PLEXIGLAS®
THE ORIGINAL BY RÖHM

# PLEXIGLAS®
# for Greenhouses

RÖHM

## Contents



# Create your own climate

Greenhouses enable us to harvest tomatoes, cucumbers and salad greens at any time of the year and grow flowering plants even in winter – even when the weather outside is rainy and snowy. They create an individual climate zone in which plants can flourish and vegetables can ripen. In zoos and botanical gardens, they offer a pleasant temperature for flora and fauna from foreign climes.

It is crucial for greenhouses to offer high light transmission if they are to provide a good yield. Light helps crops grow faster, and a high proportion of UV light gives blossoms more intense color. Greenhouses made of PLEXIGLAS® always provide plants with the right mix of sunlight and UV radiation. Their good heat insulation means hardly any energy is lost. That cuts heating costs and lightens the load on the environment. These are decisive factors for the competitiveness of every horticultural company.

The Röhm GmbH is among the world's leading suppliers of PMMA and acrylic products, which were invented in 1933 by Dr. Otto Röhm and his team. The products we market under the PLEXIGLAS® brand (and under the ACRYLITE® brand in the Americas), as well as our know-how, are available everywhere, either directly via our global distribution network, via regional distributors or qualified fabricators.

**Let us help you create the ideal climate for growth!**

# PLEXIGLAS®
# 10 good reasons

A variety of factors interact to ensure that greenhouses provide a good yield

**1 High light transmission and UV transmission for the best growth results**

Light is an essential production factor in horticulture. PLEXIGLAS® multi-skin sheets let up to 91% of photosynthetically active radiation (PAR) into the greenhouse. That leads to optimum plant growth over the entire service life of the product, which is more than 30 years. Natural growing conditions produce excellent leaf and bloom quality, often after shorter growing times. These are economic benefits that help to increase your greenhouse crop yield.

Comparisons between a conventional double-glazed greenhouse and a structure glazed with PLEXIGLAS® Alltop show that PLEXIGLAS® Alltop transmits up to 20 % more light to the plants. This is a major advantage, especially in the winter months and in regions where the sun does not always shine. And a lasting benefit too, because PLEXIGLAS® retains this level of light transmission for decades.

PLEXIGLAS® Alltop also transmits the entire spectrum of ultraviolet light that reaches the earth's surface. Plants in the greenhouse receive almost exactly the same composition of sunlight as they would outdoors. Vividly colored blossoms and strong, compact growth can be obtained quite naturally. The result is outstanding plant quality. Exotic animals and plants in zoos and botanical gardens receive exactly the type of light they need.

If this type of radiation is not wanted, the material is also available in a UV-absorbing grade. PLEXIGLAS® Heatstop additionally reflects infrared radiation and protects against excessive heat. This reduces heat buildup in work areas or connecting passages and makes for a pleasant working climate.

**2 No yellowing, ever**

We guarantee that our multi-skin sheets marketed under the PLEXIGLAS® trademark will show no yellowing and will retain their maximum light transmission for 30 years. This guarantee is the only one of its kind in the market.

Sunlight brings the light and warmth to the greenhouse that enable your plants to flourish. But sunlight also contains UV radiation, which is a problem for many types of plastic and causes them to yellow. PLEXIGLAS® is perfectly protected against this effect. The material consists of UV-stable molecular chains through and through. These protect the entire sheet, not just its surface.

Ask us for examples and see for yourself. We will be pleased to give you the addresses of PLEXIGLAS® greenhouses that have been in operation for many years. Compare them with greenhouses made from other plastic materials – but only if these have also been in use for 30 years!

**3 Protection from hail**

PLEXIGLAS® multi-skin sheets are tough enough to resist hailstorms. Impact-resistant PLEXIGLAS® Resist multi-skin sheets are even tougher. Their outstanding feature is their extremely high impact strength and hail resistance, which comes with a 10-year guarantee.

