p><a href="#">Bioguard Zero – fluorine-free water repellency   ChemSec Marketplace</a></p> <p><a href="#">APGLO - Plasma Dry Technology free of PFOA   ChemSec Marketplace</a></p> <p><a href="#">Texfin HTF   ChemSec Marketplace</a></p> <p><a href="#">HYDROSIN NF-01 - Textile fluorine-free water repellence   ChemSec Marketplace</a></p> <p><a href="#">GreenShield ZERO - Fluorine Free Finish for Water-Based Stain Resistance   ChemSec Marketplace</a></p> <p><a href="#">Fluorine free DWR: HC303 and NIA   ChemSec Marketplace</a></p> <p><a href="#">EVORAL NFP – PFC-free water repellent (Textile)   ChemSec Marketplace</a></p> <p><a href="#">Aquapel™ - PFAS free DWR   ChemSec Marketplace</a></p> |
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|  | Professional sportswear and footwear | 5 | 5 | 7 | 73 | <a href="#">HeiQ Eco Dry – Durable water repellency (DWR) without fluorine (non-PFC)   ChemSec Marketplace</a><br><a href="#">PFC Free Water- and Windproof Membrane   ChemSec Marketplace</a><br><a href="#">Zelan™ R3 finish: Non-fluorinated, bio-based, durable water repellent finish   ChemSec Marketplace</a><br><a href="#">NEOSEED® Series: Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">MLSE® - Multiplexed Laser Surface Enhancement for Textile   ChemSec Marketplace</a><br><a href="#">BIONIC-FINISH® ECO   ChemSec Marketplace</a><br><a href="#">Evo Protect D - Fluorine-free Water Repellency   ChemSec Marketplace</a><br><a href="#">ecorepel – PFC-free water and mud repellent   ChemSec Marketplace</a><br><a href="#">Sciessent Curb® Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">HyperDRY™ Fluorocarbon Free Water Resistant Down Insulation   ChemSec Marketplace</a><br><a href="#">Unidyne XF - fluorine-free, water-based polymer emulsion   ChemSec Marketplace</a><br><a href="#">Crypton C-Zero fluorine-free performance technology   ChemSec Marketplace</a><br><a href="#">LIFA INFINITY PRO™   ChemSec Marketplace</a><br><a href="#">PFC-free Eco DWR impregnation   ChemSec Marketplace</a><br><a href="#">Nanoman™ - Nanotechnology-based treatment products   ChemSec Marketplace</a><br><a href="#">Reapret - fluorine-free water repellent   ChemSec Marketplace</a><br><a href="#">Permutex® WR 43-064 - PFC-free water repellence   ChemSec Marketplace</a><br><a href="#">Bioguard Zero – fluorine-free water repellency   ChemSec Marketplace</a><br><a href="#">APGLO - Plasma Dry Technology free of PFOA   ChemSec Marketplace</a><br><a href="#">Texfin HTF   ChemSec Marketplace</a><br><a href="#">HYDROSIN NF-01 - Textile fluorine-free water repellence   ChemSec Marketplace</a> |
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|                   |                                                          |   |   |   |    | <a href="#">GreenShield ZERO - Fluorine Free Finish for Water-Based Stain Resistance   ChemSec Marketplace</a><br><a href="#">Fluorine free DWR: HC303 and NIA   ChemSec Marketplace</a><br><a href="#">Porelle Dry - waterproof and breathable membrane   ChemSec Marketplace</a><br><a href="#">Intrepid - breathable waterproof membrane   ChemSec Marketplace</a><br><a href="#">EVORAL NFP – PFC-free water repellent (Textile)   ChemSec Marketplace</a><br><a href="#">Waterproof fluorine-free membrane   ChemSec Marketplace</a><br><a href="#">Dermizax - laminate without PFCs   ChemSec Marketplace</a><br><a href="#">Aquaapel™ - PFAS free DWR   ChemSec Marketplace</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Technical textile | High performance membranes (e.g. automotive and medical) | 4 | 4 | 4 | 19 | <a href="#">PFC Free Water- and Windproof Membrane   ChemSec Marketplace</a><br><a href="#">NEOSEED® Series: Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">MLSE® - Multiplexed Laser Surface Enhancement for Textile   ChemSec Marketplace</a><br><a href="#">BIONIC-FINISH® ECO   ChemSec Marketplace</a><br><a href="#">Sciessent Curb® Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">Unidyne XF - fluorine-free, water-based polymer emulsion   ChemSec Marketplace</a><br><a href="#">Reapret - flourine-free water repellent   ChemSec Marketplace</a><br><a href="#">Permutex® WR 43-064 - PFC-free water repellence   ChemSec Marketplace</a><br><a href="#">Bioguard Zero – flourine-free water repellency   ChemSec Marketplace</a><br><a href="#">APGLO - Plasma Dry Technology free of PFOA   ChemSec Marketplace</a><br><a href="#">Texfin HTF   ChemSec Marketplace</a><br><a href="#">HYDROSIN NF-01 - Textile flourine-free water repellence   ChemSec Marketplace</a><br><a href="#">GreenShield ZERO - Fluorine Free Finish for Water-Based Stain Resistance   ChemSec Marketplace</a><br><a href="#">Fluorine free DWR: HC303 and NIA   ChemSec Marketplace</a> |

