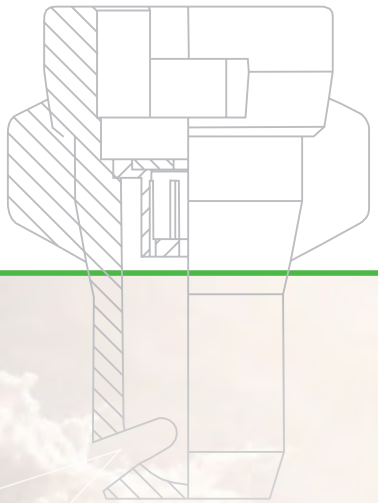
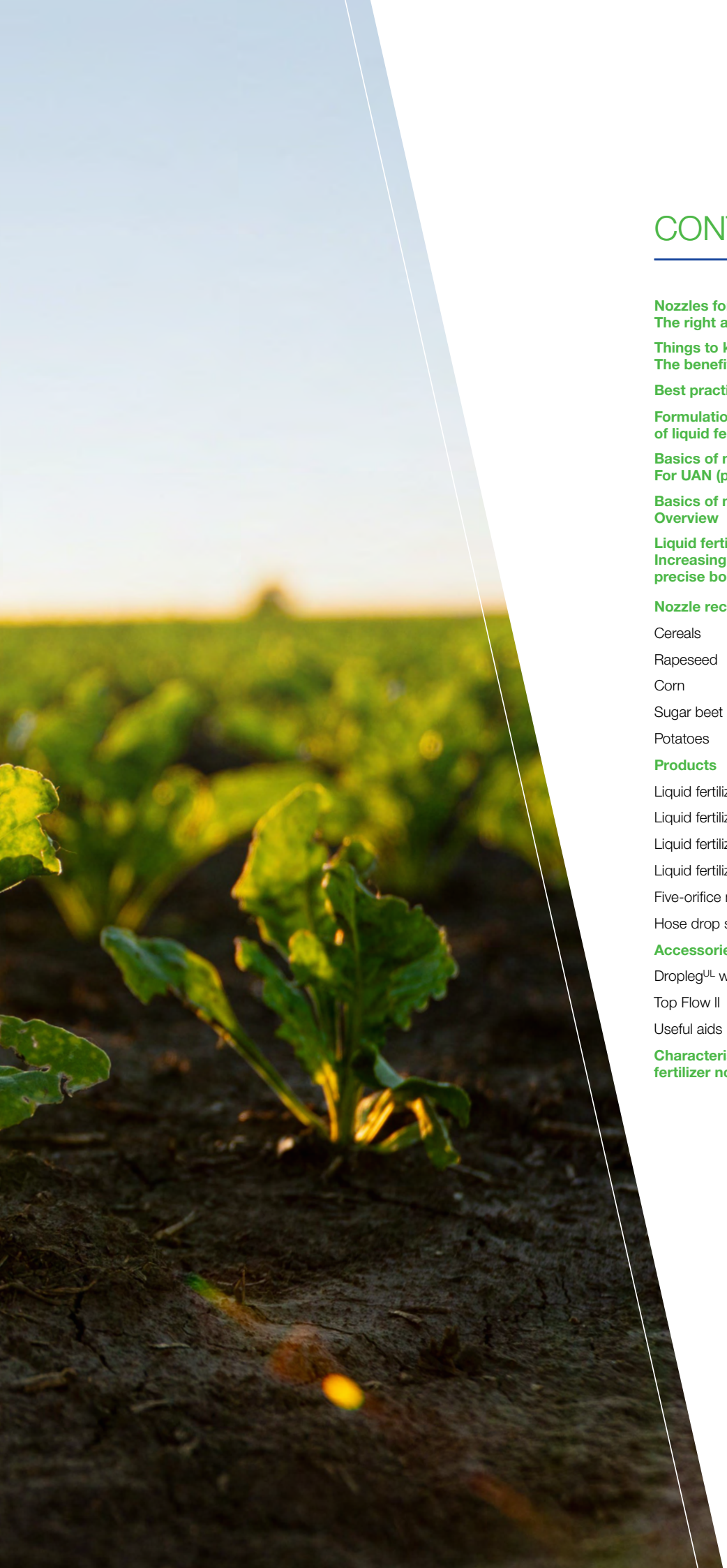
ENGINEERING
YOUR SPRAY SOLUTION

LIQUID FERTILIZER AGRICULTURAL NOZZLES AND ACCESSORIES



AGRICULTURE

LECHLER NOZZLES FOR LIQUID FERTILIZER APPLICATION – FOR HEALTHY GROWTH



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NOZZLES FOR LIQUID FERTILIZER APPLICATION
THE RIGHT AMOUNT IN THE RIGHT PLACE

Lechler is a world leader in nozzle technology. For over 140 years, we have pioneered numerous groundbreaking developments in the field of nozzle technology. Thanks to our decades of experience with drift-reducing technology, we have been able to make a significant contribution to more gentle and precise application of plant protection products.

We developed the ID 120-05 as early as the 1990s – the first JKI-approved nozzle with 90 % drift reduction for field crops. This also laid down a marker for future developments for viticulture, orchard and specialty crops. The innovative ITR air-injector hollow cone nozzle was introduced in 1998. In 2017, it was approved in the 95 % drift reduction class for viticulture (insecticide treatment of Drosophila suzukii).

2005

- VarioSelect, strawberries frame
- IDK
- IDN
- IDKN

2010

- FD
- IDKT
- PSV, VarioInject
- Dropleg[UL]

2015

- SC
- VarioSelect II
- 5S
- Hose drop system
- ID3
- PRE

2020

- IDTA
- Cleaner series
- ESV
- FS

- XDT
- VR
- FB
- TR 60

The great breakthrough with drift reduction nozzles in sprayers was achieved more than 20 years ago with low-drift 90° flat fan nozzles. Many national and international approvals as loss-reducing technology with up to 99 % drift reduction are available for the ID-90, IDK 90 and AD 90 series. We have consistently followed this path with ongoing new developments.

In Europe, Lechler has been the number one for nozzle technology for a long time now. However, we do not just see ourselves as a nozzle manufacturer, but above all as a partner in efforts to achieve both environmentally-friendly and efficient agriculture. This applies in particular to the large growth markets in China and India, where we are already represented by subsidiaries and an extensive sales network.

THINGS TO KNOW ABOUT LIQUID FERTILIZER APPLICATION
THE BENEFITS

Economic benefits, not just through combinations

The economic benefits of liquid fertilizer application are due to the cheaper price compared with calcium ammonium nitrate (CAN) and also the delivery method using a field sprayer, which permits high workrates. Including the additional calcium adjustment, the price of urea ammonium nitrate (UAN) is around 85 % in comparison with CAN.

Precise fertilizer distribution with high workrate

The use of specially matched liquid fertilizer nozzles from Lechler guarantees exact and uniform fertilizer distribution with precise borders, also for large working widths and in unfavorable wind conditions.

Improved fertilizer utilization – lower leaching rates

In addition to absorption via the root system, the liquid fertilizer can also be absorbed through the leaves. This means nitrogen is used more effectively, particularly in years with dry weather conditions in spring and early summer. Adapted distribution of the liquid fertilizer with several individual applications during the vegetation period is possible. This significantly reduces nitrate leaching in the soil – a primary objective in water protection areas.

BEST PRACTICE
FOR LIQUID FERTILIZER APPLICATION

Suitable cultures

High-quality liquid fertilizer can be used in almost all crops if it is applied at the right time using the right technique.

The application should be carried out according to the growth stage of the crop and the type of application/ nozzle recommended. Country-specific regulations must also be observed. Optimal conditions for professional application are, e.g.:

- Coarse droplet size
- Preferably application on dry crops in the afternoon or early evening (not onto morning dew or directly after rainy period)
- After a rainy period, wait for 1–2 days until a sufficient waxy layer has been regenerated
- Frost-dry plants (however, avoid intermittent frost conditions), observe county specific fertiliziler regulations
- Mixtures of UAN 28
- Application before germination max. up to 3 days after seeding
- UAN pure application with VR/FD/FL/FS nozzles

FORMULATION AND CHARACTERISTICS OF LIQUID FERTILIZERS

UAN (urea ammonium nitrate)

UAN consists of ammonium nitrate, urea, and water. Commercially available qualities contain 28 %, 30 % or 32 % nitrogen (N). If the quality is good, the pH value is around 7 to 7.5. This can be achieved through a slight ammonia surplus during manufacture.

UAN supplies plants with nitrogen in the form of ammonium (NH_4^+) and nitrate (NO_3^-), which is important for growth. Both nitrogen forms are water-soluble and are absorbed by the plant roots in order to be then converted into amino acids and proteins. As ammonium can be toxic in larger quantities, correct dosing is important.

UAN is applied to the soil as a liquid formulation, where it quickly dissolves and makes the nitrogen compound available to the plants. Application close to the ground via liquid fertilizer nozzles or hose drops maximizes the efficiency of fertilization while minimizing losses through evaporation or leaching.

Due to the higher specific densities of UAN compared with normal spray fluids, it must be ensured that the permitted axle loads are not exceeded. If necessary, the spray tank should therefore not be filled completely and corners should be taken carefully.

UAN-S solution

UAN-S solution additionally contains 3–8 % water-soluble sulfur in addition to 20–27 % nitrogen. Thus, it is suitable for the targeted and effective supply of nitrogen and sulfur to agricultural and horticultural crops.

The sulfur can be present in two forms: either as ammonium sulfate that is immediately available to plants or as ammonium thiosulfate, which is converted in the soil in several stages and is absorbed corresponding to the requirement of the respective plants. Like UAN, it is applied in a crop-friendly manner using usual crop protection equipment and nozzle technology.

Temperature dependence of UAN fertilizer solution

UAN 28 is stable down to –17 °C. Fertilizer particles crystallize out at temperatures below –17 °C, potentially causing mixture separation in the storage tank and nozzle blockages. These crystals dissolve again without residue when heated.

UAN-30 and -32, which are also available on the market, crystallize at –9 °C and 0 °C respectively and are therefore only suitable for storage, handling and application above the frost line. UAN 30 should be diluted to 28 % if necessary. Good mixing must be ensured otherwise the fertilizer solution will not be distributed uniformly.

UAN has a higher viscosity compared with normal spray fluid. Particularly at low temperatures (spring applications), this leads to a higher pressure drop between the boom line and the pressure gauge. Particularly in the case of spray booms without control computer or spray monitor, the flow rate should therefore always be calibrated before every application.

If necessary, the pressure level should be adjusted and can be between 0.1 and 1.0 bar above the values in the spraying table, depending on the device type and nozzle size.

LAS solution

Liquid ammonium sulfate (LAS) contains around 8 % nitrogen as ammonium nitrate and approximately 9 % water-soluble sulfur. The pH value of good-quality LAS is between 6 and 7.5. In the case of LAS obtained from biogas plants, attention must be paid to ensuring the correct pH value.

