

# Environmental Profile of Aurubis Selenium products



## Selenium is essential for life

Aurubis produces Selenium via its subsidiary RETORTE. Selenium is an essential trace element in our bodies and an important trace element naturally found in soil, in water, and in some foods. Selenium is used in the pharmaceutical industry for dietary supplements and medications. Selenium is also used in animal feed as a vital trace element for a balanced diet.

Selenium is used in a large number and wide variety of industrial applications, from coloring and decolorizing glass to coating digital x-ray detectors. In the solar industry, selenium is a component of CIS/CIGS solar cells.

## The environmental footprint of Aurubis Selenium products

As the EU places more and more emphasis on green technologies needed to meet its climate targets, it is increasingly important to understand the life cycles of the underlying products.

As a sustainably oriented multimetal company, Aurubis takes responsibility for the global challenges of climate change, environmental protection, and resource conservation.

Improving the environmental performance of products, along with enhancing sustainability throughout the entire supply chain, is of great importance for Aurubis. In 2021 we introduced our label 'Tomorrow Metals'. It encompasses the many measures we are taking to enhance our sustainability performance. Aurubis is at the forefront of industries committed to reducing the environmental impact of their operations: We have set the objective of achieving carbon-neutral production well before 2050.

The environmental impacts of Aurubis' products are calculated via the Environmental Footprint impact assessment method (3.0) to align with best scientific and industry reporting practices.

## Carbon footprint of Aurubis Selenium products

in kg CO<sub>2</sub> equivalent per kg Se in selenium products



# 24.6

Aurubis Selenium products (data reference 2023)

Note: The Environmental Footprint method (3.0) is the most advanced impact assessment method adopted by the European Commission

## Life cycle assessment for Aurubis Selenium products

Responding to requests from end-users, along with our own sustainability goals, Aurubis conducted a life cycle assessment (LCA) of our selenium products. In this holistic approach, we considered all steps involved in the production — starting from the upstream processes to produce the raw materials, such as raw selenium extracted from the anode slime from copper production, to the manufacturing of the selenium products. The assessment includes impacts from all activities

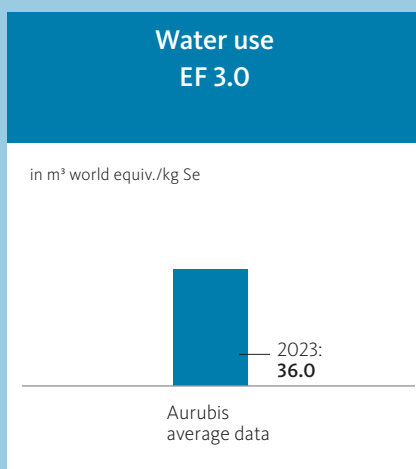
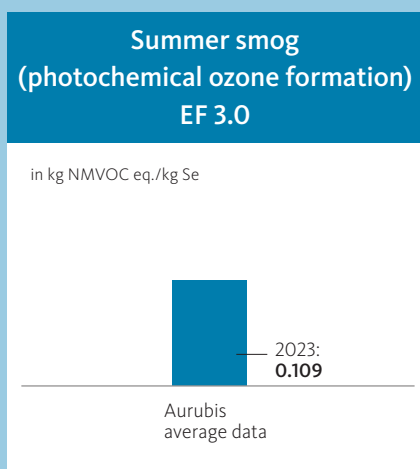
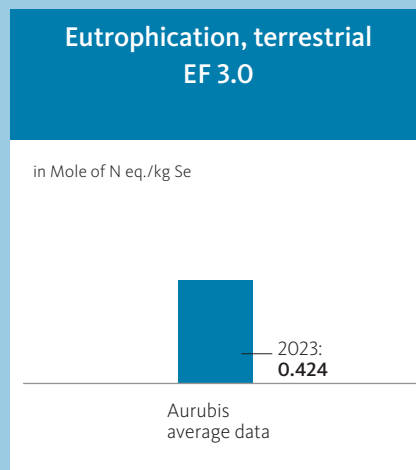
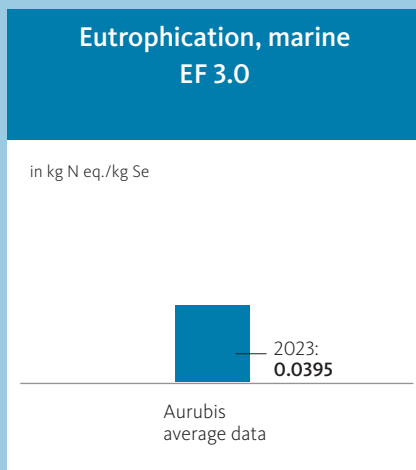
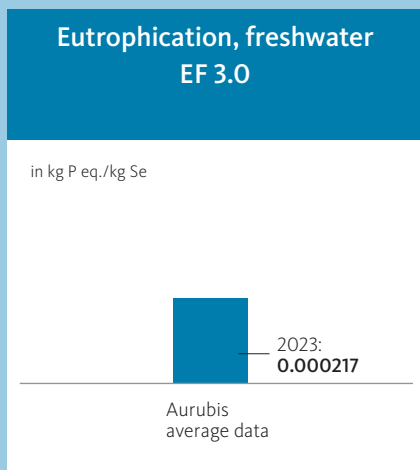
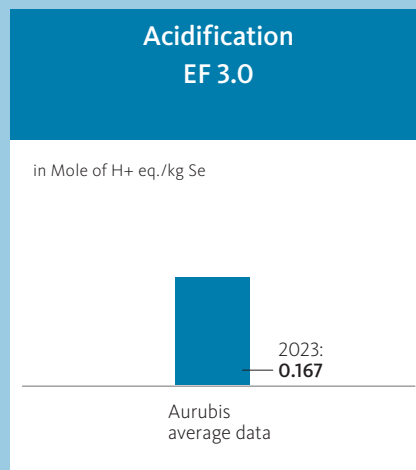
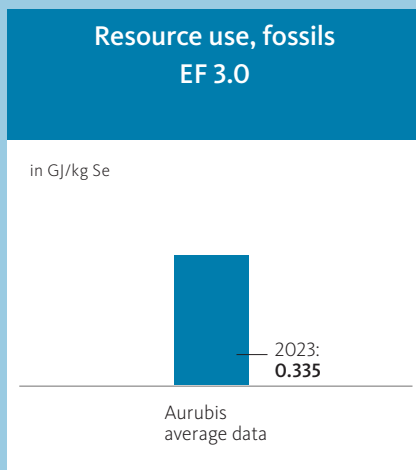
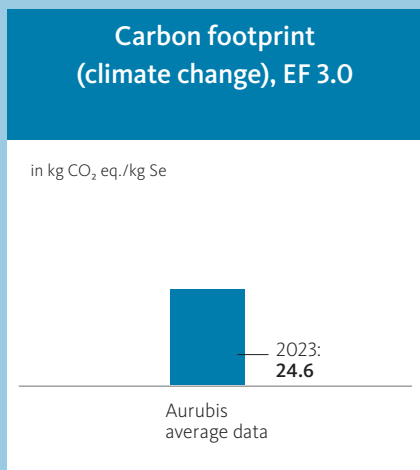
related to raw materials, direct emissions, transport, energy consumption, and auxiliary materials. The study was conducted in conformance with the ISO standards 14040 and 14044 for life cycle assessment.<sup>1</sup> Selenium is extracted during the production of copper from the anode slimes as raw selenium and further processed by Aurubis subsidiary RETORTE GmbH into various products: selenium granules, selenium powder, high-purity selenium, sodium selenite, and zinc selenite.

