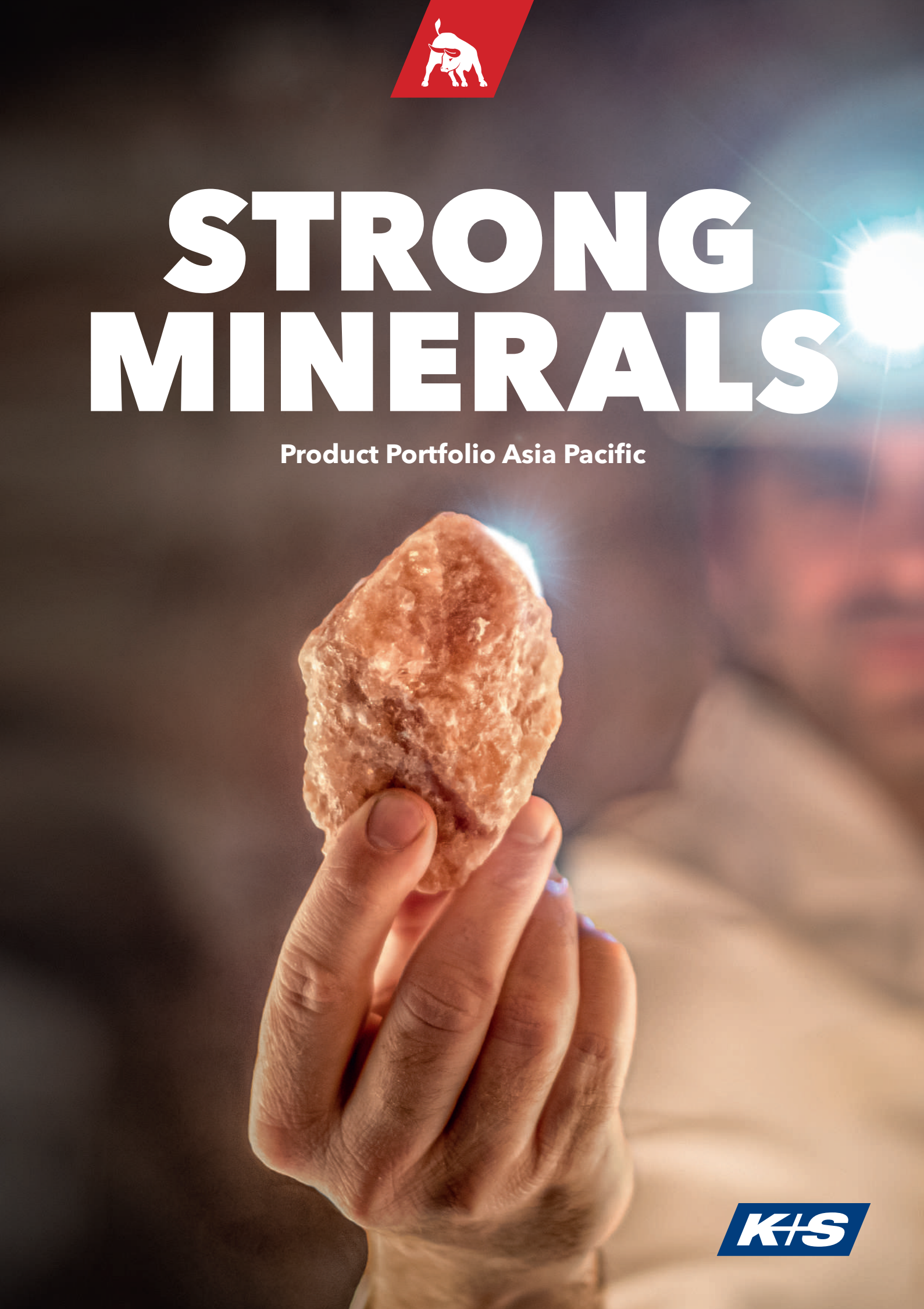
STRONG MINERALS

Product Portfolio Asia Pacific



Potassium, Magnesium and Sulphur – essential plant nutrients of natural origin

The minerals potassium, magnesium and sulphur are found widespread in nature. They are essential nutrients for plants, animals and humans. With the discovery of potash deposits in the middle of the 19th century and the processing of valuable potash fertilisers, it became possible to remedy the general deficiency of these nutrients in agriculture.

With over half a century of experience in Asia and Oceania, K+S Asia Pacific Pte Ltd is serving the APAC region with a wide range of Potassium and Magnesium fertilisers, including specialty products and boron fertiliser.

Potassium
K
39,10 19

Potassium is crucial for plant growth and development when present in the correct quantities. This mineral is involved in a number of metabolic processes, including the activation of enzymes and the synthesis and transport of carbohydrates, as well as providing natural resistance to frost and drought stress.

Magnesium
Mg
24,31 12

Magnesium alongside nitrogen, phosphorus and potassium, the central importance of magnesium is often underestimated. Magnesium promotes growth and yield formation and mitigates stress caused by high light irradiation.

Sulphur
S
32,07 16

Sulphur increases nitrogen use efficiency and is essential for protein synthesis. It is important for production of natural defense compounds in plants. Sulphur is also a necessary element in the production of aromatic and flavor compounds of bulb vegetables and fruits.

Boron
B
10,81 5

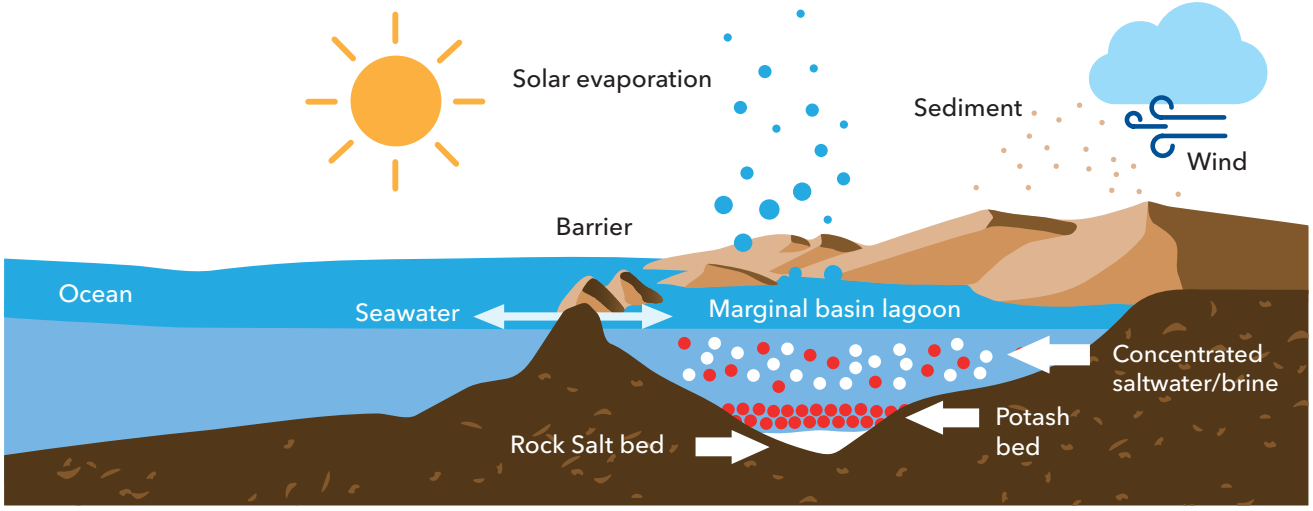
Boron is a micronutrient that is required in limited quantities according to crops and conditions involved. It contributes indirectly to yield improvement through direct actions on the stability of the cell membranes and cell division, especially along the flower and root initiations.