LAS is a combined nitrogen-sulfur fertilizer used for all agricultural cultures. The combination of nitrogen and sulfur permits appropriate supply of both nutrients to plants.

Like UAN (urea ammonium nitrate) solution, LAS can also be delivered with a crop protection sprayer. Crystallization can occur as a result of high evaporation or low temperatures. Water is often added to avoid nozzle blockages under such conditions.

LAS must be stored in a cool, dry place in LAS-resistant tanks (e.g., made of PE, PP, GFRP or stainless steel). Due to the corrosiveness of LAS, contact with uncoated concrete, steel, galvanized sheets and fitting containing copper should be avoided.

Note
Depending on its origin, LAS solution can be very acidic! Cannot be mixed with liquid potassium fertilizers or alkaline partner.

Fertilizer type	Specific gravity	Nutrient content – 100 liters of fertilizer solution contain	
	[kg/l]	kg N	kg P/S
UAN 28 (N solution)	1.28	36	–
NP solution 10/34	1.38	14	48
UAN-S solution	1.28	31	5
UAN-S 25/6	1.31	33	8
LAS solution	1.24	10	11
Liquid urea	1.10	22	–

NP solution

NP solution contains 10 % nitrogen as ammonium and 34 % phosphorus as water-soluble phosphates. The pH value of a good-quality NP solution is between 6 and 7.5.

NP solution is used as a combined nitrogen-phosphate fertilizer for all agricultural cultures. Nitrogen and phosphorus provide a balanced supply of nutrients for plant growth. Both components can be additionally absorbed through the leaves.

NP solution is mostly applied in a mixture with UAN. The mixture ratio can be adjusted as needed in accordance with the N : P_{2O5} ratio required for the culture. The application tables for UAN apply to both pure HP solutions and mixtures with UAN (see page 11).

Liquid urea

Liquid urea consists of urea and water. It typically contains around 46 % nitrogen. The pH value is normally between 7 and 8.

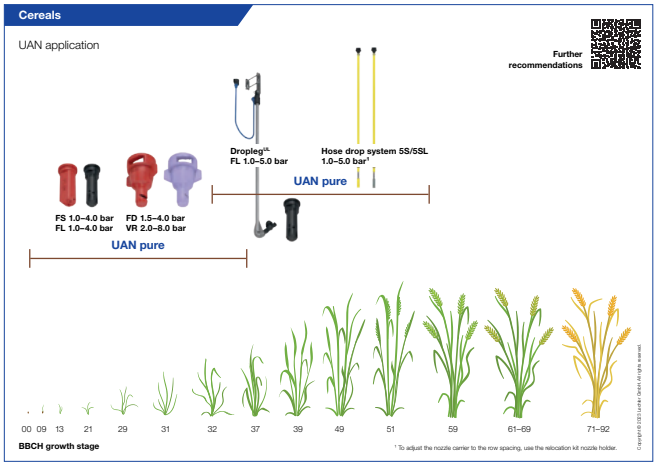
Liquid urea is clearly distinct from UAN and NP solutions. It is an organic, neutral liquid. It is therefore less corrosive. The best crop tolerance can be achieved at an urea concentration of 0.5–3 %, for cereals up to 10 %.

The problem is that there is limited solution capability. The process of mixing 10 kg of nitrogen (equivalent to 22 kg of urea) with water uses so much energy that the water temperature drops from 15 °C to zero. During this mixing process, the temperature drops and the mixing gets worse again. It is clear that a professional agitation system is needed. Mostly, this process is managed by stationary equipment, not by the sprayer. The amount of water used can be worked out using the application tables (see page 11).

BASICS OF NOZZLE TECHNOLOGY FOR UAN (PURE) APPLICATION

Liquid fertiliser is easily applied using standard nozzle technology. The following things will help you choose the right nozzle:

- The waxy layer on the crop's leaf surfaces must be as good as possible to ensure the most gentle possible application of coarse droplets with air injector flat fan nozzles
- As the crop reaches advanced growth stages, it becomes increasingly sensitive to flat fan or orifice nozzles
- The more sensitive the crop, the gentler the application method that should be chosen in the following order: Liquid fertilizer nozzle – hose drop system, Dropleg^{UL}



VR, FD, FS and FL nozzles

These nozzles are pure liquid fertilizer nozzles for gentle and low-drift delivery of low to very high application rates.

Hose drop system 5S/5SL and Dropleg^{UL}

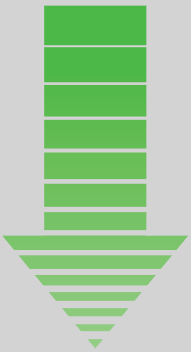
These offer the most reliable form of UAN application, for example, in late and sensitive growth stages of the crop or in unfavorable weather conditions.

If leaf necrosis occurs after UAN application, it normally disappears quickly. The yield will not be affected if it remains below 10 % at the start of vegetation and below 5 % in later growth stages of the crop.

Plant tolerance for pure UAN application decreases in the following order:

Waxy layer

- Soil fertilization up to three days after seeding
- Cereals
- Greenland
- Rapeseed
- Sugar beet
- Potatoes
- Maize/Corn
- Weak waxy layer
- Damaged plants



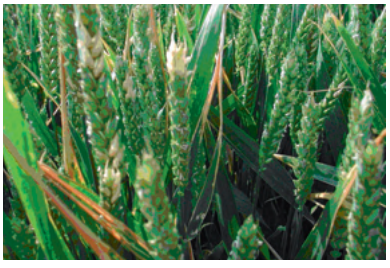
Growth stage

- Up to three days after seeding or tips
- From 3-leaf stage
- High osmotic pressure in the plant (frost, drought)
- Dilution ratio 1 : 3 (UAN : water)
- The greater the leaf mass and the wider the leaves, the more sensitive they are

Influence of nozzle technology on plant tolerance of liquid fertilizers

Expert UAN application with hose drop system

→ Leaf necrosis 0–0.5 %



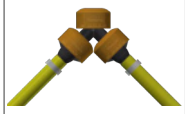
Intentional incorrect UAN application on a wheat crop after ear emergence

→ Leaf necrosis 8–9.5 %

Customized nozzle technology from Lechler guarantees and improves the economic success of liquid fertilizer application through:

- exact fertilizer distribution
- higher yields
- increased workrate
- reduced nitrogen leaching
- sufficient economical logistics

BASICS OF NOZZLE TECHNOLOGY
OVERVIEW

	VR	FD	FS	FB Border nozzle	FL (also for Dropleg[UL])	Hose drop system 5S and 5SL	Y-Kit with Dropleg[UL]
							
Spray pressure [bar] (size of dosing orifice)	**2.0–8.0**	**1.5–4.0**	**1.0–4.0** (015 to 08) **1.0–3.0** (10/15)	**1.5–4.0**	**1.0–5.0** (0.8/1.0) **1.0–4.0** (1.2) **1.0–3.0** (1.5/1.8)	**1.0–5.0** 5S: 02 to 03 5SL: 04 to 06	**1.0–8.0** (02/03/04/ 05/06)

Note

UAN corrodes non-ferrous metals such as brass, unpainted steel, and galvanized and anodized materials. For this reason, direct contact of UAN is recommended preferably only with plastics, stainless steel and well painted steel. In addition to a good cleaning effect, UAN has strong degreasing properties. Valves or tappets should therefore be oiled or greased regularly.

Materials and care

In contrast to non-ferrous metals such as brass, the nozzle material POM (plastic) is suitable and does not corrode. The pressure gauge and fittings should be suitable for use with liquid fertilizers. For care of the nozzles and the entire field sprayer equipment, rinsing and washing down with plenty of water is recommended after the end of liquid fertilizer application.

Conversion factors for different liquid densities

Density of N-solution [kg/l]	0.84	0.96	1.00 Water	1.11 Urea	1.24 LAS	1.28 UAN (28) UAN +S	1.32 UAN (30)	1.38 NP solution	1.44	1.50
Correction factor	1.09	1.02	1.00	0.95	0.90	0.88	0.87	0.85	0.83	0.81

Calibrating the nozzle's flow rate is essential for accurate spraying pressure. At lower temperatures, the pressure difference between the pressure gauge and the nozzles is higher.

For the combined application of liquid fertilizer + water + pesticides the spraying tables for water are suitable.

The following applies to conversion:

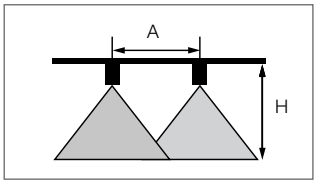
Flow rate water (table value) **x** **Conversion factor** **=** **Actual flow rate N-solution**

Density

All table values for volume flow are based on water (density 1.0 kg/l). In the case of liquids with a different density, the correction factors stated in the table must be taken into account. The specifications of fertilizer manufacturers for density must be observed.

Spraying height H: min. – optimum – max. [cm] for nozzle spacing A [m]

	Flat fan		Multi-orifice nozzle	
Nozzle type Spray angle	**VR 130°**	**FD 130°**	**FS 100°**	**FL 160°**
A = 0.50 m	**50–70**	**50–70**	**80–90**–100	**100**



LIQUID FERTILIZER APPLICATION – **INCREASING NITROGEN EFFICIENCY WITH PRECISE BORDERS**

(Guest comment from Dr. T. Kreuter and F.-L. Haupt, SKW STICKSTOFFWERKE PIESTERITZ GMBH)

High nitrogen utilization efficiency is the optimum way of achieving the ideal combination of business economy and environmental compatibility. Highly-efficient liquid fertilizers with an unbeatable price-performance ratio provide the solution for this. Cost savings result in particular from the sum of the numerous application benefits. For example, PIASAN® 28 and PIASAN®- S 25/6 and the nitrogen-stabilized liquid fertilizer ALZON liquid-S 25/6 can be handled easily as an unpressurized, water-clear liquid and can be metered very precisely with usual crop protection equipment.

This guarantees requirement-based application with precise borders over large working widths. In addition to the high workrate, simple storage transfer of the fertilizer and the associated reduction in workload offer further benefits for the user. High plant tolerance is guaranteed with observance of the application recommendation. There is no need to worry about leaf necrosis. Pesticides, micronutrients and growth regulators can be combined without problems subject to compliance with the manufacturer instructions, making application cost-efficient.

High demand for liquid fertilizers

Due to the already mentioned advantages and the introduction of more stringent distance regulations, the demand for liquid fertilizers has reached a high level of 13 % of the overall nitrogen market. In contrast, the share of solid fertilizers has been decreasing in recent years. Urea application is currently at 10 %. The market share of CAN fell to 33 % in fertilizer year 2024/2025.

Based on many years of practical experience and numerous tests, UAN with a nitrogen concentration of 28 to 30 % has proven to have the highest plant tolerance level. Based on the plant requirement, the optimum concentration of sulfur in combination products is 6 %. The highly-efficient quality liquid fertilizers PIASAN®S 25/6 and ALZON® liquid-S 25/6 are characterized by an optimum nitrogen-sulfur ratio of approx. 4 : 1. They optimally cover the simultaneous nutrient requirement of crops for nitrogen and sulfur.

