



WATER-SOLUBLE FERTILISER

Fertigation and Foliar Application

K+S



Crude Salts - Turned into High-Grade Plant Nutrients

K+S extracts valuable underground potassium and magnesium salts by mining to process them into various products including mineral fertilisers, pharmaceutical salts, table salts, animal feeds or industrial products.

With more than 125 years of company history, K+S is the world's most experienced potash producer and refiner. In addition to kieserite and other magnesium compounds, our unique deposits supply a range of valuable natural resources in the form of potassic minerals such as sylvine and carnallite. This enables us to produce essential plant nutrients including

potassium, magnesium and sulphur in a single step and to turn them into outstanding mineral fertilisers. Our highly varied product range is unique in the world.

This brochure provides an overview of our product range, covering products for fertigation purposes, foliar fertilisation or soil fertilisation.

For more information about our products, please contact our specialists at our headquarters.



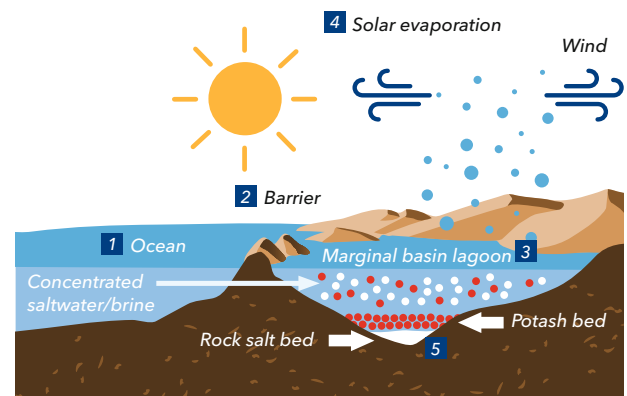
The Formation of Potash Deposits in Germany

Raw potash, potassium sulphate and kieserite are produced from natural potash deposits.

The potash deposits in Germany were formed more than 230 million years ago when the Zechstein Sea gradually evaporated. According to the barrier theory, salty seawater (1) continued to flow across the shallow straits (2) to finally reach the lower plains (3) where the strong sunlight resulted in a gradual evaporation process (4). As potassium, magnesium and sodium salts began to crystallise and deposit in the order of their solubility, the salt concentration continued to increase (5).

This process went on for thousands of years, creating two or more potash beds layered on top of each other. During the earth's more recent history these salt deposits were covered by an abundance of thick sediments, most notably bunter sandstone, lacustrine limestone and Upper Triassic. The flat, stratified potash beds located in the German regions of Hesse and Thuringia are approximately 10 to 26 feet thick and located at a depth of 1,700 to 3,300 feet underneath the surface.

Formation of Potash Deposits



230 million years ago, the Zechstein Sea gradually evaporated to form potash and magnesium sediments. Today, K+S extracts these natural deposits by mining.



About K+S soluFamily and EPSOFamily

K+S soluFamily and EPSOFamily offer a wide range and various quantities of high-purity and fully water-soluble fertilisers of plant nutrients required to meet the nutrient demand of crops at different growth stages. Applying nutrients using the right source and the right rate at the right time is essential for farmers to achieve high yield and thus better farm profits with improved nutrient use efficiency.

The soluFamily and EPSOFamily of K+S offer growers the best source of plant nutrients based on crop requirement at a critical growth stage while addressing nutrient deficiencies. With

the advancements of crop production technologies, our range of fully water-soluble fertiliser products enable the growers to supply nutrients through soil application, foliar fertilisation, fertigation and hydroponics cultivation.

K+S offers globally proven innovative plant nutrition solutions by integrating state-of-the-art mining and manufacturing technologies. We hope that the growers in the region benefit from the application of soluFamily and EPSOFamily products and achieve higher crop yields and farm profits while contributing to a sustainable soil and plant health.