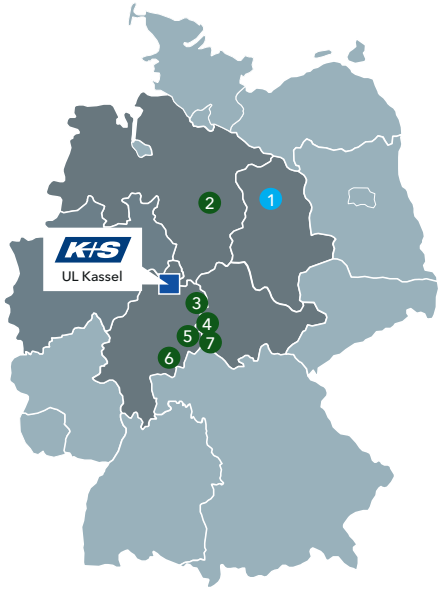


Natural Resources – The Potash deposits in Germany

The potash deposits in Germany were formed more than 250 million years ago by the evaporation of the Zechstein Sea. According to the so-called barrier theory, salty seawater flowed over shallow sea barriers into shallow marginal basins, where it evaporated due to extremely dry conditions. The salt concentration increased, and potassium, magnesium and sodium salts were crystallised and deposited in order of solubility. This process was repeated for hundreds of thousands of years, resulting in the formation of potash deposits at depths of several hundred metres. In the course of subsequent geological history, the thick salt deposits were covered by Triassic formations, vast series of shales, sandstones and limestones, mostly of the Bunter, Muschelkalk and Keuper age, thus preventing their dissolution.

Formation of Potash Deposits





K+S Potash Plants in Germany

The K+S operates a total of six potash mines in Lower Saxony, Saxony-Anhalt and in the Hessian-Thuringian Werra-Fulda district.

- Corporate management Kassel
- 1 Zielitz plant
- 2 Bergmannssegen-Hugo (Lehrte) (Production only, no mining)
- 3 Werra works – Wintershall (Heringen)
- 4 Werra works – Unterbreizbach
- 5 Werra works – Hattorf (Philippsthal)
- 6 Neuhof-Ellers plant (Neuhof)
- 7 Merkers

- Potash
- Potash and Kieserite

The fascination of mining – our potash deposits

The formation of potash deposits in Germany occurred about 250 million years ago because of the evaporation of the Zechstein Sea. Today, the shallow, seam-like potash deposits with thicknesses of about 3 – 8 metres are located at depths of between 500 and 2500 metres. Our mining operations extend down to depths of more than 1000 metres.

You will find our modern K+S mines in Saxony-Anhalt as well as in the Werra-Fulda district of Hesse and Thuringia. We extract potash crude salts and refine them into products used in agriculture, industry, health, and nutrition.

Yet we do not only produce in Germany. In 2017, the Bethune potash plant built by K+S started production in Canada, expanding the global presence of the K+S Group. Following the addition of K+S Potash Canada, we are now a potash supplier with production sites on two continents.

Due to their natural origin, many of our fertilisers are approved for use in organic farming.



Salt and other layers often form artistic structures.



Miners entering the mine. Basically, the occupation can be identified by the helmet color: for the miner it is yellow, for the mine rescue team red, for electricians green, for locksmiths blue, for security guards orange, for supervisors white, and visitors are given gray helmets.

An ordinary day at a depth of 800 metres

Extracting the white gold requires many work steps, strong technology, and well-coordinated miners. Let's enter a mine. Many fascinating things await us there. The pit cage takes us to a depth of over 500 metres in just 90 seconds. Once underground, it's time to "board up" and our four-wheel drive vehicles will take us on a tour through a seemingly endless labyrinth of roadways and mining chambers. The roadway network of the Werra plant alone, for example, is the same size as the city of Munich, including its suburbs. Fortunately, there are also underground signposts for orientation.

Not only is the route network large, so are our vehicles. Some of them are so huge that they can only be transported underground in individual parts. Our craftsmen then reassemble them underground in the workshop. There's always a lot to do, as we use many different mining machines and vehicles. These include access vehicles, scaling machines, loaders, special vehicles, milling machines, clean loaders, blast hole drill rigs, blasting vehicles as well as special drill rigs. There is quite a bit of repair and maintenance to be done.

On our way to the mining face, we can see many square metal plates on the roofs, the ceilings. These are the visible parts of the rock bolts providing safety underground. Their purpose is to maintain the bond between the rock layers and prevent salt plates from detaching from the roofs. In our mines, we install around 1.6 million of these long-threaded rods every year.

On arrival at the mining face, a blast-hole drilling rig drills seven-metre-deep holes horizontally into the face - these holes are then filled with explosives by the blaster. Important to note: Blasting is only carried out at the end of the shift when everyone has left the mining areas. After blasting, the excavated crude salt is transported from the mining face to the dumping site by means of a truck-mounted loader, which can carry up to 20 tonnes with a single bucket load. At the dumping site, a crusher breaks up the crude salt boulders for subsequent transportation on the conveyor belt to the shaft. Once they reach the surface, the colleagues from the processing department take over the crude salt. Our little underground tour ends at this point.



Repair and maintenance of the vehicles used underground (a loader in the picture) is carried out in the underground workshops.



The bench drilling rig is used for blast hole drilling in large deposit thicknesses. State-of-the-art technology is employed to create vertical blast holes over 30 metres long.

From crude salt to the finished product – our refining processes

That was fast: at up to 15 metres per second, the boulders of crude salt were transported out of the mine and arrived above ground. Work is far from over, however. Now it's time for fine grinding and refining. We use various processes for this purpose: hot solution mining, flotation, and the ESTA process. Furthermore, our kainite crystallisation and flotation plant (KCF) has been in operation at the Hattorf site of the Werra plant since 2018, with which we recover additional mineral contents from previously unused salt solutions. The selection of the process depends entirely on the crude salt composition and the desired end product. We use the processes not only in isolation from each other, but also in combination.

What happens during processing?

The crude salt boulders extracted to the surface are finely ground, and then the processing operations continue. Through these processes, the crude salt is broken down into its individual components and the minerals are separated - which is why they are also called separation processes. In this way, we can extract the valuable minerals such as potassium chloride (KCl) and kieserite, while rock salt with non-usable accompanying minerals remains as a residue.



The KCF plant reduces the wastewater volume of the Werra plant by 1.5 million cubic metres per year.

Hot solution and Flotation process at a glance

Hot solution process – Extraction of potassium chloride
For separating the components of the crude salt and obtaining potassium chloride, we utilise the different dissolving behavior of the salt components in the hot solution process. The amount of rock salt (NaCl) that can be dissolved in water is almost independent of the temperature - the soluble amount of potassium chloride (KCl) increases sharply as the temperature rises. The crude salt is dissolved, and solid residues are separated by filtering and post-clarification. Subsequently, the hot solution is cooled in the vacuum crystallisation unit. In this way, potassium chloride with a purity of up to 97 % is obtained – rock salt and kieserite remain as residues.



Flotation process – Extraction of kieserite
In the flotation process in this example, we want to extract kieserite. The great advantage is that we use the residue from the hot solution process as a raw material base and separate the rock salt from the kieserite by flotation - thereby reducing large volumes of saline wastewater. During flotation, air bubbles are blown into the salt solution; these are deposited on the kieserite, giving it buoyancy, and making it float. Now the kieserite can be skimmed off the water surface as foam.

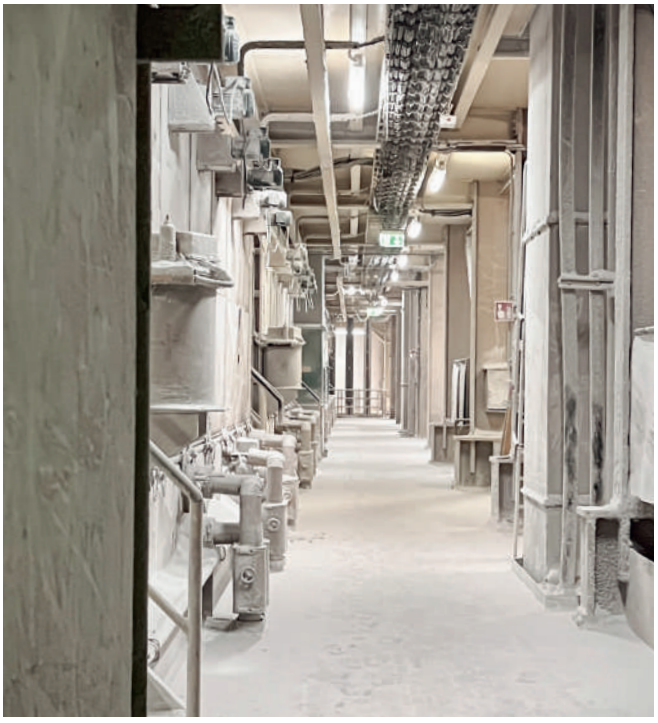


Unique Electrostatic separation – ESTA® separation

ESTA® process (Electrostatic process): This separation method, which is carried out dry without salt solutions or a high energy consumption for drying the products, it is based on a phenomenon that can also be observed in everyday life: If two materials are rubbed against each other under certain physical conditions, they can become "electrically" charged.