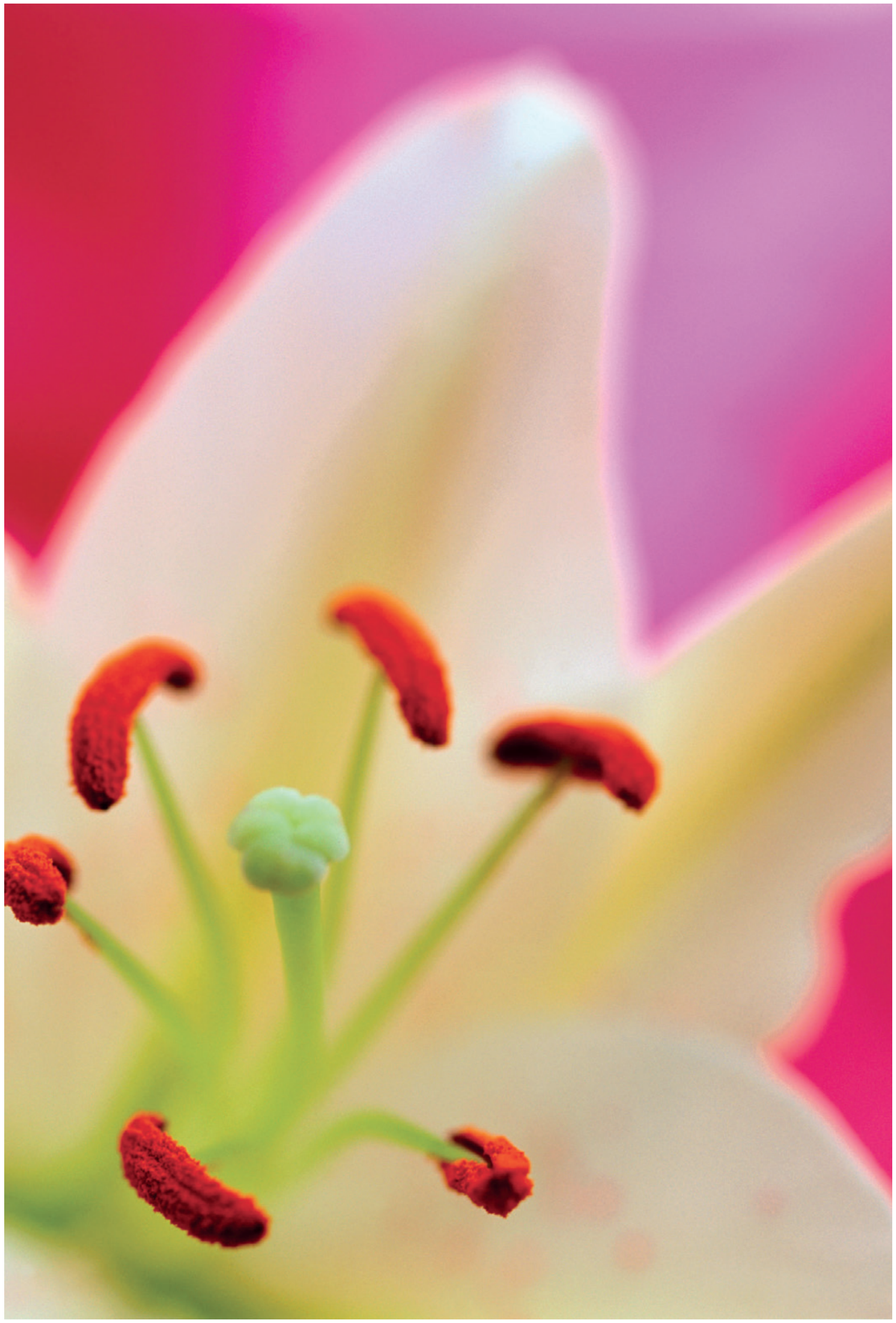
The high impact strength is also one reason why hail has caused virtually no subsequent damage since PLEXIGLAS® SP multi-skin sheets were introduced in 1971. While PLEXIGLAS® multi-skin sheet greenhouses did sustain some damage after extreme weather events with hailstones the size of tennis balls, they remained fully functional, unlike conventional greenhouses. And, an important factor for your company's ability to deliver – there was no damage to crops or subsequent damage due to falling slivers or loss of weather protection. This gives you time to clarify glazing repairs or sheet replacement with the hail insurance company. There is no need to proceed at haste and carry out risky interim repairs.