<sup>1</sup> ISO 14040:2021 Environmental management — Life cycle assessment — Principles and framework.  
 ISO 14044:2021 Environmental management — Life cycle assessment — Requirements and guidelines.

## The results

The results of the environmental footprint of Aurubis Selenium products are directly related to the footprint of the raw selenium. The key environmental aspects were assessed with the Environmental Footprint impact assessment method (3.0) along 16 impact categories.

The main impact categories reported in this factsheet were selected because they represent a broad range of environmental impacts. Results for all 16 indicators are available upon request. However, it is important to note that 'abiotic depletion potential' and 'toxicity' are not sufficiently robust and accurate to be used for metals.



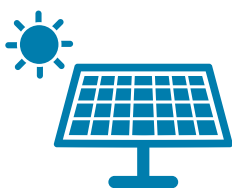
## How we got there: Improvements by constantly implementing environmental and climate measures

In the LCA, our goal was to evaluate the environmental profile of Aurubis Selenium products and allow tracking of the progress and further improvement. The LCA results strongly depend on the environmental profile of the upstream raw selenium. The results achieved were only possible with major investments in measures that reach ambitious environmental standards.



### Emission reduction

Operations have made continuous efforts to reduce direct emissions of pollutants such as dust as well as greenhouse gas emissions.



### Energy-efficient technologies

We invested in energy-efficient technologies at all sites across the Aurubis Group, implemented measures to save energy, facilitated the switch to renewable energies, and enabled decarbonization.



### Recycling

The extension of Aurubis' recycling capacities contributed to the improvements of our overall footprint on the environment.

## Ultra-pure selenium is used for the solar industry on the path to sustainable energy

Selenium is a building material for CIGS solar cells. Making these solar cells requires less semi-conductor material and energy than conventional solar cells. The thin-film solar panel is unique because it has a significantly higher absorption effect compared to silicon solar cells. Only the very highest quality ultra-pure selenium can be used to manufacture these solar cells to guarantee consistent performance, efficiency and reliability.

## Aurubis AG

Corporate Environmental Protection

### Daniela Cholakova

Director Environmental Protection  
Corporate Environmental Protection  
d.cholakova@aurubis.com

### Tom Stückemann

Environmental Manager  
Corporate Environmental Protection  
t.stueckemann@aurubis.com