In principle, the same effect occurs in the ESTA plant, a unique development by K+S. First, the crude salt is milled to a grain size of one millimetre ensuring that the mineral conglomerate is broken down into its components. In the next step, the salts are treated with surface-active substances in a fluidised bed at a precisely defined temperature and humidity, so that they selectively charge each other either electrically positive or negative. The charged salt crystals trickle through a free-fall separator, which consists primarily of two electrodes with a high voltage field in-between.

Here, the differently charged crystals are diverted either to the anode or the cathode. The sorted minerals are then caught separately below the separator.



Bildunterschrift

Process overview ESTA® process

1. Processing:

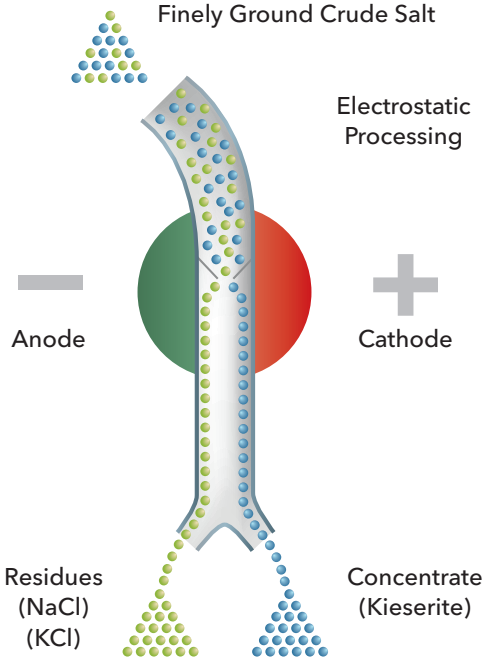
First, the crude salt is finely ground, precisely tempered, and processed. Each crystal becomes electrically charged through friction during this process.

2. Separation in an electric field:

Charged particles fall freely through a separation chamber in which a high-voltage field is generated between two electrodes. Depending on their charge, the crystals are drawn to the corresponding pole. This process is repeated several times.

3. Product recovery:

The minerals, such as potassium chloride or kieserite, are collected separately from the unwanted residues, such as rock salt, in the collection containers below the chamber.



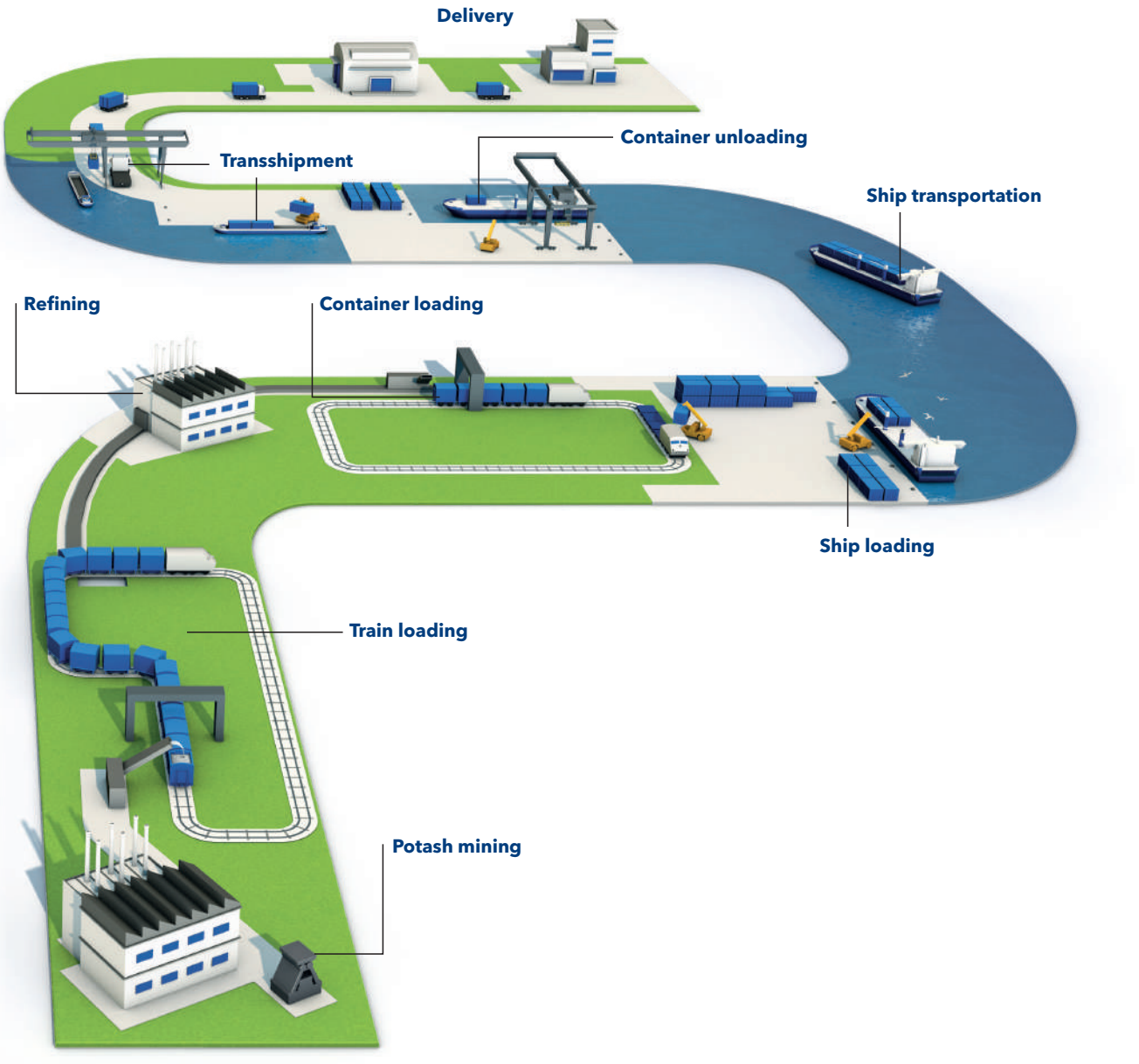
High-quality supplies – tailor-made to destinations worldwide

Besides extracting and refining natural raw materials, we also ensure efficient logistics processes. This involves transportation, storage, handling, commissioning, and bagging – from the production site inland to the recipient overseas.

We supply our customers by all common modes of transportation, from rail and inland waterways to seagoing vessels, containers, and trucks. If necessary, we also provide our own logistics solutions, such as our own fleet of rail cars, to ensure our ability to deliver in the long term.

Our own storage and transshipment facilities are the heart of the K+S transportation network. We additionally secure our supplying capacity with supplementary external resources.

Our quality assurance systems as well as regular independent audits provide a guarantee of consistently high quality.




wascosa
K+S
R 75 m
16.52 m

Strong know-how

By providing information on all aspects of fertilisation, K+S supports agricultural practice worldwide in achieving high yields and the best qualities, as well as securing them even under unfavorable weather conditions. These advisory activities are based on extensive research. For more than 100 years, K+S has been engaged in agricultural research, seeking solutions to agronomic challenges such as increasing productivity, promoting soil fertility and the efficient use of resources.

K+S advisory services pursue the goal of sharing these and other findings obtained in plant nutrition research with agricultural practice. Farmers all over the world are supported with this know-how in implementing the latest scientific findings in their fertilisation practices and therefore securing the yield as well as the quality of their harvest products. With our commitment and expertise, we are making a significant contribution to feeding the world and strengthening the livelihoods of farmers.

Research and development start much earlier, however, as new products need to be developed or established products improved. A working division of the Analysis and Research Centre (AFZ) in Unterbreizbach, Thuringia, is devoted to these topics. Here, K+S conducts its own research and development in analytics as well as in the processing of potassium, magnesium, and sodium salts from natural raw material sources.



Numerous trials are necessary before a decision is made as to whether a product idea can be turned into a marketable product.