Solid yields with liquid fertilizers

High yields can be achieved with liquid fertilizers in all agricultural cultures. The yield impact of quality liquid fertilizers and standard fertilizers such as CAN is absolutely comparable (Figure 1). A basic prerequisite for this is always expert application. In the case of liquid fertilizer application with nitrogen, the majority of the nutrients – 80 to 95 % – should be absorbed through the soil. Only 5 % up to a maximum of 20 % of N absorption take place via the leaves. This nitrogen absorption through the leaves permits improved yields particularly in dry weather conditions. This also makes it possible to achieve increased yields compared with solid fertilizers.

Accurate application for precise nutrient supply up to the border

Spreading errors cost nerves and money. They are initially not visible up to an order of magnitude of 25 % but can lead to noticeable yield losses and reduced quality. Liquid fertilizers come into their own when precision is required. This is because liquid fertilizers make it possible to easily comply with the distance stipulations of fertilizer regulations. The very precise fertilizer delivery guarantees application of the full fertilizer quantity and thus yields right up to the border. The reason for this is the uniform lateral distribution of the fertilizer nitrogen with a low variation coefficient when delivered with a crop protection sprayer compared with granulate spreaders.

Liquid fertilizers achieve yields that are at least comparable with solid fertilizers

Figure 1:
Yield results of PIASAN® 28 in main agricultural cultures, relative representation of the yield [%] (average values from 240 field studies in the years 1993–2024)

Brand quality for high crop tolerance

It is essential to use liquid fertilisers of the highest quality to guarantee the already mentioned high plant tolerance. High yields and good crop quality are guaranteed. Liquid fertilizers from SKW Piesteritz have a pH value in the neutral range between 6 and 7 and above all a very high surface tension of 60 to 80 mN/m. The high surface tension of the leaf ensures that large droplets of the applied liquid fertiliser roll off and fall to the ground (Figure 2).

It has been proven that the remaining liquid fertiliser on the leaf results in a leaf fertilisation effect. In contrast, liquid fertilizers with a low surface tension form a spray film on the leaves, which results in significantly lower plant tolerance and thus considerable yield losses.

The surface tension has a considerable influence on the yield and nitrogen uptake. It is clear from field studies with winter wheat conducted over many years that PIASAN® 28 outperforms a UAN 28 product with low surface tension. This was confirmed in a 17-year trial series under critical application conditions. The results show that the risk of leaf scorching and the related yield reductions can be successfully minimized with application of quality liquid fertilizers while at the same time significantly improving nitrogen uptake and fertilizer N utilization efficiency.

Plant damage in the form of leaf necrosis after liquid fertilizer application under critical conditions was 14 % on average over the 17-year period for a UAN with a poor low surface tension. This damage was reduced to only 4 % through the use of PIASAN® 28. This led to a considerable increase in yield of 12.4 dt per hectare (14 %). This made it possible to improve the N balance by a remarkable 23 kg N per hectare and year on average (Figure 3).

Figure 2: Difference in distribution of liquid fertilizers with different surface tensions on the leaf

Effect of different liquid fertilizers on grain yield and N uptake of winter wheat

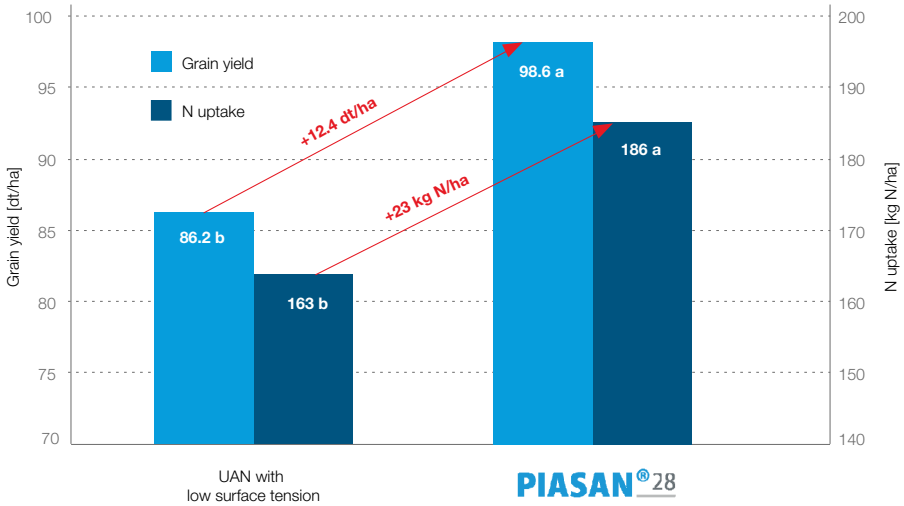


Figure 3:
Influence of the surface tension of a liquid fertilizer on yield [dt/ha] and N uptake N/ha] in winter wheat (average from 17 trials 2004–2020, different letters indicate significant differences (t-test))

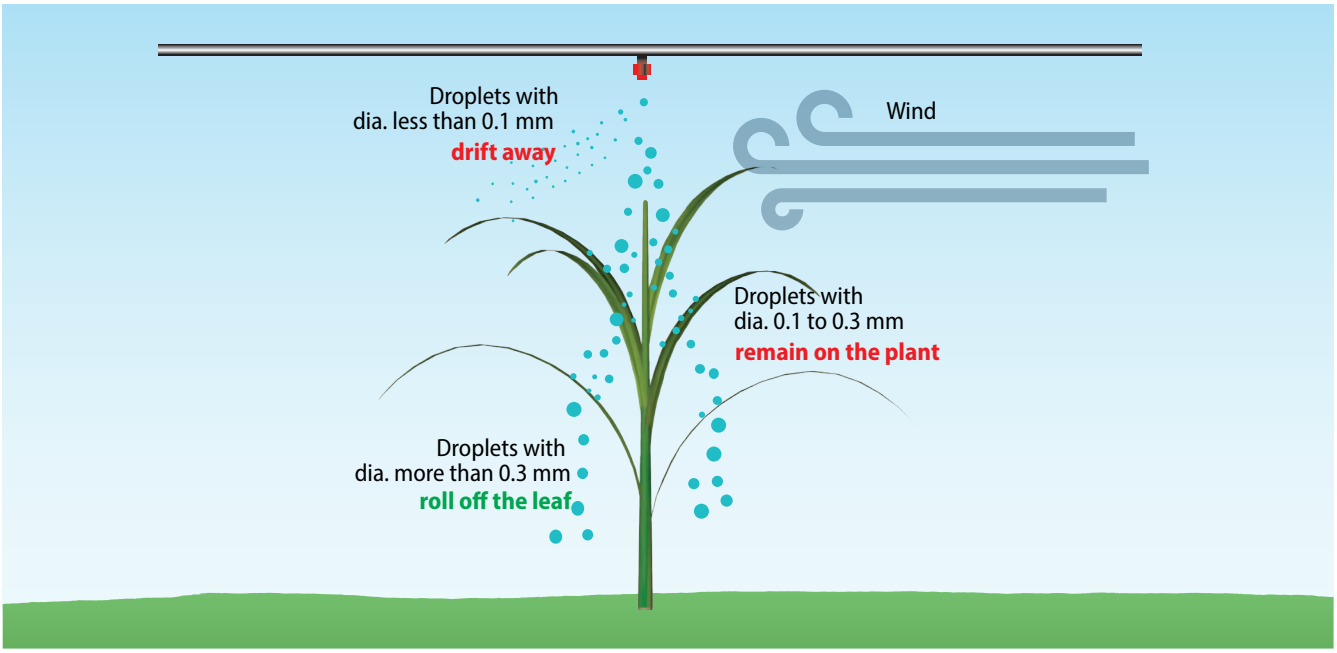


Figure 4: Schematic representation of application of different droplet sizes and their different properties on the leaf

The droplet size is decisive

Alongside the quality characteristics of the liquid fertilizers, the application method additionally supports the success of liquid fertilizer application. The generation of coarse droplets (Figure 4) is achieved through the use of drift-reducing nozzles (ID and IDK nozzles) with low spray pressure (approx. 2 bar). This results in a coarse droplet spectrum. Under critical conditions, special liquid fertilizer nozzles (FD) or multi-orifice nozzles (FL or FS) are used to also deliver the liquid fertilizer in large quantities by “rain-like” application.

The choice of nozzle is decisive

All nozzles are well-suited at the start of vegetation or at seeding. When fertilizer is applied to the plant population, the following applies: the more sensitive the plants, the larger the droplets should be and the lower the spray pressure. You can decisively influence plant tolerance through correct nozzle selection. Injector or multi-orifice nozzles are recommended for the second application in cereal or rapeseed. The use of hose or tube drop systems is recommended for later application or generally after ear emergence, in unfavorable weather conditions or in sensitive cultures.

Basics of liquid fertilizer application

Liquid fertilizer can be used in all agricultural cultures. Several principles must be observed for application of liquid fertilizers to cereal and rapeseed:

- Observe any culture type-specific application recommendation
- No blazing sun and no temperatures above 25 °C
- The better the formation of the waxy layer, the better the plant tolerance
- Pure liquid fertilizers offer good plant tolerance
- Dilution of liquid fertilizer with water at least in ratio 1 : 4
- Problem-free application from shortly before seeding to up to three days afterward; further application possible after reaching the 3-leaf stage

Application in frosty conditions

- The crop must be dry or strongly covered by white frost
- No application with intermittent frost
- Possible restriction due to legal requirements

Partial area-specific liquid fertilizer application

The above-mentioned advantages are complemented by the key benefit of site-specific application of nitrogen fertilizers, which takes into account growth and soil differences, making a further important contribution to requirement-based, environmentally-friendly and sustainable fertilizer application. Historic field block information (soil maps, yield data) and current crop data can be used for this. Liquid fertilizers are equally as well-suited as granulated solid fertilizers. Implementation of the obtained information (offline or online) requires corresponding application equipment. This must be able to deliver different liquid fertilizer quantities. The “VarioSelect” delivery system is suitable for this, for example, offering individual nozzle deactivation for variable application quantity control.

In the period 2015–2017, the Agricultural Applications Research division of SKW Piesteritz conducted a trial series with several on-farm experiments (OFE) on the topic of partial area-specific liquid fertilizer application. Sensor-based fall nitrogen uptake maps formed the basis for definition of adapted and differentiated spring fertilizer application. The trial results show that variable application of conventional and nitrogen-stabilized liquid fertilizers is possible without problems with corresponding equipment (Figure 5).