**4 Energy savings of up to 60 %**

Energy costs are an important competition factor for operators of commercial greenhouses. Often, consumption costs can be cut by around 40 % using 16 mm thick PLEXIGLAS® double-skin sheets, as compared with single-glazed greenhouses. These are savings that pay off and significantly reduce the environmental burden.

The 32 mm thick PLEXIGLAS® Resist S5 P NO DROP quadruple-skin sheet provides maximum heat insulation. With a savings potential of up to 60 %, it is used for the walls of highly heat-insulating greenhouses, and in the north of Scandinavia, also for roofs.

The money you save by cutting energy costs means that your investment pays off within only a few years. In addition, you will save thousands of euros over the entire service life of PLEXIGLAS® (30 years+), which will then be available for new investments.



**5 Patented anti-condensation technology**

Keeping a clear view: PLEXIGLAS® remains clear-transparent even in bad weather. The patented NO DROP coating causes rain and condensation to flow off the material as a continuous, self-cleaning film. No disturbing droplets are formed. Depending on requirements, the product is coated on one or both sides and inside the cavities (NO DROP or Alltop).

Especially at darker times of the year, Alltop makes sure that the light transmission of 91 %, which is a sensational value for double glazing, is also retained when the sheet is wet. The theoretical values measured on other types of glazing, in tests performed on dry specimens without condensation, are not much use under practical conditions. Why settle for less when it comes to the quality of your plants?

**6 Stability and performance in use**

The naturally stable molecular chains of the PLEXIGLAS® polymer, combined with the PLEXIGLAS® multi-skin sheet configurations and skin thicknesses that have been optimized over decades, make the sheets durable and more stable in the long run than other multi-skin sheets. More than 7.5 million square meters of PLEXIGLAS® multi-skin sheets have been used to build commercial greenhouses all over the world and have proved their outstanding properties in a variety of climate zones, from the ice and snow of Nordic countries to hot, arid regions.

**7 Savings on accessories**

PLEXIGLAS® multi-skin sheets retain heat in the greenhouse by natural means. Experience shows that considerable savings can be made, both when it comes to dimensioning the heating unit and the number of heating pipes.

**8 Longevity**

PLEXIGLAS® multi-skin sheets are renowned for their extreme longevity. You save on the repair or replacement costs that are incurred in the course of time for other, less durable greenhouse materials. Even the next generation of young gardeners benefits from this aspect when it comes to taking over the business.

**9 Environmental protection**

Wherever PLEXIGLAS® is used, less energy and resources are consumed. This is of lasting benefit to the environment. Added to this, a PLEXIGLAS® greenhouse is built to last for 30 years and more. That means it is only glazed once. Other plastics usually have to be replaced two or three times in the same period, which uses up a corresponding amount of energy and resources.

When PLEXIGLAS® does have to be disposed of after decades of service, it can be recycled and used for other purposes. That makes it an ecological solution.

The polymethyl methacrylate (PMMA, otherwise known as acrylic) PLEXIGLAS® contains no hazardous substances. It releases no harmful substances into the environment. This applies equally during its application and its fabrication and recycling.

**10 The best guarantees in the industry**

PLEXIGLAS® puts you on the safe side. It comes with the best guarantees, with specific guarantee values. There is no stepwise reduction according to current market value, unlike conventional guarantees. The material is replaced 100 % when the guarantee conditions are met.

Compare well before making your decision!