„A company like K+S can only succeed in global competition in the long term if it continuously generates new knowledge. Furthermore, this knowledge must be translated into practice rapidly – in the form of new products, processes, and services. The AFZ provides crucial foundations for this."

Dr. Ludger Waldmann
Head of Research and Development

Product development at K+S

It seems quite simple: a fertiliser granule must be sufficiently stable to prevent dusting when it is spread on the field. Even before that, it must withstand tough mechanical stresses, such as during transportation and storage. K+S has a lot of experience with the granulation of potassium and magnesium fertilisers complying with such requirements. What happens, however, when a micronutrient is added to the tried-and-tested fertiliser? Do the components of the granules still hold together tightly even then? Such questions about physical properties of a potential product innovation are clarified in the Mechanical Processing department at the AFZ. For this purpose, the change of climatic conditions is simulated in the laboratory and the granule stability of the samples is measured. Only when the prototype has passed all quality tests can it be developed into a marketable product.



An examining look at the result of the test series: The prototype of the product is once again a step closer to market maturity because of the successful, practice-relevant quality test.

Process engineering test facilities

The technical centre at the AFZ has an 18-metre-high hall structure. The test facilities installed here serve to optimise important raw material preparation processes, for example wastewater-free electrostatic separation (ESTA), flotation, granulation, or crystallisation. Before modified or new process steps are implemented at the plants, they have to pass the elaborate test sections in the technical centre.



The sequences of new process steps are tested several times in the technical centre of the AFZ.



Our Contribution to Reducing CO_2 in Agriculture

Why C:LIGHT?

Industrial agriculture is vital for sustaining life and is critical to the system. However, food production is responsible for 33% of global greenhouse gases, with fertiliser production and application being considered the main causes. As a pioneer in sustainable, environmentally friendly mining, K+S is taking responsibility by offering CO_2-reduced potassium and magnesium fertilisers for the first time with C:LIGHT.

Potassium – the logical next step in CO_2 reduction after nitrogen

Innovative nitrogen fertilisers have been essential in reducing the CO_2 footprint of agricultural products, and potassium fertilisers have the potential to make a significant impact, especially for crops like sugar beets that require a lot of potassium. And that's precisely where our C:LIGHT products come in!

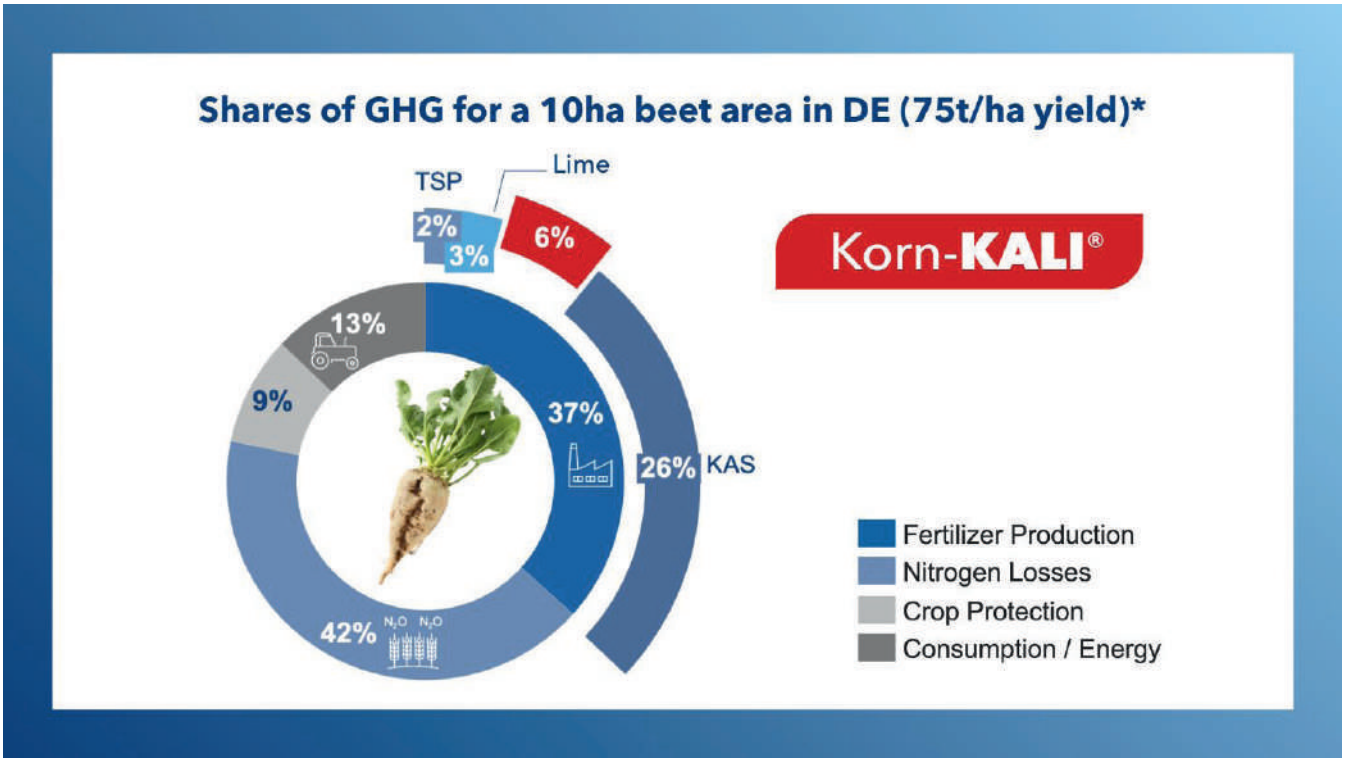
What is C:LIGHT?

We are increasingly using electricity from renewable energy sources for heat generation in our production processes. This reduces our consumption of fossil natural gas and significantly lowers our carbon footprint.

We do not have production lines powered exclusively by renewable energy at all times. However, we have a clear goal of contributing to reduced CO_2 emissions in agriculture. To this end, we purchase certificates of origin (COO) for renewable energy. We allocate these certificates to the electricity required for producing our C:LIGHT products.

To make this visible and transparent, we use a mass balance approach. Simply put, the calculated heat requirement for C:LIGHT products is replaced by electricity. Additionally, the electricity requirement for all production steps that do not require the conversion of electricity into heat is entirely covered by COO-certified renewable energies.





**Reference values for fertilisation LKSH 2022, values determined based on regular nutrient requirements and soil content class C; calculator: Coolfarm Tool*

C:LIGHT in Detail

We determine the individual heat and electricity requirements, as well as the resulting CO_2 emissions, for each of our products using a calculation method verified by DEKRA Assurance Services GmbH.

Currently, the heat requirement is primarily covered by natural gas. Some of the electricity is generated in our gas-fired power plants, while the rest is purchased from the public grid.

Our products are manufactured using the following energy sources:

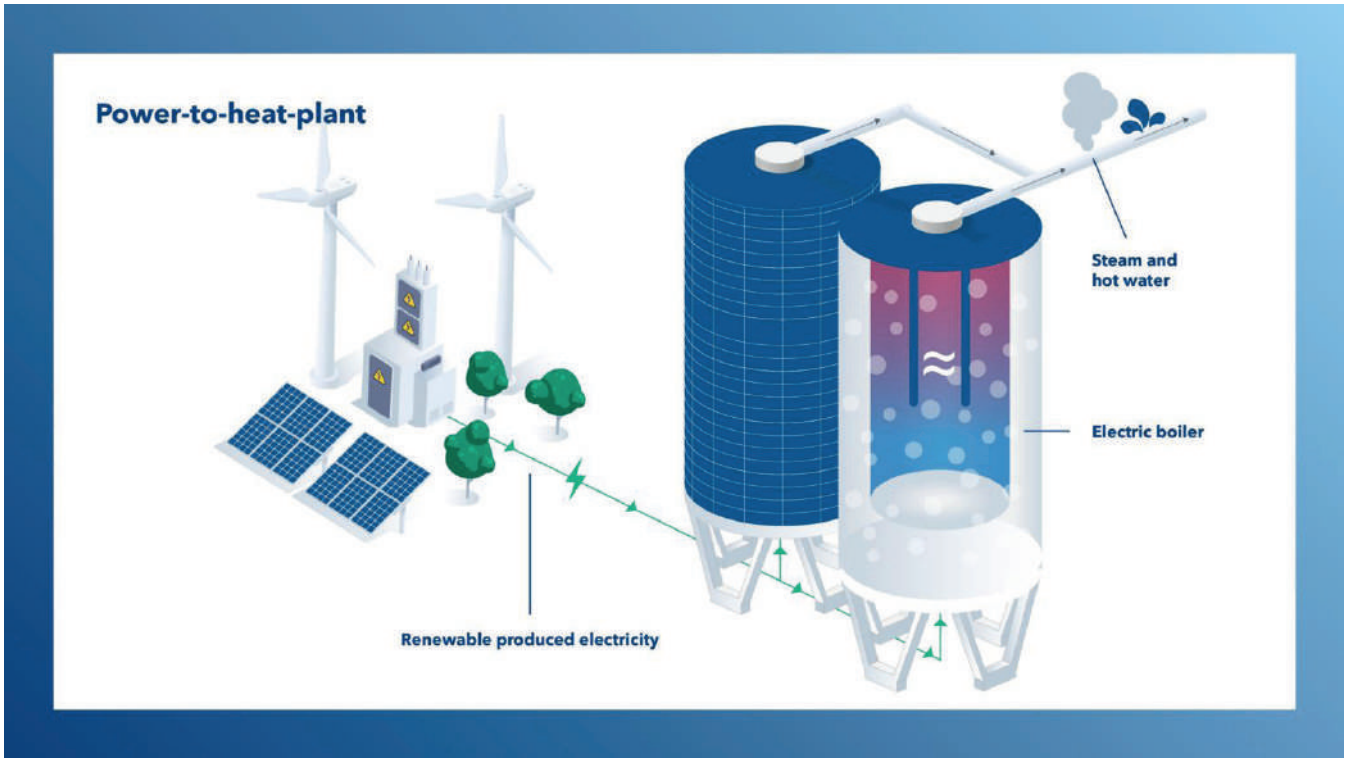
- Diesel, especially for underground mining of cude salt,
- electricity, both underground and above ground, and
- natural gas, especially in above-ground operations, in power plants, and in drying facilities.

We operate power-to-heat (PtH) boilers* at our German sites in Werra, Neuhof-Ellers, and Zielitz to reduce our natural gas consumption and the associated CO_2 emissions. These plants use electricity to generate heat.

Currently, the total amount of heat generated is insufficient to cover the heat requirements of all products. For accounting purposes, this amount of heat is allocated to certain products, known as C:LIGHT products.

C:LIGHT products are physically and chemically identical to our other products. Due to our integrated production processes and high throughput, physical or logistical separation within the manufacturing process is not possible.

The allocation in the balance sheet makes the CO_2 savings associated with using PtH boilers visible and traceable. Specifically, the heat generated by PtH boilers using renewable energy is allocated to C:LIGHT products so that the calculated heat requirement is met by the actual PtH heat generated



*Power-to-heat boiler: Converts electrical energy directly into heat by passing electricity through boiler water. The water acts as a conductor, and the electrical resistance immediately generates heat that can be used for hot water or steam. This boiler reacts quickly, starting up within a few minutes, and can therefore absorb surplus electricity from wind or solar power plants flexibly. This balances fluctuations in the power grid and efficiently converts renewable energy into heat for industrial processes or district heating networks. Since combustion does not occur, the boiler operates cleanly, requires little maintenance, and can be easily integrated into existing heating systems.

within the twelve months prior to delivery. Therefore, for every tonne of C:LIGHT delivered, the amount of natural gas that would have otherwise been required to provide heat in power plants and drying facilities is saved.

For C:LIGHT products, we obtain certificates of origin for the electricity used in PtH boilers and for the electricity required for other production steps. These certificates prove that the electricity comes from renewable energy sources and was generated in Germany, Austria, or Switzerland.

Refined products from sites without primary production—that is, without the underground mining and processing of crude salt—can also be offered as C:LIGHT products. A C:LIGHT (preliminary) product from a primary site must be used as the raw material. The electricity used at the processing site is certified as renewable energy by certificates of origin.

We are significantly contributing to the decarbonisation of the potash and magnesium industries by using power-to-heat technology and renewable energy sources to generate heat. This work is truly pioneering.

Clarification of the system with sample figures:

The production of one tonne of a conventional product requires 0.4 MWh of heat and 0.2 MWh of electricity.

For C:LIGHT products, the heat requirement is generated in a power-to-heat (PtH) boiler using electricity. This replaces the natural gas consumption that would have been required for heat in conventional production.

Therefore, the total electricity consumption used to produce one tonne is 0.6 MWh/t. It consists of 0.4 MWh/t for heat generation in the PtH boiler and 0.2 MWh/t for the remainder of the production process. Certificates of origin corresponding to this electricity are obtained, certifying the use of electricity from renewable energy sources.

Reduction of up to 90% compared to conventional products

As a primary producer, K+S generates most of its emissions directly from production rather than from the use of intermediate products. Proven PtH technology reduces Scope 1 and 2 emissions (according to the GHG Protocol) by up to 90% compared to conventionally manufactured products (based on the 2020 reference year).



Determination of CO_2 Value

K+S applies internationally recognised standards to calculate its CO_2 emissions. DEKRA Assurance Services GmbH conducted a critical review of our calculation methodology based on ISO 14040 and 14044. Based on this review, the individual PCFs are aggregated at the main group level and reported using the declared unit of "kg CO_2e per tonne of unpackaged product."



KALISOIL

SUPPORTING YOUR SOIL FERTILISATION AND PROCESSING

Product	K_2O	MgO	S*	Other nutrients and beneficial elements	for organic farming**
FINE Korn-KALI®	38	6	4.8		✓
+B Korn-KALI®	38	6	4.8	0.25 B	✓
GRAN. KALIMOP	60	-	-	-	✓
DUSTFREE KALIMOP	60	-	-	-	✓
FINE KALIMOP	60	-	-	-	✓
GRAN. KALISOP®	50	-	17.6	-	✓
FINE KALISOP®	50	-	18	-	✓
FINE MAX. 0.5% CL KALISOP®	51	-	18	-	✓
PatentKALI®	30	10	17.6	-	✓
GRAN. ESTA® Kieserit	-	25	20.8	-	✓
FINE 26 ESTA® Kieserit	-	26	21.2	-	✓
FINE 27 ESTA® Kieserit	-	27	22.2	-	✓

*Conversion example sulphur (S) to sulphur trioxide (SO_3): 5.2 % S x 2.5 = 13 % SO_3. *All figures in percent.*

**approved for use in organic farming in accordance with Regulations (EU) 2018/848 and (EU) 2021/1165

Further information: Products | K+S Aktiengesellschaft (kpluss.com)

FINE

Korn-KALI®

Our all-rounder – for your various applications

MINERAL FERTILISER
K_2O (MgO, SO_3), 38 (+6+12)

Declared nutrient contents by mass:

38 % K_2O	water soluble potassium oxide (= 31.5 % K)
6 % MgO	water soluble magnesium oxide (= 3.6 % Mg)
12 % SO_3	water soluble sulphur trioxide (= 4.8 % S)

Granulometry :	**typical**
0.09–0.8 mm	90 %
d_{50}	0.3 mm ± 0.2 mm

Chemical Composition

60 %	Potassium chloride KCl
18 %	Magnesium Sulphate $MgSO_4$
17 %	Other Components [Potassium Sulphate (K_2SO_4), Sodium Chloride (NaCl), Magnesium Chloride ($MgCl_2$) and Calcium Sulphate ($CaSO_4$)]
5 %	other as crystal water

Potassium magnesium sulphate particles are suitable for direct application and to produce NPK mixtures through compaction or steam granulation. The natural potassium is completely soluble, as is the magnesium, which comes from natural ESTA Kieserit and is available to plants over the long term.