Yield and revenue difference of N-stabilized fertilizer application in comparison with conventional nitrogen fertilizer application in winter rapeseed
(average from 25 trials 2015–2017)

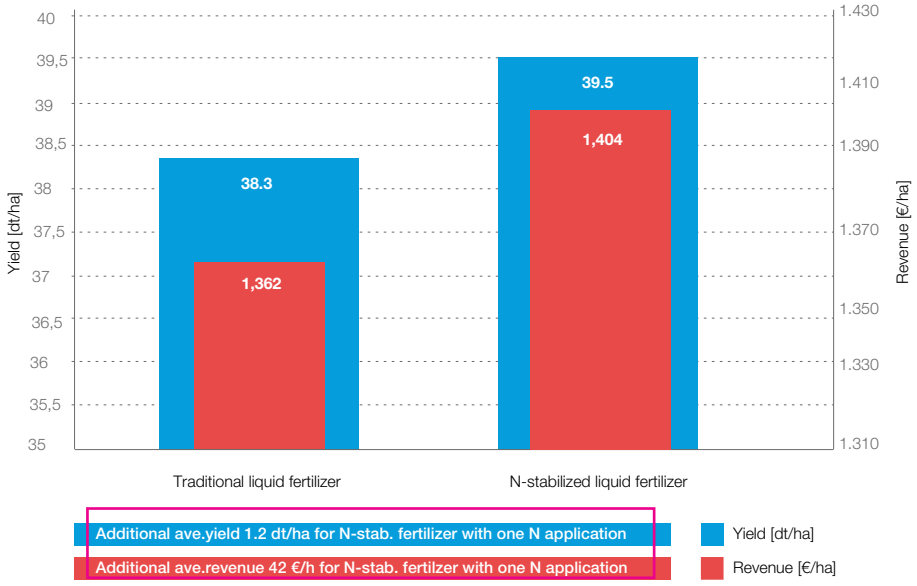


Figure 5:
Liquid fertilizer application and partial area-specific application

Late fertilizer application in winter wheat is no problem with liquid fertilizer

Thanks to technical development, considerable progress was made in the past particularly in relation to late fertilizer application in cereal crops with UAN. Under critical application conditions and with sensitive plant populations, FD nozzles, multi-orifice nozzles or hose drop systems permit liquid fertilizer application beyond BBCH 32 up to shortly before ear emergence (BBCH 49/51). In winter wheat in particular, the grain yields achieved with this fertilizer application strategy and also the raw protein content are completely equivalent to the values for comparative solid fertilizers.

After ear emergence (BBCH 49/51), only hose drop systems (5S or 5SL) that are submerged into the crop or tube drop systems (Dropleg[UL]) that work according to a similar principle should be used. Combination with pesticide measures is not possible either for multi-orifice nozzles or hose drop systems.

Achieve even higher yields with stabilized liquid fertilizers

Stabilization of the nitrogen results in particularly sustainable and efficient plant nutrition. Here, the highly-efficient nitrification inhibitor in ALZON® liquid-S 25/6 slows down the conversion of the stable ammonium into the mobile nitrate form in a period of six to ten weeks. The results are high yields with good quality and optimum fertilizer N utilization efficiency (Figure 6). In terms of work efficiency, the reduced number of passes is also advantageous.

Stabilized UAN offers at least the same performance with fewer passes

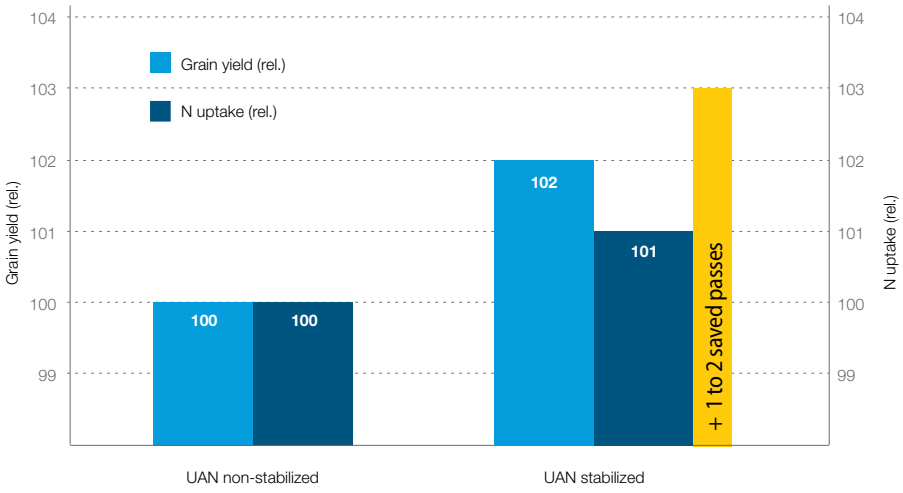


Figure 6:
Advantages of N-stabilized UAN compared with non-stabilized UAN, relative representation of the yield [%] and N uptake [%] (average values from 22 field trials in the years 2008–2023)

Conclusion

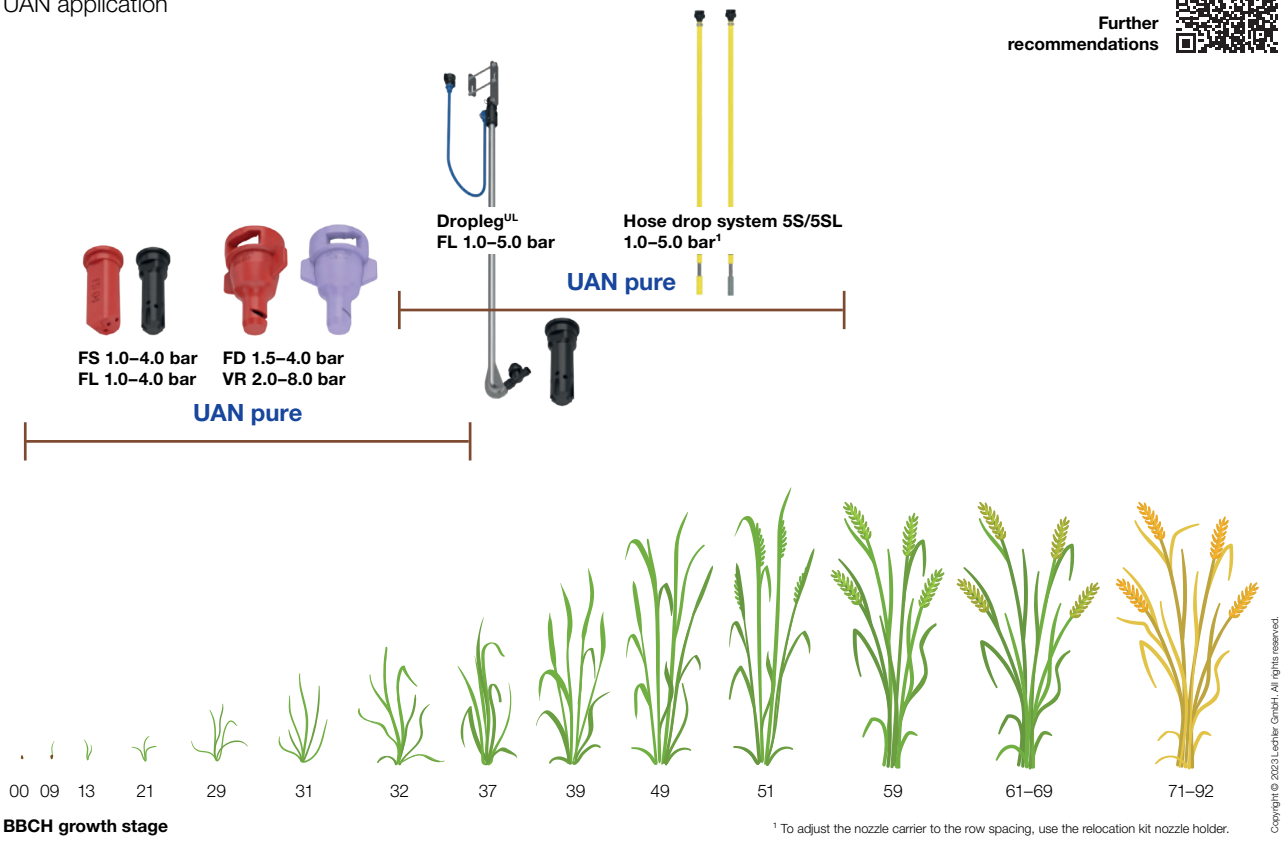
To summarize, it can be said that liquid fertilizers offer many advantages and possible applications. High-quality brand products ensure efficient nitrogen fertilizer application in combination with modern nozzle technology. If the application recommendations and schedules are also observed, liquid fertilizer application guarantees the best yields and qualities.

NOZZLE RECOMMENDATIONS IN CEREALS

Cereals

UAN application

Further recommendations



[1] To adjust the nozzle carrier to the row spacing, use the relocation kit nozzle holder.

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Winter cereals can already be fertilized in the first application during the dormancy period with a maximum of 60–100 kg N/ha in the form of pure UAN. A prerequisite for this is well-rooted plants with at least three to four leaves. The combination with weed control measures is recommended particularly if the spring application is split.

If application of more than 50 l UAN/ha is to take place at a later time, up to 150 l/ha pure UAN can be applied with FD nozzles, five-orifice nozzles or Dropleg^{UL}, hose drop systems. Liquid fertilizer application is possible only with Dropleg^{UL} or hose drop systems from ear emergence or opening of the leaf sheath.

Nozzle recommendation at the start of vegetation 150 to 280 l/ha UAN:

- VR-M and VR-L
- FD 03 to 10
- FL gray with dosing orifice 1.2/1.5/1.8
- FS 03 to 10

Second nitrogen application 60 to 170 l/ha pure UAN:

- VR-M
- FD 02 to 06 (pure UAN)
- FS 02 to 05 (pure UAN)

Late fertilizer application 140 to 170 l/ha UAN:

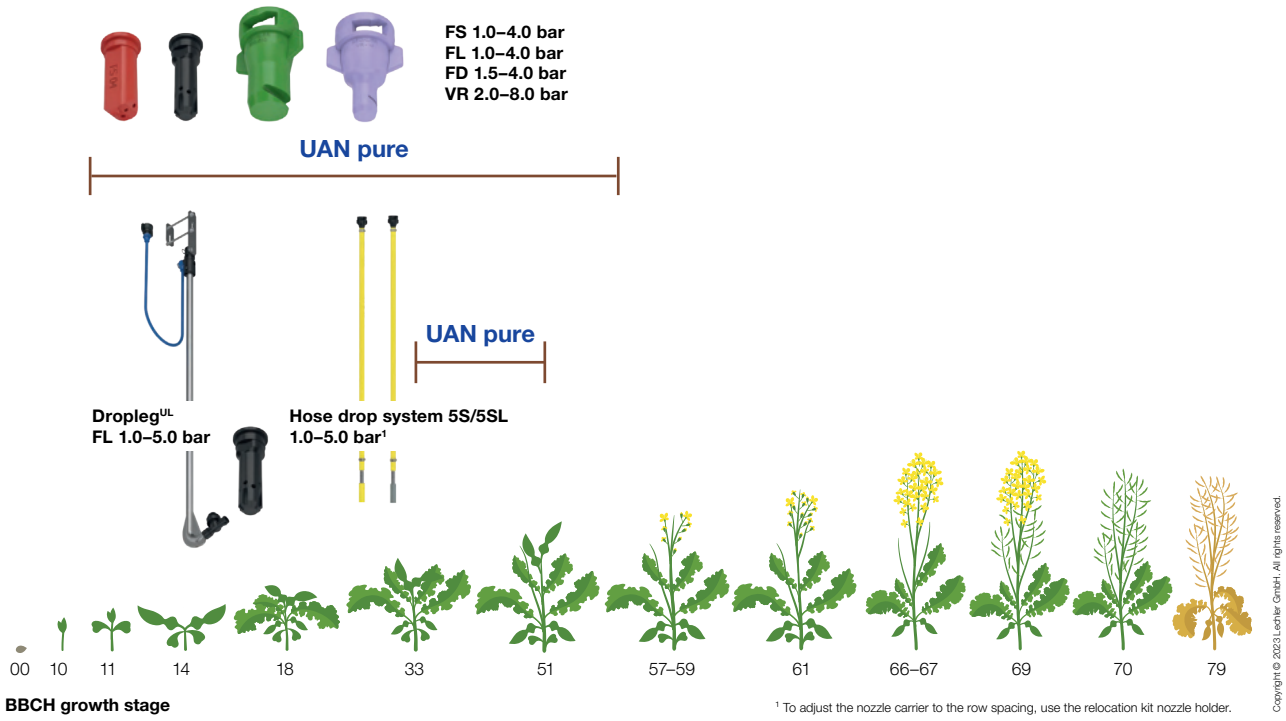
- FD 02 to 05
- FL black with dosing orifice 1.0/1.2 or FL gray with dosing orifice 1.2/1.5
- FS 02 to 05
- Hose drop system 5S with dosing orifice 02/03 or 5SL with dosing orifice 04
- Dropleg^{UL} with FL black and dosing orifice 1.0/1.2 or FL gray and dosing orifice

NOZZLE RECOMMENDATIONS IN RAPESEED

Rapeseed

UAN application

Further recommendations



In winter rapeseed, more than 200 kg/ha N can be applied in the form of pure UAN during the vegetation period, split into two applications, using nozzles or hose drop systems.

Note
Care must be taken in intermittent frost conditions.

Nozzle recommendation at the start of vegetation 220 to 350 l/ha UAN:

- VR-M and VR-L
- FD 04 to 10
- FL gray with dosing orifice 1.5/1.8
- FS 04 to 10

Second nitrogen application up to bud formation 170 to 280 l/ha UAN:

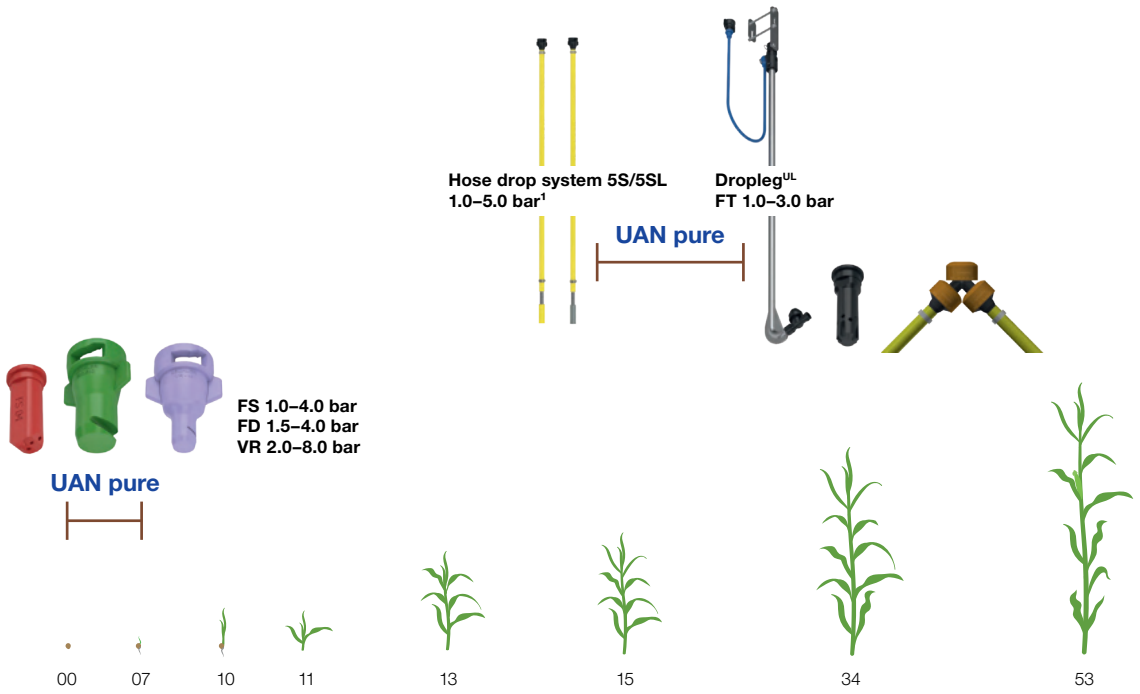
- VR-M and VR-L
- FD 03 to 08
- FL gray with dosing orifice 1.2/1.5/1.8
- FS 03 to 08
- Hose drop system 5S with dosing orifice 03 or 5SL with dosing orifice 04 or 05

NOZZLE RECOMMENDATIONS IN CORN

Corn

UAN application

Further recommendations



[1] To adjust the nozzle carrier to the row spacing, use the relocation kit nozzle holder.

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Corn does not tolerate direct spraying of UAN onto the leaves. Later UAN applications in the post-emergence phase are possible only with Dropleg[UL] or hose drop systems.

The combination of Dropleg[UL] with the Y-Kit is particularly recommended in corn. This is the most plant-friendly way of applying liquid fertilizer in row crops, something which is particularly important for corn. In addition, late fertilizer application and application splitting are becoming increasingly interesting for corn due to the fertilizer regulations.

From a crop production perspective, late fertilizer application also makes sense because corn absorbs around 80 % of the total nutrient requirement only from the 8-leaf stage. In contrast, it absorbs only around 5 % of its total N requirement in the first six weeks after seeding. Exclusive fertilizer application at seeding therefore enormously increases the risk of washout and N losses. Depending on the yield, the N requirement of corn is between 180 and 250 kg N/ha. It is therefore important to make best possible use of the fertilizer and avoid losses. Application splitting is required for this because this is the only way to ensure that the nitrogen can be supplied according to requirements, thus avoiding N losses and increasing N efficiency. This is also shown in higher yields.

Nozzle recommendation before seeding up to three days afterward 280 to 500 l/ha UAN:

- VR-M and VR-L
- FD 04 to 15
- FS 04 to 15

Second nitrogen application up to 8-leaf stage 80 to 170 l/ha UAN:

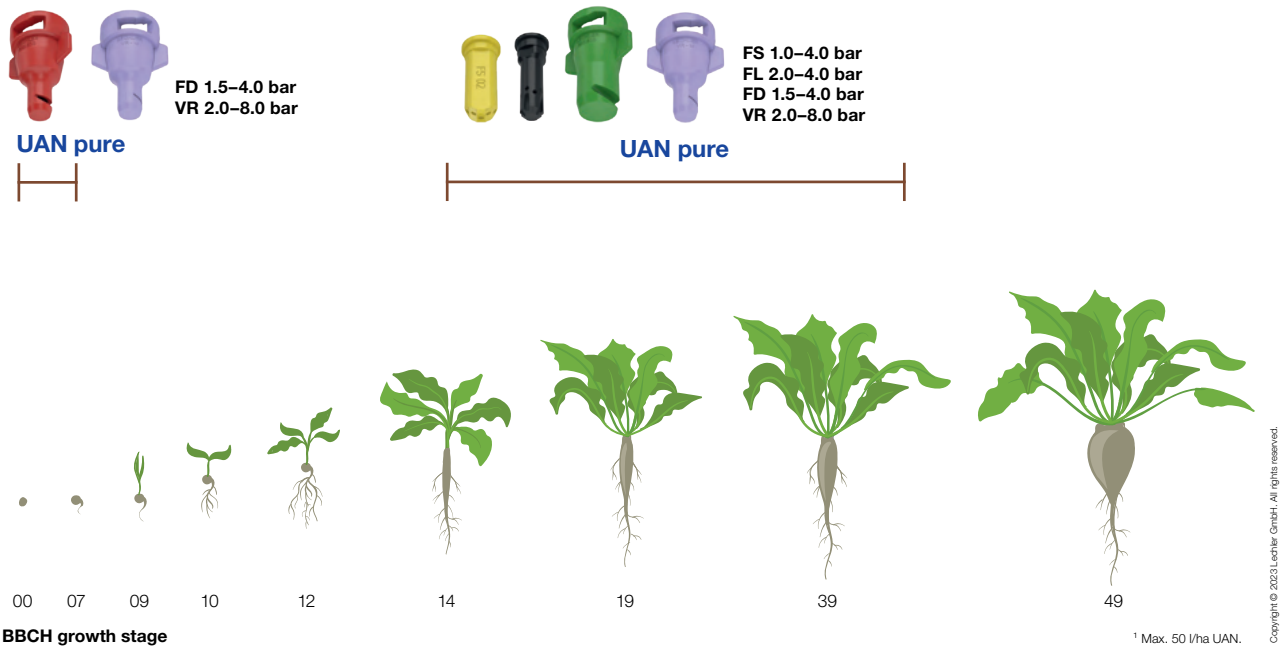
- Hose drop system 5S with dosing orifice 02 or 03
- Dropleg[UL] with Y-Kit and dosing orifice 02
- Dropleg[UL] with FL gray with dosing orifices 1.2/1.5/1.8

NOZZLE RECOMMENDATIONS IN SUGAR BEET

Sugar beets

UAN application

Further recommendations



[1] Max. 50 l/ha UAN.

In sugar beet, both the beet yield and also the sugar content can be positively influenced by targeted UAN fertilizer application in comparison with conventional fertilizer application with calcium ammonium nitrate. Up to 120 kg N/ha can be applied for the basic fertilizer application before seeding. Subsequently, pure UAN can also be applied after dry periods during the vegetation phase from the 4-leaf stage with a maximum application quantity of 40 kg N/ha (corresponds to approx. 110 l UAN/ha) without the risk of scorching.

The time interval before and after herbicide applications should be at least three days – this applies particularly if oil additives are used.