**PLEXIGLAS® Alltop**

**PLEXIGLAS® Alltop High Impact**

**PLEXIGLAS® Resist**

**PLEXIGLAS® Heatstop**

**PLEXIGLAS® Alltop**

**PLEXIGLAS® Alltop High Impact**

**PLEXIGLAS® Resist**

**PLEXIGLAS® Heatstop**

# PLEXIGLAS®
# A world of opportunities

Plants need ideal conditions for growth, including light, temperature and humidity. This is true of market gardening, research facilities or parks like zoos and botanical gardens, all over the world. PLEXIGLAS® creates the best conditions in every field of application.

**Commercial greenhouses**

Operators know how important it is to monitor and optimize the environment in which plants grow. That is why leading horticulturalists around the globe rely on PLEXIGLAS® for its high light transmission and transparency, weather resistance and energy savings – benefits that are retained for decades.

**Research and teaching**

Well-known research institutes also opt for greenhouses made of PLEXIGLAS®. Researchers need controlled and stable conditions for their work. This is the only way they can achieve solid results. Research greenhouses made of PLEXIGLAS® offer constant lighting and UV conditions that make sure experiments can be replicated. Another benefit is that they require very little maintenance. Low maintenance means low costs, as well as energy savings due to the material's good heat insulation. These are just two reasons why PLEXIGLAS® is also the ideal material for research facilities and universities.

**Botanical gardens and zoos**

Exotic habitats call for special surroundings. That is no problem thanks to PLEXIGLAS®. Its transmission properties make it possible to obtain the full spectrum of light in botanical gardens or zoos. Thanks to their excellent U-values, 32 mm thick PLEXIGLAS® multi-skin sheets are particularly suitable for meeting the requirements of highly heat-insulated structures.

# PLEXIGLAS® multi-skin sheets
# in the world of horticulture

**1**

- Greenhouses made from PLEXIGLAS® multi-skin sheets with and without NO DROP coating, PLEXIGLAS® Alltop SDP
- Location: V.D.E. plant b.v. in Woubrugge, The Netherlands
- Total area glazed with PLEXIGLAS® SP: approx. 100,000 m²
- Built in several stages between 1977 and 2006
- Fabricator: Thermoflor, Wateringen, The Netherlands


**2**

- Greenhouses built with approx. 60,000 m² of PLEXIGLAS® Alltop SDP in several construction phases from 1999 to 2005
- Location: Truck Farm Blom in Aalsmeer, The Netherlands
- Fabricator: Van Diemen, De Kwakel, The Netherlands and Bosman, Aalsmeer, The Netherlands

**3**

- Greenhouses made of PLEXIGLAS® Resist SDP, approx. 50.000 m², built in 2003 and 2008
- Location: Sion Orchids in De Lier, The Netherlands
- Fabricator: Technokas, De Lier, The Netherlands

**4**

- Greenhouses made of PLEXIGLAS® Alltop SDP, approx. 28,000 m², built in January 2000 and 2002.
- Location: Truck Farm Mustakosken in Seinäjoki and Kaskinen, Finland
- Fabricator: Schetelig, Turku, Finland and Viemose-Driboga, Tommerup, Denmark

**1** V.D.E. plant is one of the Netherlands' largest horticultural companies that grows green houseplants. Their range includes palms such as Areca lutescens, Caryota mitis, Chamaedorea elegans and other green plants like Dizygotheca elegantissima, Beaucarnea recurvata and Murraya paniculata. Flowering pot plants like Euphorbia milii ‚Vulkanus' and Spathiphyllum ‚Cupido' round off the range. Mr. Van der Eijk relies on PLEXIGLAS® multi-skin sheets because they guarantee good produce by ensuring constant climatic and lighting conditions. The first 10,000 square meters of PLEXIGLAS® multi-skin sheets were installed here 35 years ago, and have meanwhile paid off several times over by enabling energy savings of some 40 % as compared with conventional single glazing, and by reducing the load on the environment. In 1998, V.D.E. plant won the Dutch horticultural business prize. The last construction phase was in 2006 and involved 16,000 m² of PLEXIGLAS® Alltop SDP.