+B

Korn-KALI®

Our all-rounder – for you now also with boron

MINERAL FERTILISER with micronutrients
K_2O (MgO, SO_3), 38 (+6+12) +0.25 % B

Declared nutrient contents by mass:

38 % K_2O	water soluble potassium oxide (= 31.5 % K)
6 % MgO	water soluble magnesium oxide (= 3.6 % Mg)
12 % SO_3	water soluble sulphur trioxide (= 4.8 % S)
0.25 % B	water soluble Boron (B) as sodium tetraborate pentahydrate

Granulometry :	**typical**
2.0 – 5.0 mm	> 90 %
d_{50}	3.4 mm ± 0.3 mm

Chemical Composition

60 %	Potassium chloride KCl
17.5 %	Magnesium Sulphate $MgSO_4$
15.8 %	Other Components [Potassium Sulphate (K_2SO_4), Sodium Chloride (NaCl), Magnesium Chloride ($MgCl_2$) and Calcium Sulphate ($CaSO_4$)]
1.7 %	Disodiumtetraborate Pentahydrate
5 %	other as crystal water



GRAN.

KALIMOP

Our potassium chloride your first choice

MINERAL FERTILISER (Germany/Canada)
K_2O, 60

Declared nutrient contents by mass:

60 % K_2O water soluble potassium oxide (= 49.8 % K)

Granulometry :	**typical**
2 – 5 mm	> 92 %
d_{50}	3.1 mm ± 0.2 mm

Chemical Composition

95.4 %	Potassium chloride KCl (Canada: 96 %)
4.4 %	Other (NaCl, K_2SO_4, $MgCl_2$, $MgSO_4$...)
0.2 %	Moisture





DUSTFREE

KALIMOP

MINERAL FERTILISER (Germany/Canada)
K_2O, 60

Declared nutrient contents by mass:

60 % K_2O water soluble potassium oxide (= 49.8 % K)

Granulometry :	**typical**
d_{50}	0.2 mm Germany
d_{50}	0.5 mm Canada

Chemical Composition

95.7 %	Potassium chloride KCl
4.1 %	Other (NaCl, K_2SO_4, $MgCl_2$, $MgSO_4$...)
0.2 %	Moisture



FINE

KALIMOP

MINERAL FERTILISER
K_2O, 60

Declared nutrient contents by mass:

60 % K_2O water soluble potassium oxide (= 49.8 % K)

Granulometry :	**typical**
0.09–0.8 mm	90 %
d_{50}	0.2 mm ± 0.3 mm

Chemical Composition

95.4 %	Potassium chloride KCl (Canada: 96 %)
4.4 %	Other (NaCl, K_2SO_4, $MgCl_2$, $MgSO_4$...)
0.2 %	Moisture



GRAN.

KALISOP®

Our top quality – for your special crops

MINERAL FERTILISER K_2O (SO_3), 50 (+44)

Declared nutrient contents by mass:

50 % K_2O water soluble potassium oxide (= 41.5 % K)
44 % SO_3 water soluble sulphur trioxide (= 17.6 % S)



Granulometry :	**typical**
2 – 4.8 mm	> 90 % (min: 85 % – max: 95 %)
d_{50}	3.0 mm ± 0.2 mm
Hardness	60 – 50 N
Moisture	1.4 % max (typical: 0.9%)
pH (23 °C–5%water)	8.5 – 9

Chemical Composition

93 %	Potassium sulphate K_2SO_4
3 %	Other sulphates ($MgSO_4$, $CaSO_4$)
2 %	Chlorides (KCl, NaCl)
1 %	Chloride as Cl
2 %	other as crystal water

Application recommended for crops:

- chlorine sensitives (vegetable, tobacco…)
- produced in saline intrusion (deltas…)
- with high K requirements (banana, sugarcane…)
- with high S requirements (fruits, potatoes...)

FINE

KALISOP®

Our top quality – for your special crops

MINERAL FERTILISER K_2O (SO_3), 50 (+45)

Declared nutrient contents by mass:

50 % K_2O water soluble potassium oxide (= 41.5 % K)
45 % SO_3 water soluble sulphur trioxide (= 18 % S)

Granulometry :	**typical**
0.09 – 0.5 mm	67 %
> 0.5 mm	5 %
< 0.9 mm	28 %
d_{50}	0.13 mm

Chemical Composition

93 %	Potassium sulphate K_2SO_4
4 %	Other sulphates ($MgSO_4$, $CaSO_4$)
2 %	Chlorides (KCl, NaCl)
1 %	Chloride as Cl
2 %	other as crystal water

Application recommended for crops:

- chlorine sensitives (vegetable, tobacco…)
- produced in saline intrusion (deltas…)
- with high K requirements (banana, sugarcane…)
- with high S requirements (fruits, potatoes...)



FINE MAX. 0.5% CL

KALISOP®

Our top quality – for your special crops

MINERAL FERTILISER K_2O (SO_3), 51 (+45)

Declared nutrient contents by mass:

51 % K_2O water soluble potassium oxide (= 42.3 % K)
45 % SO_3 water soluble sulphur trioxide (= 18 % S)

Granulometry :	**typical**
0.09 – 0.5 mm	45 %
> 0.5 mm	5 %
< 0.09 mm	50 %
d_{50}	0.12 mm

Chemical Composition

95.5 %	Potassium sulphate K_2SO_4
2.6 %	Other sulphates ($MgSO_4$, $CaSO_4$)
0.8 %	Chlorides (KCl, NaCl)
0.5 %	Chloride as Cl
0.9 %	other as crystal water (moisture: 0.2 %)

Application recommended for crops:

- chlorine sensitives (vegetable, tobacco…)
- produced in saline intrusion (deltas…)
- with high K requirements (banana, sugarcane…)
- with high S requirements (fruits, potatoes...)



PatentKALI®

Our formula for success – for the highest quality of your crops

MINERAL FERTILISER
K_2O (MgO, SO_3), 30 (+10+44)

Declared nutrient contents by mass:

30 % K_2O water soluble potassium oxide (= 24.9 % K)
10 % MgO water soluble magnesium oxide (= 6 % Mg)
44 % SO_3 water soluble sulphur trioxide (= 17.6 % S)

Granulometry :	**typical**
2.0 – 5.0 mm	> 85 %
d_{50}	3.4 ± 0.3 mm

Chemical Composition

50.5 %	Potassium sulphate K_2SO_4
30.5 %	Magnesium sulphate $MgSO_4$
1.5 %	other sulphate ($CaSO_4$)
5.5 %	Chlorides (KCl, NaCl)
3 %	max. Chloride as Cl
12 %	as crystal water

Potassium Sulphate and Magnesium Sulphate granule to optimise fertiliser application and nutrient uptake.

Adapted for straight and blends application.

Natural Mineral fertiliser with step-wise magnesium water-soluble release.



GRAN.

ESTA® Kieserit

Our highly concentrated – magnesium-sulphur power for plants

MINERAL FERTILISER
(MgO, SO_3) (25+52)

Declared nutrient contents by mass:

25 % MgO water soluble magnesium oxide (= 15.1 % Mg)
52 % SO_3 water soluble sulphur trioxide (= 20.8 % S)

Granulometry :	**typical**
2.0 – 5.0 mm	> 90 %
d_{50}	3.5 ± 0.3 mm

Chemical Composition

75 %	Magnesium sulphate $MgSO_4$
1.5 %	Potassium oxide K_2O
1.5 %	other sulphate (K_2SO_4, $NaSO_4$, $CaSO_4$)
3 %	Chlorides (KCl, NaCl)
18 %	as crystal water 342 g/L Solubility

Magnesium and Sulphur are essential for the photosynthesis, sugar translocation and root development.

Magnesium fertiliser with step-wise Mg-release proprieties conferred by the unique mineral crystal structure.

Our product is made from crude potassium salt of natural origin and is permitted for use in organic farming according to the Regulations (EU) 2018/848 and (EU) 2021/1165.



FINE 26

ESTA® Kieserit

Our highly concentrated – magnesium-sulphur power for plants

MINERAL FERTILISER
(MgO, SO_3) (26+53)

Declared nutrient contents by mass:

26 % MgO water soluble magnesium oxide (= 15.7 % Mg)
53 % SO_3 water soluble sulphur trioxide (= 21.2 % S)

Granulometry :	**typical**
0.09 – 0.8 mm	> 90 %
d_{50}	0.4 mm

Chemical Composition

79 %	Magnesium sulphate $MgSO_4$
2.5 %	Potassium oxide K_2O
3 %	other sulphate (K_2SO_4, $NaSO_4$, $CaSO_4$)
6 %	Chlorides (KCl, NaCl)
12 %	as crystal water

Magnesium and Sulphur are essential for the photosynthesis, sugar translocation and root development.