Nozzle recommendation 1 week before seeding 170 to 335 l/ha UAN (total N quantity):

- VR-M and VR-L
- FD 03 to 10
- FL gray with dosing orifices 1.2/1.5/1.8
- FS 03 to 10

Up to three days after seeding up to 220 l/ha UAN:

- VR-M and VR-L
- FL gray with dosing orifices 1.2/1.5
- FS 03 to 06
- FD 03 to 06

Second nitrogen application from the 4-leaf stage up to approx. end of May shortly before row closing 80 to 110 l/ha UAN:

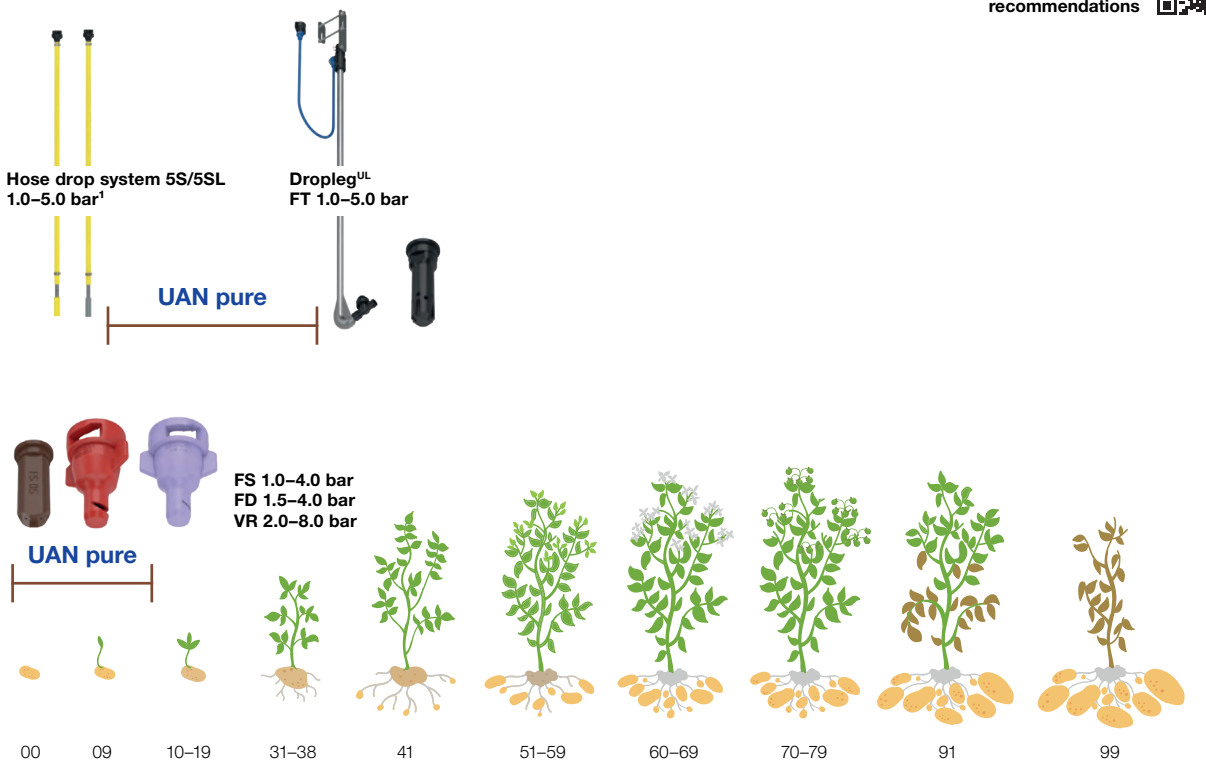
- VR-M and VR-L
- FD 02 to 03
- FS 015 to 03
- Hose drop system 5S with dosing orifice 02 or 03
- FL black with dosing orifice 0.8/1.0

NOZZLE RECOMMENDATIONS IN POTATOES

Potatoes

UAN application

Further recommendations



[1] To adjust the nozzle carrier to the row spacing, use the relocation kit nozzle holder.
[2] Max. 30 l/ha UAN together with potato blight application.

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For potatoes, the following division of liquid fertilizer application is recommended:

- First application before planting
- Second application up to 60 kg N/ha pure before leaf emergence

Nozzle recommendation before planting 170 to 335 l/ha UAN:

- FD 03 to 10
- FL gray with dosing orifices 1.2/1.5/1.8
- FS 03 to 10

Second nitrogen application 110 to 170 l/ha pure UAN:

- FD 02 to 05 (pure UAN)
- FS 02 to 05 (pure UAN)

Before row closing:

- Hose drop system 5S with dosing orifice 02 or 03
- Dropleg[UL] with Y-Kit and dosing orifice 02 or FL black with dosing orifices 0.8/1.0/1.2

Liquid fertilizer nozzle
VR

Crop production | Ground care

Dimensions in mm.

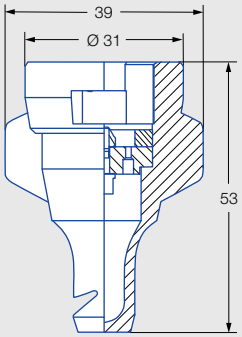
- Liquid fertilizer nozzle with variable flow rate
- Based on FD design with extremely uniform lateral distribution

Advantages

- Variable flow rate covers up to five ISO FD nozzle sizes
- Higher workrate without changing nozzles
- Flexible delivery with changing spraying speeds and in precise farming applications
- Gentle liquid fertilizer application thanks to extremely low spray impact
- Minimum risk of scorching due to ultra-coarse droplet spectrum
- Nozzle in cap with MULTIJET bayonet system incl. gasket and nozzle strainer 80 M

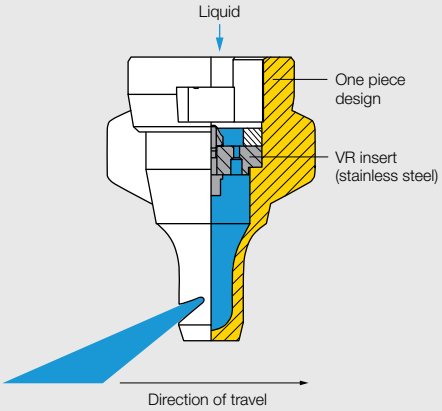
VR-M

VR-L



Series VR

Removable insert



Application:

- **Liquid fertilizer delivery**
- **Golf course**

Technical data:

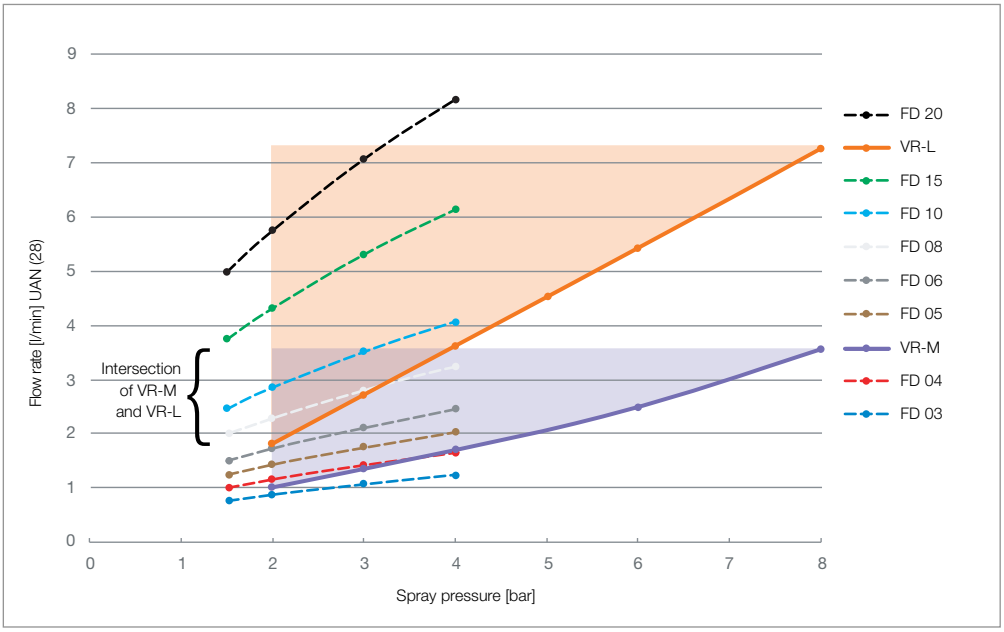
- **Nozzle sizes** VR-M and VR-L
- **Spray angle** 130°
- **Materials** POM, stainless steel
- **Pressure ranges** 2–8 bar
- **Recommended strainer** 80 M
- **Droplet size** Ultra coarse
- **Spray heights** 50–70 cm

Assembly

Note

The Lechler VR assembly aid facilitates aligned installation of the VR stainless steel insert including gasket.
Order number of VR assembly tool: **6VR.000.56.10.00**
(can be optionally ordered)

		[l/min]	UAN [l/ha] 0.5m								
		UAN 28	5.0 km/h	6.0 km/h	7.0 km/h	8.0 km/h	10.0 km/h	12.0 km/h	14.0 km/h	16.0 km/h	18.0 km/h
VR-M	2.0	1.03	247	206	177	154	124	103	88	77	69
	3.0	1.37	329	275	235	206	165	137	118	103	92
	4.0	1.71	410	341	293	256	205	171	146	128	114
	5.0	2.07	496	414	355	310	248	207	177	155	138
	6.0	2.50	600	500	428	375	300	250	214	187	167
	7.0	2.92	701	584	501	438	351	292	250	219	195
	8.0	3.57	857	715	612	536	429	357	306	268	238
VR-L	2.0	1.83	439	366	314	275	220	183	157	137	122
	3.0	2.71	650	542	465	407	325	271	232	203	181
	4.0	3.64	874	729	625	546	437	364	312	273	243
	5.0	4.52	1.086	905	775	678	543	452	388	339	302
	6.0	5.43	1.303	1.086	931	814	652	543	465	407	362
	7.0	6.40	1.535	1.280	1.097	960	768	640	548	480	427
	8.0	7.29	1.749	1.457	1.249	1.093	874	729	625	546	486



- Operating pressure at the nozzle (measured with diaphragm valve)
- The stated liter-per-hectare rates apply to UAN (28/1.28 kg/l)
- Verify the table values by gauging the flow rates prior to every spraying season
- Ensure uniform nozzle adjustment

Nozzle calculator app

The apps for Lechler agricultural nozzles make selection and use of the optimum nozzle even easier. Find out more here: **www.lechler.com/de-en/service/apps**

Recommendation
Use in flow-controlled boom sprayers.

Ordering example:	Series	+	Nozzle size	=	Order no.
	VR	+	M	=	VR-M

Liquid fertilizer nozzles
FD

Crop production | Ground care

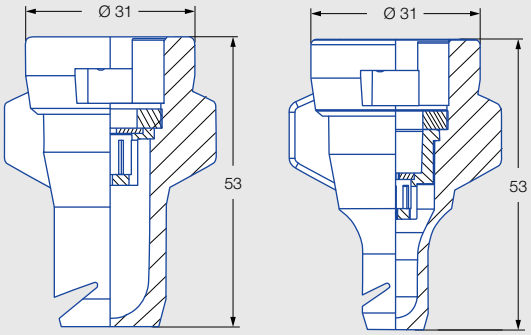
PATENTED

Dimensions in mm.