Our Products at a Glance

| Product | N | P, as P ₂ O ₅ | K, as K ₂ O | Mg, as MgO | S, as SO ₃ | Other elements |
|------------------------------------|---|-------------------------------------|------------------------|--------------------------|-----------------------|---|
| soluMAP [®] | 12 % NH ₄ -N | 61 % | - | - | - | - |
| soluMKP [®] | - | 52 % | 34 % | - | - | - |
| soluUP [®] | 17 % ureic N | 44 % | - | - | - | - |
| soluNOP [®] | 13.5 % NO ₃ -N | - | 46 % | - | - | - |
| soluCN [®] | 14.4 % NO ₃ -N 1.1 % NH ₄ -N | - | - | - | - | 25.9 % CaO |
| soluSOP [®] | - | - | 50 % | - | 42.5 % | - |
| soluSOP ^{® 52} | - | - | 52 % | - | 42.5 % | - |
| soluAMS [®] | 21 % NH ₄ -N | - | - | - | 60 % | - |
| soluNPK [®] | 19 % | 19 % | 19 % | - | - | - |
| soluCMS [®] | - | - | - | 98.4 % MgSO ₄ | 79.2 % | 0.6 % K ₂ SO ₄ 0.5 % CaSO ₄ |
| EPSOTop [®] * | - | - | - | 16 % | 32.5 % | - |
| EPSOMicrotop [®] * | - | - | - | 15 % | 31 % | 0.9 % B 1 % Mn |
| EPSOCombitop [®] * | - | - | - | 13 % | 34 % | 4 % Mn 1 % Zn |

* Certified for organic farming according to the regulations (EU) 2018/848 and (EC) No. 889/2008.

soluMAP[®]



soluMAP[®]

EC FERTILISER

Mono Ammonium Phosphate

12 % NH₄-N ammoniacal nitrogen

61 % P₂O₅ phosphorus pentoxide

soluMAP[®] (12:61:00)

- is a crystalline NP fertiliser, suitable for fertigation and foliar application. It can be used on a wide range of crops and can be applied in all soils to promote vegetative growth and root vigour.
- the only water-soluble fertiliser containing highest content of available P and low N in ammoniacal form, makes it ideal for application in the initial crop growth stages.
- NH₄-N in soluMAP reduces the pH of soil surrounding root system and helps in rapid absorption of native soil phosphorus in addition to externally applied P, contributing to improved P uptake.
- supports growth of reproductive parts during fertilisation, reduces flower drop, increases fruit setting and contributes to increased crop yield and quality produce.
- is low in chloride and has a low pH value, can be mixed with other fertilisers to meet the nutrient requirement throughout the crop growth. Growers may be cautioned for not mixing soluMAP with calcium or magnesium fertilisers.
- is recommended at a concentration of 0.5 - 3.0 % (5 - 30 g/l) in foliar application. Rates vary between different crops, growth stages of the crop and environmental conditions.



EC FERTILISER
Mono Potassium Phosphate

52 % P_2O_5 phosphorus pentoxide
34 % K_2O potassium oxide

soluMKP® (00:52:34)

- chloride free water-soluble fertiliser rich in phosphorus and potassium; ideal for foliar application and fertigation systems in saline areas.
- preferred source of phosphorus and potassium for early growing season in fruit crops to establish healthy root system.
- suitable for application at pre-flowering and flowering stages for excellent flowering, fruit setting and fruit development.
- imparts attractive colour and lustre, hastens quality of tubers, fruits and vegetables, contribute to better shelf life and marketability of produce.
- application of 1 % soluMKP mixed with systemic fungicides reduces the application rates and improves the fungicide efficiency to control fungal diseases such as powdery mildew in grapes, mango, cucumbers, melons, peas and others.
- has a high compatibility with other fertilisers and plant protection products. Caution if Ca^{2+} and Mg^{2+} are included as mixing material, perform tank mix test before application.
- is recommended at a concentration of 1 - 3 % in foliar application. Rates vary between different crops, growth stages of the crop and environmental conditions.



soluUP[®]



soluUP[®]

NP FERTILISER

17 % N total nitrogen

44 % P₂O₅ water-soluble phosphorus pentoxide

soluUP[®] (17:44:00)

- is an excellent, fully water-soluble fertiliser suitable for fertigation and foliar application.
- provides both N and P in a directly plant-available form, and is therefore very suitable for the initial and mid-season growth stages.
- is virtually free of chloride (< 1 % Cl) making it particularly suitable for chloride-sensitive crops.
- has a reducing effect on the pH value of irrigation water, making it suitable for all types of irrigation waters.
- helps to improve micronutrient availability in pH-neutral to alkaline soils.
- keeps pipes and drippers clean; prevents clogging.
- is ideal for application on calcareous soils with high pH due to its pH lowering effect.
- enhances the movement of native soil phosphorus by lowering the soil pH and solubilizing the native phosphorus in contrast to other phosphorus sources.
- may not be used together with calcium nitrate or magnesium sulfate fertilisers. Please perform tank mix test before using and follow producer instructions.

soluNOP[®]



soluNOP[®]