Magnesium fertiliser with step-wise Mg-release proprieties conferred by the unique mineral crystal structure.

Our product is made from crude potassium salt of natural origin and is permitted for use in organic farming according to the Regulations (EU) 2018/848 and (EU) 2021/1165.



FINE 27

ESTA® Kieserit

Our highly concentrated – magnesium-sulphur power for plants

MINERAL FERTILISER
(MgO, SO_3) (27+55.5)

Declared nutrient contents by mass:

27 % MgO water soluble magnesium oxide (= 16.3 % Mg)
55.5 % SO_3 water soluble sulphur trioxide (= 22.2 % S)



Granulometry :	**typical**
0.09 – 0.8 mm	> 90 %
d_{50}	0.38 mm

Chemical Composition

81 %	Magnesium sulphate $MgSO_4$
2.5 %	Potassium oxide K_2O
5 %	other sulphate (K_2SO_4, $NaSO_4$, $CaSO_4$)
Max. 3 %	Chlorides (KCl, NaCl)
11.5 %	as crystal water

Magnesium and Sulphur are essential for the photosynthesis, sugar translocation and root development.

Magnesium fertiliser with step-wise Mg-release proprieties conferred by the unique mineral crystal structure.

Our product is made from crude potassium salt of natural origin and is permitted for use in organic farming according to the Regulations (EU) 2018/848 and (EU) 2021/1165.







KALISOLU

OUR PRODUCTS FOR FOLIAR FERTILISATION & FERTIGATION

Product	K_2O	MgO	S*	Other nutrients and beneficial elements	for organic farming**
soluMAP®	-	-	-	12 N · 61 P_2O_5	-
soluMOP®	60	-	-	-	✓
soluSOP®	50	-	17	-	-
soluSOP® 52 ORGANIC	52.5	-	18	-	✓
epsoTOP®	-	16	13	-	✓
epsoMICROTOP®	-	15	12.4	0.9 B · 1 Mn	✓
epsoCOMBITOP®	-	14	13.8	4 Mn · 1 Zn	✓
epsoBORTOP®	-	12.6	10	4 B	✓
epsoPROFITOP®	-	12	14	1 Cu · 5 Mn · 2 Zn	✓

*Conversion example sulphur (S) to sulphur trioxide (SO_3): 5.2 % S x 2.5 = 13 % SO_3. *All figures in percent.*

**approved for use in organic farming in accordance with Regulations (EU) 2018/848 and (EU) 2021/1165

Further information: Products | K+S Aktiengesellschaft (kpluss.com)

soluMAP®

Instant availability – nitrogen and phosphorus that fuel your plants potential

MINERAL FERTILISER
P_2O_5, 12–61

Declared nutrient contents by mass:

12 % N-NH_4	water soluble total nitrogen in form of ammonium nitrogen (= 12 % N)
61 % P_2O_5	water soluble phosphorus pentoxide(= 26.6 % P)

Granulometry :	**typical**
< 1 mm	≥ 90 %
< 0.09 mm	< 1.5 %

Chemical Composition

≥ 98.5 %	Ammonium dihydrogen orthophosphate
≤ 0.2 %	Moisture
< 0.1 %	H_2O-insoluble

Solubility in water (20 °C):

36.8 kg in 100 L water



- Readily soluble, practically without residues; always vigorously stir the salt into water or solution
- Store in a dry place and protect from moisture. The minimum storage life is 5 years.

soluMOP®

Our professional – for yield and quality security

MINERAL FERTILISER
K_2O, 60

Declared nutrient contents by mass:

60 % K_2O water soluble potassium oxide (= 49.8 % K)

Granulometry :	**typical**
0.16 – 0.8 mm	95 %

Chemical Composition

95.8 %	Potassium chloride KCl
4 %	Other (NaCl, K_2SO_4, $MgCl_2$, $MgSO_4$...)
0.2 %	Moisture
0.1 %	max. H_2O insoluble

Solubility in water:

25.5 %	KCl at 20 °C Salt index: 114



- Completely soluble potassium chloride fertiliser.
- Cost effective and highly concentrated source of K.
- Ideal source of potassium for use in fertigation and foliar fertilisation.

soluSOP®

Our ideal source – potassium and sulphur for your crops

MINERAL FERTILISER
K_2O (SO_3), 50 (+42.5)

Declared nutrient contents by mass:

50 % K_2O water soluble potassium oxide (= 43.6 % K)
42.5 % SO_3 water soluble sulphur trioxide (= 17 % S)

Granulometry :	**typical**
> 0.25 mm	40 %
< 0.25 mm	60 %

Chemical Composition

95 %	K_2SO_4
2.1 %	Na, Ca, Mg
Max. 1.5 %	Cl
0.2 %	Moisture
0.2 %	H_2O-Insolubles



soluSOP® 52 ORGANIC

Our ideal source for organic farming – potassium and sulphur for your crops

MINERAL FERTILISER
K_2O (SO_3), 52.5 (+45)

Declared nutrient contents by mass:

52.5 % K_2O water soluble potassium oxide (= 43.6 % K)
45 % SO_3 water soluble sulphur trioxide (= 18 % S)

Granulometry :	**typical**
< 1 mm	98 %
d_{50}	0.15 mm

Chemical Composition

≥ 99 %	K_2SO_4
0.4 %	Na, Ca, Mg
0.15 %	Cl
0.1 %	Moisture
0.05 %	H_2O-Insolubles

Electric conductivity (EC):

1 %	11.2 mS/cm
4 %	38.6 mS/cm
8 %	72.2 mS/cm



Temperature °C	Solubility K_2SO_4	
	g/100g water	%
10 (50 °F)	9.2	8.4
20 (68 °F)	11.1	10.0

Recommendations

- Jar test is recommended before proceeding to mixing (it is preferable to not mix with calcium to avoid gypsum precipitation).
- Note: Calcium contents on irrigation water is variable depending on environment condition.
- Storage in dry condition
- Avoid application during high temperature and low air humidity.

epsoTOP®

The basic element – for foliar fertilisation

MINERAL FERTILISER
(MgO, SO_3) (16+32.5)

Declared nutrient contents by mass:

16 % MgO water soluble magnesium oxide (= 9.6 % Mg)
32.5 % SO_3 water soluble sulphur trioxide (= 13 % S)

Granulometry :	**typical**
< 1 mm	70 %
d_{50}	0.8 mm

Chemical Composition

49 %	$MgSO_4 \times 7H_2O$
50.9 %	as crystal water
0.1 %	NaCl, K_2SO_4, $CaSO_4$, KCl

Solubility in water (20 °C):

100 kg in 100 L water



- Readily soluble, practically without residues; always vigorously stir the salt into water or solution
- Maximum solubility in 100 litres of water: abt. 75 kg at 5°C and abt. 100 kg at 20 °C
- Store at a cool and dry place. Excessive storage pressure and large temperature fluctuations can result in caking, which can be broken up by pounding of the bags.
- 5 kg epsoTOP per 100 l water is preferably used as a foliar fertiliser for higher yields and better quality. epsoTOP eliminates latent magnesium and sulphur deficiencies quickly and successfully. When mixed with any plant protection products the recommendations of the manufacturers of these products have to be followed.

epsoMICROTOP®

The basic element – with Manganese and Boron

MINERAL FERTILISER with micronutrients
(MgO, SO_3) (15+31) + 0.9 % B + 1 % Mn

Declared nutrient contents by mass:

15 % MgO	water soluble magnesium oxide (= 9 % Mg)
31 % SO_3	water soluble sulphur trioxide (= 12.4 % S)
1 % Mn	water soluble Manganese (Mn) as sulphate
0.9 % B	water soluble Boron (B) as boric acid

Granulometry :	**typical**
< 1 mm	70 %
d_{50}	0.75 mm

Chemical Composition

45.5 %	$MgSO_4 \times 7H_2O$
46.5 %	as crystal water
5.1 %	Boric acid (H_3BO_3)
2.8 %	Manganese sulphate ($MnSO_4$)
0.1 %	NaCl, K_2SO_4, $CaSO_4$, KCl

Solubility in water (20 °C):