**2** For their new 6-hectare outfit in Aalsmeer, the Blom brothers have also decided in favor of a roof with PLEXIGLAS® Alltop SDP. They cultivate palms up to 5 meters in size. The savings in heating costs, the long-term investment in the future and the possibility of better regulating the greenhouse climate were their major decision criteria.

**3** Sion Orchids has been growing potted Phalaenopsis orchids under PLEXIGLAS® Resist SDP 16 NO DROP glazing since 2003. The excellent climate beneath these sheets was one of the main features that convinced Eric Moor. Energy savings and the benefits for the plants themselves tipped the scales in favor of PLEXIGLAS®.

**4** Mr. Jorma Mustakosken cultivates cucumbers and tomatoes in three greenhouses with a total surface area of about 7 hectares. He has had over 20 years' experience with PLEXIGLAS® doubleskin sheets. But never before have the yields in cucumbers and tomatoes been so high as in the two new PLEXIGLAS® Alltop SDP greenhouses in Seinäjoki, which are 21 m wide and 240 m long. The climate is very good and the lighting conditions are fantastic, thanks to the Alltop coating.


**5**

- Greenhouses built with approx. 10,000 m² of PLEXIGLAS® Alltop SDP in several construction phases from 2000 to 2008
- Location: Orto Novo market gardens in Ekerö, Sweden
- Fabricator: Grönsta-Nop , Sweden, Thermoflor, The Netherlands, Viemose-Driboga, Denmark

**6**

- PLEXIGLAS® Resist SDP 8 NO DROP greenhouses, approx. 100,000 m², installed between 2005 and 2011
- Location: Matsui Orchids in Salinas, California and New Jersey, USA
- Fabricator: Greenhouse System USA, Watsonville, CA and Bosman, Aalsmeer, The Netherlands

**7**

- PLEXIGLAS® Alltop High Impact and PLEXIGLAS® Resist SDP 16 NO DROP greenhouses, approx. 100,000 m², installed between 1997 and 2011
- Location: Rosa Flora in Dunnville, Ontario, Canada
- Fabricator: Edwards Greenhouses, Dunnville, Canada

**8**

- PLEXIGLAS® SDP 16 NO DROP and PLEXIGLAS® Resist SDP NO DROP greenhouses, approx. 3,200 m², installed between 1985 and 2007
- Location: Yasui market gardens in Shizuoka, Japan
- Fabricator: Hyodo, Fukuroi, Japan

**5** Orto Novo specializes in growing herbs like basil, thyme, sage, lemon balm and dill. “What we appreciate most about PLEXIGLAS® is its high stability and light transmission,” says Alvar Kårfors, Junior Managing Director at Orto Novo. Based on the idyllic island of Ekerö, Orto Novo supplies wholesalers and restaurants in the greater Stockholm area and the whole of Sweden with delicious fresh herbs.

**6** Andy Matsui from California’s Salinas Valley opted for coldcurvable PLEXIGLAS® Resist double-skin sheets for his curved greenhouses. The long service life of the PLEXIGLAS® glazing and the excellent climate in the greenhouses were his main reasons for choosing this material.

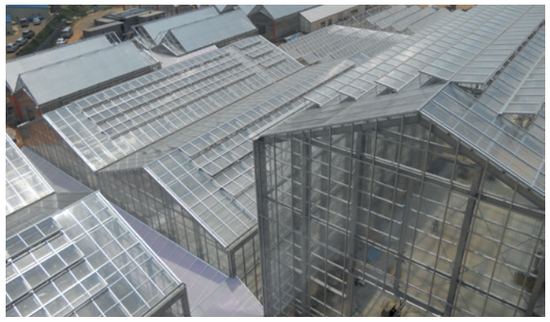
At its new site in New Jersey, Matsui once again opted for 8 mm thick PLEXIGLAS® Resist double-skin sheets to glaze the Venlo greenhouses supplied by Bosman (the Netherlands).