EC FERTILISER
Potassium Nitrate

13.5% N total nitrogen
13.5% N nitric nitrogen
46% K₂O water-soluble potassium oxide

soluNOP[®] (13:00:46)

- supplies crops with water-soluble nitrate nitrogen and potassium, well-suited for fertigation and foliar fertilisation purposes and ideal for application at post blossom and physiological maturity stage.
- is virtually free of chloride, sodium and has a pH near to neutral. Therefore, it can be applied to a wide range of crops and orchards.
- NO₃-N in soluNOP helps the plant to minimize its uptake of chloride whenever toxic Cl⁻ is present in the soil solution or in irrigation water. Similarly, K⁺ in soluNOP counteracts the harmful effects of sodium. Thus, soluNOP is a perfect necessity for use in salt-sensitive crops and for crops grown on saline soils.
- application increases the uptake of potassium, calcium and magnesium from the soil and is very suitable for optimising nutrition and increasing the uptake efficiency of other nutrients.
- facilitates assimilate translocation and sugar formation in crops, helps in high yield, better quality and longer storage life with high net returns.
- offers crop resistance to biotic and abiotic stresses such as pest and diseases, drought stress, winter hardiness/ frost injury, terminal heat stress, and others.
- is recommended at a concentration of 0.5–4 % in foliar application. Rates vary between different crops, growth stages of the crop and environmental conditions.





EC FERTILISER
Calcium Nitrate

26.5% CaO calcium oxide
15.5% total nitrogen
14.4% NO₃-N nitric nitrogen
1.1% NH₄-N ammoniacal nitrogen

soluCN® (15:00:00+26.5 CaO)

- is a very pure, fully water-soluble fertiliser for the nutrition of agricultural crops with readily available nitrogen and calcium.
- is the only water-soluble source of calcium for plants, works both as a fertiliser and for disease control, suited for foliar application and fertigation as well as hydroponic systems.
- is recommended at a concentration of 0.5–5 % in foliar application. Rates vary between different crops, growth stages of the crop and environmental conditions.
- is compatible with other fertiliser and plant protection products. Caution when mixing with soluble sulphates and phosphates, perform tank mix test before application.
- calcium has limited mobility in the plant, supplying Ca throughout the growth season using soluCN helps in proper development.
- improves bud formation, fruit setting and strengthens plant cell wall, leading to better fruit quality, increased shelf life, pest and disease resistance.
- contains nitrogen in nitrate form, which improves the uptake of calcium and other cations (e.g. Mg and K) from soil by the plant.
- free of chloride, popularly known for an ameliorating effect under saline growing conditions, combating the negative effects of Na and Cl⁻.
- used for controlling disorders such as blossom end rot of tomato, pepper, aubergine, melon, squash; cork spot and bitter pit in apples, internal tip burn in cabbage; hollow heart of brassicas; and black heart of celery.



EC FERTILISER
Potassium Sulphate

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

soluSOP® (00:00:50+17 S)

- is an excellent water-soluble fertiliser designated for fertigation and foliar application (insoluble < 0.2 %).
- is ideal for open field as well as protected crops.
- is virtually free of chloride (< 1.5 % Cl) making it particularly suitable for chloride-sensitive crops.
- compared to other potassium sources, has a very low salt index (46).
- provides K and S in a direct plant-available form.
- is excellent for use under conditions prone to salinity.
- mixes well with other fertiliser components (except Ca containing products, risk of gypsum precipitate).



soluSOP® 52



soluSOP® 52

EC FERTILISER Potassium Sulphate

52 % K_2O water-soluble potassium oxide
42.5 % SO_3 water-soluble sulphur trioxide (=17 % S)

soluSOP® 52 (00:00:52+17 S)

- is a high-quality water-soluble sulphate of potash fertiliser suitable for fertigation and foliar application.
- is excellent for use under conditions prone to salinity due to its very low sodium and chloride content (< 0.5 % Cl).
- has low pH value (2.5 in 5 % solution) and can easily dissolve in irrigation water, providing K and S nutrients in a direct plant available form.
- with its low pH value not only avoids drippers from clogging and keeps micro-irrigation systems clean but also helps to improve the availability of nutrients such as phosphorus, iron and other trace elements to the plants.
- is compatible with other fertilisers (except Ca containing products, risk of gypsum precipitate) and plant protection products. When mixing this product, comply with the manufacturer's instructions or perform tank mix test before application.
- doesn't contain nitrogen and is therefore suitable for all growing stages and especially for maturity stage when plants need relatively more K to improve crop yield and quality.
- is a highly soluble component for the preparation of soluble and liquid NPK fertilisers.