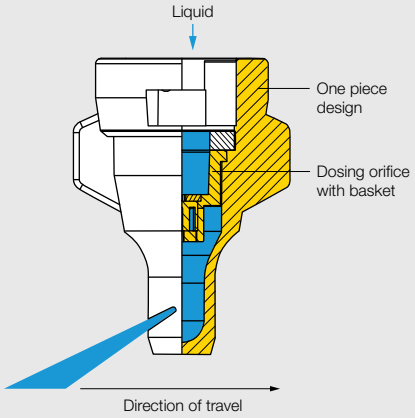
- Flat fan nozzle with horizontal spray pattern for uniform cross distribution

Advantages

- Gentle liquid fertilizer application thanks to extremely low spray impact
- Minimum risk of scorching due to extremely coarse droplet application
- No striping due to optimum cross distribution
- Nozzle in cap for standard bayonet connection system MULTIJET (incl. gasket)



Series FD



Pre-chamber can be removed without tools

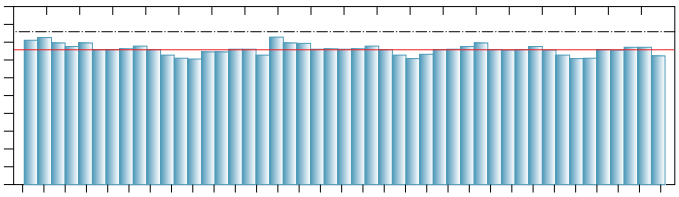
Application:

- **Liquid fertilizer delivery** (AHL, UAN)
- **Greenhouse**
- **Golf course**

Technical data:

- **Nozzle sizes** 02–20
- **Spray angle** 130°
- **Material** POM
- **Pressure ranges** **1.5–4** bar
- **Recommended strainers**
  - 60 M 02–04
  - 25 M 05–20
- **Droplet size** Ultra coarse
- **Spray heights** 50–70 cm

FD 04 – Cross distribution on patternator (with water)



Pressure range: 2.0 bar
Spray height: 600 mm
Coefficient of variation: 3.4 %

		[bar]	[l/min]		UAN [l/ha] 0.5m								
			Water	UAN	5.0 km/h	6.0 km/h	7.0 km/h	8.0 km/h	10.0 km/h	12.0 km/h	14.0 km/h	16.0 km/h	18.0 km/h
	FD 02 (60 M)	1.5	0.57	0.50	121	101	86	76	60	50	43	38	34
		2.0	0.65	0.57	138	115	98	86	69	57	49	43	38
		3.0	0.80	0.71	170	141	121	106	85	71	61	53	47
		4.0	0.92	0.81	195	163	139	122	98	81	70	61	54
	FD 03 (60 M)	1.5	0.85	0.75	180	150	129	113	90	75	64	56	50
		2.0	0.98	0.87	208	173	148	130	104	87	74	65	58
		3.0	1.20	1.06	255	212	182	159	127	106	91	80	71
		4.0	1.39	1.23	295	246	211	184	147	123	105	92	82
	FD 04 (60 M)	1.5	1.13	1.00	240	200	171	150	120	100	86	75	67
		2.0	1.31	1.16	278	232	198	174	139	116	99	87	77
		3.0	1.60	1.41	339	283	242	212	170	141	121	106	94
		4.0	1.85	1.64	392	327	280	245	196	164	140	123	109
	FD 05 (25 M)	1.5	1.41	1.25	299	249	214	187	149	125	107	93	83
		2.0	1.63	1.44	346	288	247	216	173	144	123	108	96
		3.0	2.00	1.77	424	354	303	265	212	177	152	133	118
		4.0	2.31	2.04	490	408	350	306	245	204	175	153	136
	FD 06 (25 M)	1.5	1.70	1.50	361	301	258	225	180	150	129	113	100
		2.0	1.96	1.73	416	346	297	260	208	173	148	130	115
		3.0	2.40	2.12	509	424	364	318	255	212	182	159	141
		4.0	2.77	2.45	588	490	420	367	294	245	210	184	163
	FD 08 (25 M)	1.5	2.26	2.00	479	400	342	300	240	200	171	150	133
		2.0	2.61	2.31	554	461	395	346	277	231	198	173	154
		3.0	3.20	2.83	679	566	485	424	339	283	242	212	189
		4.0	3.70	3.27	785	654	561	491	392	327	280	245	218
	FD 10 (25 M)	1.5	2.83	2.50	600	500	429	375	300	250	214	188	167
		2.0	3.27	2.89	694	578	495	434	347	289	248	217	193
		3.0	4.00	3.54	849	707	606	530	424	354	303	265	236
		4.0	4.62	4.08	980	817	700	613	490	408	350	306	272
	FD 15 (25 M)	1.5	4.24	3.75	899	750	642	562	450	375	321	281	250
		2.0	4.90	4.33	1.039	866	742	650	520	433	371	325	289
		3.0	6.00	5.30	1.273	1.061	909	795	636	530	455	398	354
		4.0	6.93	6.13	1.470	1.225	1.050	919	735	613	525	459	408
	FD 20 (25 M)	1.5	5.66	5.00	1.201	1.001	858	750	600	500	429	375	334
		2.0	6.53	5.77	1.385	1.154	989	866	693	577	495	433	385
		3.0	8.00	7.07	1.697	1.414	1.212	1.061	849	707	606	530	471
		4.0	9.24	8.17	1.960	1.633	1.400	1.225	980	817	700	613	544

- Operating pressure at the nozzle (measured with diaphragm valve)
- The stated liter-per-hectare rates apply to UAN (28/1.28 kg/l)
- Verify the table values by gauging the flow rates prior to every spraying season
- Ensure uniform nozzle adjustment

Nozzle calculator app

The apps for Lechler agricultural nozzles make selection and use of the optimum nozzle even easier. Find out more here: **www.lechler.com/de-en/service/apps**

Ordering example:	Series	+ Nozzle size	+ Material	= Order no.
	FD	+ 06	+ (POM)	= FD 06

Intermediate and extension adapters

Intermediate adapter[1]

Lechler TWISTLOC system **092.163.56.00.22** Extension: 22 mm

Rau system **092.163.56.00.21** Extension: 20 mm

Hardi system **092.163.56.00.20** Extension: 17 mm

Agrifac system **092.163.56.00.29** Extension: 18.5 mm

Jacto system **092.163.56.00.24** Extension: 13 mm

Extension adapter and bayonet nipple[1]

MULTIJET system **092.163.56.00.23** Extension: 32 mm

MULTIJET bayonet nipple **092.163.56.00.26**

[1] Including gasket.

Liquid fertilizer nozzles
FS

Crop production | Ground care

- Orifice nozzle with vertical spray pattern
- Use on all boom types

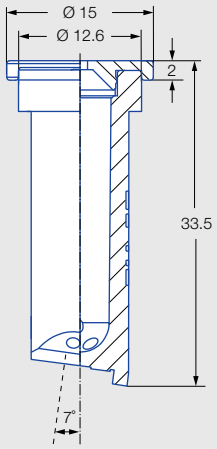
Advantages

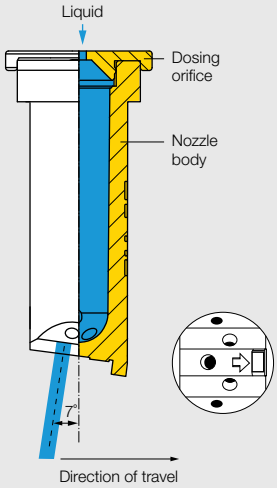
- 7° backward spray inclination reduces the jet force and ensures gentle application
- Optimized bore arrangement for enhanced cross distribution
- Nozzle sizes FS 06 to FS 15 with oval bores for gentle fertilizer jets – gentle application of large amounts
- Dosing orifice can be removed without tools for cleaning

Series FS

Orifice can be removed without tools

Dimensions in mm.





Application:

Liquid fertilizer delivery

Technical data:

Nozzle sizes
015–15

Spray angle
100°

Material
POM

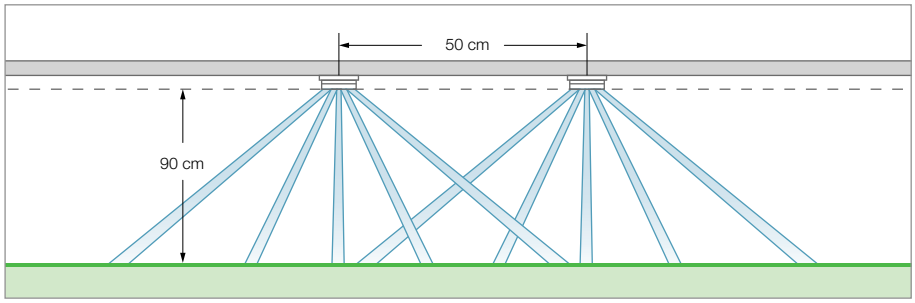
Pressure ranges
- FS 015 to -08: 1–4 bar
- FS 10 and 15: 1–3 bar

Recommended strainer
25 M

Droplet size
Ultra coarse

Width across flats
10 mm

Spray heights
80–**90**–100 cm



		[l/min]		UAN [l/ha] 0.5m								
		Water	UAN	5.0 km/h	6.0 km/h	7.0 km/h	8.0 km/h	10.0 km/h	12.0 km/h	14.0 km/h	16.0 km/h	18.0 km/h
FS 015 (25 M)	1.0	0.34	0.30	72	60	51	45	36	30	26	23	20
	1.5	0.42	0.37	89	74	63	55	44	37	32	28	25
	2.0	0.48	0.42	101	84	72	63	51	42	36	32	28
	2.5	0.54	0.48	114	95	81	71	57	48	41	35	32
	3.0	0.59	0.52	125	104	89	78	62	52	45	39	35
	4.0	0.68	0.60	144	120	103	90	72	60	51	45	40
FS 02 (25 M)	1.0	0.46	0.40	97	81	69	61	49	40	35	45	27
	1.5	0.57	0.50	120	100	86	75	60	50	43	56	33
	2.0	0.65	0.57	137	114	98	86	69	57	49	65	38
	2.5	0.73	0.64	154	128	110	96	77	64	55	72	43
	3.0	0.80	0.70	169	141	121	106	84	70	60	53	47
	4.0	0.92	0.81	194	162	139	121	97	81	69	91	54
FS 03 (25 M)	1.0	0.69	0.61	146	121	104	91	73	61	52	45	40
	1.5	0.84	0.74	177	148	127	111	89	74	63	56	49
	2.0	0.97	0.85	205	171	146	128	102	85	73	65	57
	2.5	1.09	0.96	230	192	164	144	115	96	82	72	64
	3.0	1.19	1.05	251	209	180	157	126	105	90	79	70
	4.0	1.37	1.21	289	241	207	181	145	121	103	91	80
FS 04 (25 M)	1.0	0.91	0.80	192	160	137	120	96	80	69	60	53
	1.5	1.12	0.99	237	197	169	148	118	99	84	74	66
	2.0	1.29	1.14	272	227	195	170	136	114	97	86	76
	2.5	1.44	1.27	304	253	217	190	152	127	109	95	84
	3.0	1.58	1.39	334	278	238	209	167	139	119	104	93
	4.0	1.82	1.60	384	320	275	240	192	160	137	121	107
FS 05 (25 M)	1.0	1.14	1.00	241	201	172	150	120	100	86	75	67
	1.5	1.39	1.22	294	245	210	183	147	122	105	92	82
	2.0	1.61	1.42	340	283	243	213	170	142	121	107	94
	2.5	1.80	1.58	380	317	272	238	190	158	136	119	106
	3.0	1.97	1.73	416	347	297	260	208	173	149	130	116
	4.0	2.27	2.00	479	400	342	300	240	200	171	150	133
FS 06 (25 M)	1.0	1.36	1.20	287	239	205	180	144	120	103	90	80
	1.5	1.67	1.47	353	294	252	220	176	147	126	110	98
	2.0	1.93	1.70	408	340	291	255	204	170	146	128	113
	2.5	2.15	1.89	454	378	324	284	227	189	162	143	126
	3.0	2.36	2.08	498	415	356	312	249	208	178	156	138
	4.0	2.73	2.40	577	480	412	360	288	240	206	180	160
FS 08 (25 M)	1.0	1.82	1.60	384	320	275	240	192	160	137	121	107
	1.5	2.23	1.96	471	392	336	294	235	196	168	148	131
	2.0	2.58	2.27	545	454	389	341	272	227	195	170	151
	2.5	2.88	2.53	608	507	434	380	304	253	217	191	169
	3.0	3.16	2.78	667	556	477	417	334	278	238	209	185
	4.0	3.65	3.21	771	642	551	482	385	321	275	241	214
FS 10 (25 M)	1.0	2.27	2.00	479	400	342	300	240	200	171	150	133
	1.5	2.79	2.46	589	491	421	368	295	246	210	184	164
	2.0	3.22	2.83	680	567	486	425	340	283	243	212	189
	2.5	3.60	3.17	760	634	543	475	380	317	272	238	211
	3.0	3.94	3.47	832	693	594	520	416	347	297	260	231
FS 15 (25 M)	1.0	3.41	3.00	720	600	514	450	360	300	257	225	200
	1.5	4.18	3.68	883	736	631	552	441	368	315	276	245
	2.0	4.83	4.25	1.020	850	729	638	510	425	364	319	283
	2.5	5.40	4.75	1.140	950	815	713	570	475	407	356	317
	3.0	5.91	5.20	1.248	1.040	892	780	624	520	446	390	347