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|  |                                                              |   |   |   |    | <a href="#">EVORAL NFP – PFC-free water repellent (Textile)   ChemSec Marketplace</a><br><a href="#">Aqualon™ - PFAS free DWR   ChemSec Marketplace</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|  | Medical applications (e.g. surgical drapes, gowns, curtains) | 4 | 4 | 3 | 19 | <a href="#">PFC Free Water- and Windproof Membrane   ChemSec Marketplace</a><br><a href="#">NEOSEED® Series: Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">MLSE® - Multiplexed Laser Surface Enhancement for Textile   ChemSec Marketplace</a><br><a href="#">BIONIC-FINISH® ECO   ChemSec Marketplace</a><br><a href="#">Sciessent Curb® Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">Unidyne XF - fluorine-free, water-based polymer emulsion   ChemSec Marketplace</a><br><a href="#">Reapret - fluorine-free water repellent   ChemSec Marketplace</a><br><a href="#">Permutex® WR 43-064 - PFC-free water repellence   ChemSec Marketplace</a><br><a href="#">Bioguard Zero – fluorine-free water repellency   ChemSec Marketplace</a><br><a href="#">APGLO - Plasma Dry Technology free of PFOA   ChemSec Marketplace</a><br><a href="#">Texfin HTF   ChemSec Marketplace</a><br><a href="#">HYDROSIN NF-01 - Textile fluorine-free water repellence   ChemSec Marketplace</a><br><a href="#">GreenShield ZERO - Fluorine Free Finish for Water-Based Stain Resistance   ChemSec Marketplace</a><br><a href="#">Fluorine free DWR: HC303 and NIA   ChemSec Marketplace</a><br><a href="#">EVORAL NFP – PFC-free water repellent (Textile)   ChemSec Marketplace</a><br><a href="#">Aqualon™ - PFAS free DWR   ChemSec Marketplace</a> |
|  | Outdoor technical textile (e.g. canvas, awnings,             | 7 | 7 | 5 | 19 | <a href="#">PFC Free Water- and Windproof Membrane   ChemSec Marketplace</a><br><a href="#">NEOSEED® Series: Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a><br><a href="#">MLSE® - Multiplexed Laser Surface Enhancement for Textile   ChemSec Marketplace</a><br><a href="#">BIONIC-FINISH® ECO   ChemSec Marketplace</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

|  |                            |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--|----------------------------|--|--|--|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | tarps, tents, sails, rope) |  |  |  |  | <p><a href="#">Sciessent Curb® Fluorine-Free Durable Water Repellent   ChemSec Marketplace</a></p> <p><a href="#">Unidyne XF - fluorine-free, water-based polymer emulsion   ChemSec Marketplace</a></p> <p><a href="#">Reapret - fluorine-free water repellent   ChemSec Marketplace</a></p> <p><a href="#">Permutex® WR 43-064 - PFC-free water repellence   ChemSec Marketplace</a></p> <p><a href="#">Bioguard Zero – fluorine-free water repellency   ChemSec Marketplace</a></p> <p><a href="#">APGLO - Plasma Dry Technology free of PFOA   ChemSec Marketplace</a></p> <p><a href="#">Texfin HTF   ChemSec Marketplace</a></p> <p><a href="#">HYDROSIN NF-01 - Textile fluorine-free water repellence   ChemSec Marketplace</a></p> <p><a href="#">GreenShield ZERO - Fluorine Free Finish for Water-Based Stain Resistance   ChemSec Marketplace</a></p> <p><a href="#">Fluorine free DWR: HC303 and NIA   ChemSec Marketplace</a></p> <p><a href="#">EVORAL NFP – PFC-free water repellent (Textile)   ChemSec Marketplace</a></p> <p><a href="#">Aqualon™ - PFAS free DWR   ChemSec Marketplace</a></p> |
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