soluAMS®



soluAMS®

EC FERTILISER
Ammonium Sulphate

21 % N nitrogen in total

21 % NH₄-N water-soluble ammoniacal nitrogen

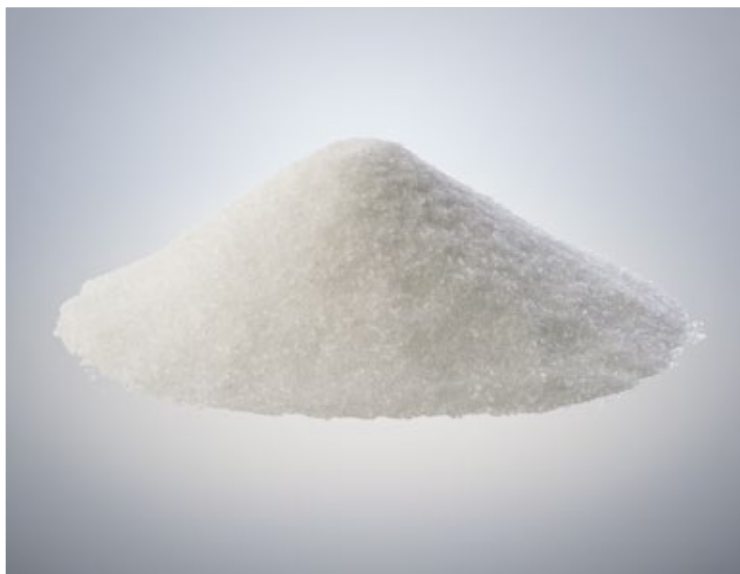
60 % SO₃ water-soluble sulphur trioxide (= 24 % S)

soluAMS® (21:00:00+24 S)

- is a water-soluble nitrogen fertiliser which dissolve rapidly and completely, easy to handle during application.
- not sensitive to caking and is recommended during periods of vegetative growth.
- the high levels of nitrogen and sulphur improves cell elongation and contributes to the production of proteins, supporting enzymatic reactions to improve vegetative growth.
- developed for fertigation in open field and greenhouse conditions, also suitable for foliar application.
- compatible with most water-soluble fertilisers, except for calcium fertilisers. While mixing with crop protection products, a compatibility test may be conducted prior to preparing the spray-mix.



soluNPK®



soluNPK®

EC FERTILISER

Water-soluble N:P:K fertiliser

19% N water-soluble nitrogen

19% P water-soluble phosphorus

19% K water-soluble potassium

soluNPK® (19:19:19)

- water-soluble fertiliser with all the three essential plant nutrients required for initial rejuvenation and vegetative growth of crop.
- helps to maintain crop health and vigour during the early stages of crop growth.
- the nitrogen in solu NPK is available in three forms, viz. amide, ammoniacal and nitric, thus nitrogen is available to plants over a long period with minimal N losses.
- in the annual crops, ideal for application during initial crop growth from seedling to flowering stage. This helps to develop strong root and shoot growth.
- in the perennial fruit trees, ideal for post-harvest application to rejuvenate/restore crop growth and support required plant nutrition for healthy flowerings.



soluCMS®



soluCMS®

Declaration (typical composition)

98.4 % MgSO_4 magnesium sulphate

0.6 % K_2SO_4 potassium sulphate

0.5 % CaSO_4 calcium sulphate

soluCMS®

- is an ideal additive for water-soluble fertilisers.
- is virtually free of chlorides, heavy metals and organic substances.
- provides highly concentrated magnesium sulphate for the production of water-soluble fertiliser blends.
- reduces caking in fertiliser blends due to its water-binding properties.
- improves storage properties and quality conservation.
- remains free-flowing under dry storage.
- is exempt from REACH registration due to its natural origin.



EPSOTop®



EPSOTop®

EC FERTILISER Magnesium sulphate

16% MgO water-soluble magnesium oxide (= 9.6% Mg)
32.5% SO₃ water-soluble sulphur trioxide (= 13% S)

EPSO Top®

- is a fast-acting magnesium and sulphur fertiliser for fertigation and foliar application. Sulphate-bound nutrients ($\text{MgSO}_4 \times 7 \text{H}_2\text{O}$) are fully water-soluble.
- quickly dissolves in water without residues, making it well-suited for spraying when used as a foliar fertiliser or fed into irrigation systems (fertigation).
- is to be used for supplementary soil fertilisation, primarily to overcome a lack of nutrients or to cover peak demand periods. No risk of crop damage (when complying with the manufacturer's instructions and recommended concentrations).
- mixes with most crop protection products and water-soluble fertiliser. Do not mix with Ca-containing products (precipitation of gypsum). Please comply with the manufacturer's instructions.
- allows for a loss-free magnesium and sulphur uptake through the leaves for maximum efficiency.
- is certified for organic farming according to the regulations (EU) 2018/848 and (EC) No. 889/2008.