**7** Otto and Corine Bulk moved to Ontario from the Netherlands and built up one of the country’s biggest cut-flower establishments. The company based in Rosa Flora cultivates a wide range of fresh cut flowers like roses, Alstroemeria (Peruvian Lilies), gerbera and snap-dragons that all flourish under PLEXIGLAS®. “Even the 20-year old PLEXIGLAS® sheets are still as clear as on day one,” Otto Bulk confirms.

**8** Mr. Yasui grows the famous Shizuoka Crown Melons in 14 special greenhouses. All his greenhouses are glazed with PLEXIGLAS®. Thanks to the excellent climate beneath the PLEXIGLAS® sheets, the Crown Melons are produced in outstanding quality.

**9**

- Greenhouses made from PLEXIGLAS® Alltop SDP, around 3,000 m², built in 2005
- Location: Beeren horticultural company in Nettetal, Germany
- Fabricator: Maurice in Horst, The Netherlands



**10**

- Greenhouses made of PLEXIGLAS® Alltop SDP, around 18,000 m², built in 2011
- Location: National Ecological Institute, South Korea
- Fabricator: Greenponex in South Korea

**9** The Beeren company specialises in growing orchids as pot plants. To produce high-quality Phalaenopsis orchids, it takes a perfect tropical climate. Energy-saving PLEXIGLAS® Alltop double-skin sheets are ideal for this purpose. The UV transmission of the Alltop sheets makes the plants robust and compact, with vividly colored blossoms.

**10** The National Ecological Institute's horticulturalists grow and tend to the plants in this impressive garden and leisure park in Seocheon. Once again, the UV transmission of the PLEXIGLAS® Alltop double-skin sheets was the crucial criterion for selecting the glazing material for the new greenhouses, some of which are extremely high to offer place for large individual plants to survive the winter.

# Products, applications and properties

| Applications | Products | Properties |
|---|---|---|
| **Commercial greenhouses**<br><br>**Research and Institutional greenhouses**<br><br>**Greenhouses for Botanical Gardens and Zoos** | PLEXIGLAS® Alltop SDP 16-64 | • Patented anti-condensate technology on both sides and inside of the sheets<br>• Exeptional high light- and UV-transmission<br>• Extremley resistant to weathering and aging<br>• Naturally UV-stable technology<br>• Energy savings of 40 % and more |
| | PLEXIGLAS® Alltop SDP 16-64 impact | • Patented anti-condensate technology on both sides and inside of the sheets<br>• Exeptional high light transmission<br>• Hail resistance and toughness<br>• Naturally UV-stable technology<br>• Energy savings of 40 % and more |
| | PLEXIGLAS® Resist SDP 8-16<br><br>PLEXIGLAS® Resist SDP 16-32<br><br>PLEXIGLAS® Resist SDP 16-64 | • No Drip technology on one side<br>• High light-transmission<br>• Hail resistance and toughness<br>• Cold bending for curved roofs<br>• Naturally UV-stable technology<br>• Energy savings up to 40 % and more |
| | PLEXIGLAS® Resist S3P 16-24<br><br>PLEXIGLAS® Resist S5P 32-32 | • Exeptional high heat insulation<br>• Energy savings up to 60 %<br>• Hail resistance and toughness<br>• No Drip technology on one side<br>• Naturally UV-stable technology |
| | PLEXIGLAS® Heatstop SDP 16-64 | • Infrared-reflecting technology reduces heat buildup<br>• Hail resistance and toughness<br>• No Drip technology on one side<br>• Naturally UV-stable technology<br>• Energy savings of 40 % and more |

PLEXIGLAS® 30 YEARS GUARANTEE NO YELLOWING

NATURALLY UV STABLE PLEXIGLAS®

## SUSTAINABILITY

**The Sustainable Development Goals (SDG), adopted by the United Nations in 2016, all have one goal: By 2030, all inhabitants of planet Earth should be able to live in dignity.**

To this end, the United Nations has formulated 17 goals to support global sustainability efforts. The SDGs are our compass in aligning our sustainability-strategy, creating innovations and identifying new business opportunities and take advantage of them.

Products and solutions from Röhm make a measurable contribution to achieving these goals. This is how we assume responsibility.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