80 kg in 100 L water



- Readily soluble, practically without residues; always vigorously stir the salt into water or solution
- the pH value is lowered by up to two units starting from a neutral water quality
- Maximum solubility in 100 litres of water: abt. 75 kg at 5 °C and abt. 100 kg at 20 °C
- Store at a cool and dry place. Excessive storage pressure and large temperature fluctuations can result in caking, which can be broken up by pounding of the bags.
- 5 kg epsoMICROTOP per 100 l water is preferably used as a foliar fertiliser for higher yields and better quality. epsoMICROTOP eliminates latent magnesium, sulphur, boron and manganese deficiencies quickly and successfully. When mixed with any plant protection products, the recommendations of the manufacturers of these products have to be followed.

epsoCOMBITOP®

The basic element – with Manganese and Zinc

MINERAL FERTILISER with micronutrients (MgO, SO_3) (14+34.5) + 4 % Mn + 1 % Zn

Declared nutrient contents by mass:

14 % MgO	water soluble magnesium oxide (= 8.4 % Mg)
34.5 % SO_3	water soluble sulphur trioxide (= 13.8 % S)
4 % Mn	water soluble Manganese (Mn) as sulphate
1 % Zn	water soluble Zinc (Zn) as sulphate

Granulometry :	**typical**
< 1 mm	70 %
d_{50}	0.6 mm

Chemical Composition

41.7 %	$MgSO_4 \times 7H_2O$
44.5 %	as crystal water
11.2 %	Manganese sulphate ($MnSO_4$)
2.5 %	Zinc sulphate ($ZnSO_4$)
0.1 %	NaCl, K_2SO_4, $CaSO_4$, KCl

Solubility in water (20 °C):

100 kg in 100 L water



- Readily soluble, practically without residues; always vigorously stir the salt into water or solution
- the pH value is lowered by up to two units starting from a neutral water quality
- Maximum solubility in 100 litres of water: abt. 75 kg at 5 °C and abt. 100 kg at 20 °C
- Store at a cool and dry place. Excessive storage pressure and large temperature fluctuations can result in caking, which can be broken up by pounding of the bags.
- 5 kg epsoCOMBITOP per 100 l water is preferable used as a fast acting and efficient foliar treatment to prevent and correct visible and sub-clinical Magnesium, Sulphur, Manganese and Zinc deficiencies, thus improving yield and quality. When tank-mixed with other fertilisers and/or agrochemicals, the manufacturers instructions should always be followed. epsoCOMBITOP should always be admixed before other agrochemicals are added.

epsoBORTOP®

The basic element – with Boron

MINERAL FERTILISER with micronutrients (MgO, SO_3) (12.6+25) + 4 % B

Declared nutrient contents by mass:

12.6 % MgO water soluble magnesium oxide (= 7.6 % Mg)
25 % SO_3 water soluble sulphur trioxide (= 10 % S)
4 % B water soluble Boron (B) as boric acid

Granulometry :	**typical**
< 1 mm	80 %
d_{50}	0.6 mm

Chemical Composition

37.7 %	$MgSO_4 \times 7H_2O$
39.6 %	as crystal water
22.6 %	Boric acid (H_3BO_3)
0.1 %	NaCl, K_2SO_4, $CaSO_4$, KCl

Solubility in water (20 °C):

20 kg in 100 L water



- Readily soluble, practically without residues; always vigorously stir the salt into water or solution
- the pH value is lowered by up to two units starting from a neutral water quality
- Maximum solubility in 100 litres of water: abt. 13 kg at 5 °C and abt. 20 kg at 20 °C
- Store at a cool and dry place. Excessive storage pressure and large temperature fluctuations can result in caking, which can be broken up by pounding of the bags.
- 5 kg epsoBORTOP per 100 l water is preferably used as a foliar fertiliser for higher yields and better quality. epsoBORTOP eliminates latent magnesium, sulphur and boron deficiencies quickly and successfully. When mixed with any plant protection products, the recommendations of the manufacturers of these products have to be followed.

epsoPROFITOP®

The basic element – with Copper, Manganese and Zinc

MINERAL FERTILISER with micronutrients
(MgO, SO_3) (12+35) + 1 % Cu + 5 % Mn + 2 % Zn

Declared nutrient contents by mass:

12 % MgO	water soluble magnesium oxide (= 7.2 % Mg)
35 % SO_3	water soluble sulphur trioxide (= 14 % S)
1 % Cu	water soluble Copper (Cu) as sulphate
5 % Mn	water soluble Manganese (Mn) as sulphate
2 % Zn	water soluble Zinc (Zn) as sulphate



Granulometry :	**typical**
< 1 mm	75 %
d_{50}	0.6 mm

Chemical Composition

36.5 %	$MgSO_4 \times 7H_2O$
41.9 %	as crystal water
5.2 %	Zinc Sulphate ($ZnSO_4$)
2.6 %	Copper sulphate ($CuSO_4$)
13.7 %	Manganese sulphate ($MnSO_4$)
0.1 %	NaCl, K_2SO_4, $CaSO_4$, KCl

Solubility in water (20 °C):

100 kg in 100 L water

- Readily soluble, practically without residues; always vigorously stir the salt into water or solution
- the pH value is lowered by up to two units starting from a neutral water quality
- Maximum solubility in 100 litres of water: abt. 75 kg at 5 °C and abt. 100 kg at 20 °C
- Store at a cool and dry place. Excessive storage pressure and large temperature fluctuations can result in caking, which can be broken up by pounding of the bags.
- 5 kg epsoPROFITOP per 100 l water is preferable used as a fast acting and efficient foliar treatment to prevent and correct visible and sub-clinical Magnesium, Sulphur, Copper, Manganese and Zinc deficiencies, thus improving yield and quality.

Tank mixtures – application of macro- and micronutrients with crop protection products

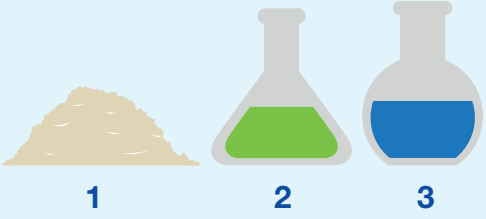
The application of macro- and micronutrients through the leaf is part of good agricultural practice. K+S's completely water-soluble products can be applied to increase yields and quality or as a quick measure in the event of latent deficiencies.

Mixtures of foliar fertilisers and plant protection products save time during application. For such mixtures, however, there is often not enough information available from the manufacturers. Caution is required here!

In mixtures, no flocculation or precipitation as well as strong discoloration, increased foaming or even reactions may become visible.

The „Jar Test"

A good method for testing the miscibility of different products is the so-called "Jar Test". Here, the products are placed in a transparent container with water, which should be as lockable as possible, and shaken vigorously.



Tank mixture

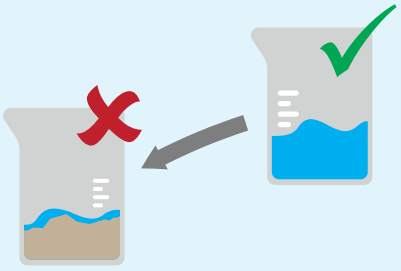
For tests and tank mixtures, pay attention to the correct order of addition to the water:

1. Our water-soluble products and other solid soluble substances (granules)
2. Products containing solid particles suspended in liquid (suspensions)
3. Products containing dissolved active ingredients



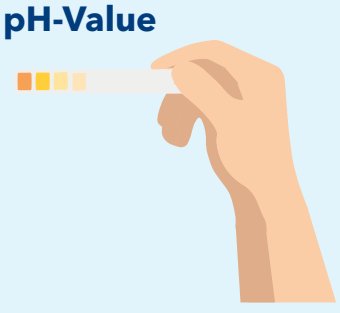
Water temperature

In general, the higher the water temperature, the better the products of the water-soluble family dissolve. Therefore at low water temperatures, more attention should be paid to ensure proper mixing.



Check pH value

When mixing different fertilisers, a change in the pH value, sometimes severe, must be expected. This change can impair the effectiveness of crop protection products. Particular attention should be paid to this when using pyrethroids. Therefore, check the pH value before and after preparing the mixture.



Safety

For all tests, as always when handling fertilisers or crop protection agents, observe the safety instructions for user protection in accordance with the Plant Protection and Hazardous Substances Ordinance.

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