EPSOMicrotop®



EPSOMicrotop®

EC FERTILISER

Magnesium sulphate and micro nutrients

- 15% MgO** water-soluble magnesium oxide (= 9% Mg)
- 31% SO₃** water-soluble sulphur trioxide (= 12.4% S)
- 0.9% B** water-soluble boron
- 1% Mn** water-soluble manganese

EPSO Microtop®

- is a fast-acting magnesium and sulphur fertiliser used as foliar spray and in fertigation offering additional boron and manganese. All nutrients are present in the form of sulphates.
- supports the increasing demand for micro nutrients.
- quickly and reliably prevents magnesium, sulphur, boron or manganese deficits during the growth stages.
- is particularly well-suited as a low-cost precautionary measure to avoid nutrient deficiencies.
- when used as foliar spray fully penetrates the leaves to ensure quick action and works regardless of soil pH as the nutrients are absorbed by the leaves.
- enables a quick, targeted and controlled treatment with boron and manganese in combination with magnesium and sulphur.
- should be used for boron-sensitive crops (e.g. all grain crops, strawberries, sugar beet), if the farmer knows the boron content in the soil or plants.
- is certified for organic farming according to the regulations (EU) 2018/848 and (EC) No. 889/2008.



EPSOCombitop®



EPSOCombitop®

EC FERTILISER

Magnesium sulphate and micro nutrients

- 13 % MgO** water-soluble magnesium oxide (= 7.8 % Mg)
- 34 % SO₃** water-soluble sulphur trioxide (= 13.6 % S)
- 4 % Mn** water-soluble manganese
- 1 % Zn** water-soluble zinc

EPSO Combitop®

- is tailored for high micro nutrient demands in grain crops, and this is the ideal supplement for magnesium and sulphur.
- is a fast-acting magnesium and sulphur fertiliser used as foliar spray and in fertigation offering additional manganese and zinc. All nutrients are present in the form of sulphates.
- supports the increasing demand for micro nutrients.
- quickly and reliably prevents magnesium, sulphur, manganese or zinc deficits during the growth stages.
- is particularly well-suited as a low-cost precautionary measure to avoid nutrient deficiencies.
- when used as foliar spray fully penetrates the leaves to ensure quick action and works regardless of soil pH as the nutrients are absorbed by the leaves.
- enables a quick, targeted and controlled treatment with manganese and zinc in combination with magnesium and sulphur.
- is certified for organic farming according to the regulations (EU) 2018/848 and (EC) No. 889/2008.



Strong Know-how - Research & Advisory of K+S

K+S supports agricultural practice all over the world by providing expert knowledge on fertilisation, in order to achieve high yields and excellent quality, and to maintain these even under adverse climatic conditions. The foundation of the advice provided is our extensive research activity.

For more than 100 years, K+S has been involved in agricultural research, always looking for solutions to agronomical challenges, such as how to increase productivity, how to improve soil fertility and how to efficiently use resources.

Together with Georg-August-University of Goettingen K+S today runs the Institute of Applied Plant Nutrition (IAPN). As an intersection between science and practice, the IAPN picks up on topical issues, pools existing knowledge and transfers new findings to agricultural practitioners.

K+S supports IMI, International Magnesium Institute, in China to understand and strengthen the growing importance of magnesium nutrition, especially in high value crops.

The advisory service of K+S as well aims at transferring existing and new research findings in the field of plant nutrition to agricultural practice. Farmers all over the world benefit from this know-how, which enables them to implement new and promising methods in their fertilisation practice, and to thereby improve yields and quality of their harvests. Our commitment and our expertise represent a significant contribution to securing global food supply and to protect the livelihoods of farmers.

Benefit from our agronomists' expertise and get more information on www.ks-minerals-and-agriculture.com/uken/fertiliser. Here you will find useful technical information, brochures and also our app, KALI-TOOLBOX.

For personal advice, call our Research & Advisory department in Kassel that might as well provide local contacts.

How to contact us

Detailed information on all K+S Minerals and Agriculture GmbH fields of expertise can be found at:
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