- Operating pressure at the nozzle (measured with diaphragm valve)
- The stated liter-per-hectare rates apply to UAN (28/1.28 kg/l)
- Nozzle spacing 0.5 m
- Verify the table values by gauging the flow rates prior to every spraying season
- Ensure uniform nozzle adjustment

Nozzle calculator app

The apps for Lechler agricultural nozzles make selection and use of the optimum nozzle even easier. Find out more here: **www.lechler.com/de-en/service/apps**

Ordering example:	Series	+ Nozzle size	+ Material	= Order no.
	FS	+ 04	+ (POM)	= FS 04

Liquid fertilizer border nozzle
FB

Crop production | Ground care

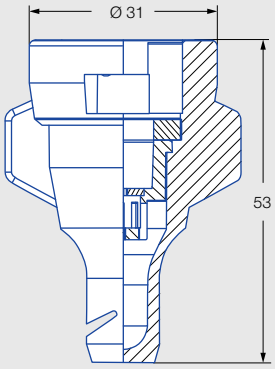
Dimensions in mm.

- Border nozzle compatible with FD series
- For right boom side

Advantages

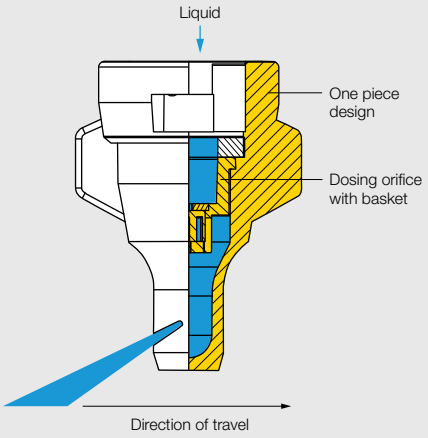
- 100 % uniform cross distribution up to the field edge:
  - Prevents hunger stripes (often seen with fertilizer spreaders)
  - No yield and quality drop at the field edge
  - Economical and environmentally friendly application of liquid fertilizers to the field edge without over/under dosing and losses
  - Compliance with the German Fertilizer Regulation
- No overspraying of the field boundary
- Corresponding FB border nozzle in same ISO color as FD nozzle

FB 100-03



Series FB

Pre-chamber can be removed without tools



Application:

Border nozzle | **Liquid fertilizer delivery** | **Greenhouse** | **Golf course**

Technical data:

Nozzle sizes
02–08

Spray angle
100°

Material
POM

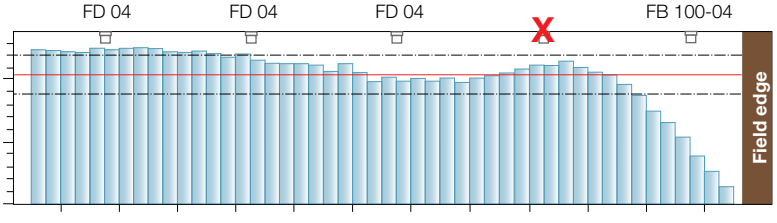
Pressure ranges
1.5–4 bar

Recommended strainers
- 60 M 02–04
- 25 M 05–08

Droplet size
Ultra coarse

Spray heights
50–70 cm

FD 04 – Cross distribution with border nozzle FB 100-04 on patternator (with water)



Pressure range: 3 bar
Spray height: 500 mm

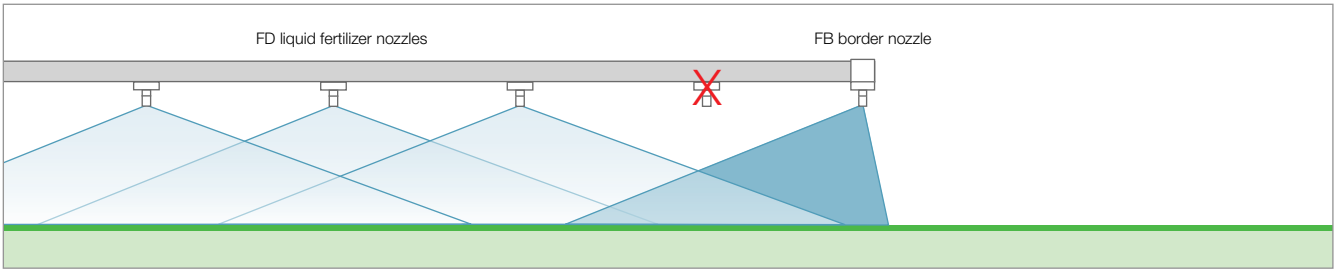
Electric border nozzle kit

- Retrofittable, compact 3-way valve with integrated nozzle holders
- Can be electrically controlled from the driver's seat
- Ideally suited for FB nozzles in combination with FD nozzles, IS nozzles in combination with ID nozzles, IDK nozzles in combination with IDKS nozzles, IDTA nozzles in combination with IS nozzles and IDKT nozzles in combination with IDKS nozzles

Advantages

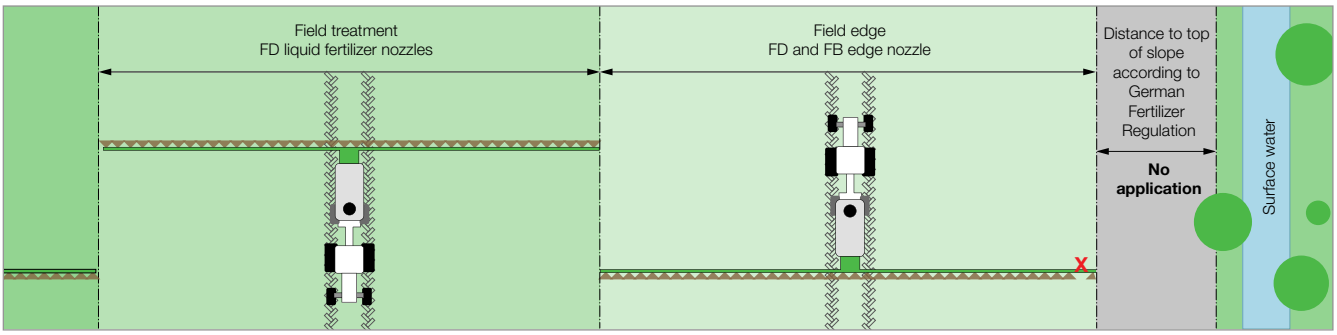
- Switchover without dismounting
- Fast switching in less than 1 second
- Minimum energy requirement, no power consumption during spraying
- All parts made of liquid fertilizer-resistant plastic or stainless steel

Order no. 065.290.00.00.00



The spray range of the FB border nozzle is matched to FD nozzles.

Note
When treating the field edge, the FD nozzle in position 2 must be deactivated in order to avoid overspraying.



FB nozzles permit precise liquid fertilizer application up to the boundary of protected zones.

Pressure range: 3 bar
Spray height: 500 mm

Good to know

You can find detailed information in our assembly instruction "Electric Border Valve Kit" and at **www.lechler.com/de-en/support**

Ordering example:	Series	+	Nozzle size	+	Material	=	Order no.
	FB	+	02	+	(POM)	=	FB 02

5-orifice nozzles
FL

Crop production | Ground care

Dimensions in mm.

- Orifice nozzle with horizontal spray pattern

Advantages

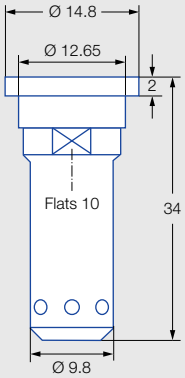
- Black, gray and stainless steel nozzle sizes can be combined with dosing orifices
- Change in delivery rate by changing the dosing orifice
- No leaf damage due to extremely coarse droplets
- Suitable for PWM

Installation instruction

Inscription on dosing orifice must face upward when inserted in the bayonet cap!

FL black

FL stainless steel



Series FL

Application:

Liquid fertilizer delivery

Dropleg[UL]

Technical data:

Bore diameter
0.8–1.8 mm

Spray angle
160°

Materials
- Nozzle housing: POM, stainless steel
- Dosing orifice: Stainless steel

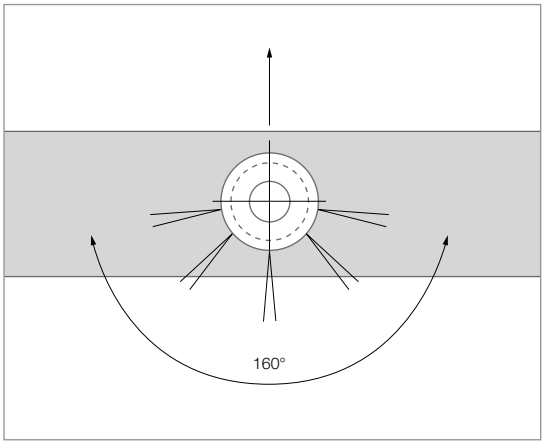
Pressure ranges
- Dosing orifice 0.8–1.0: **1–5** bar
- Dosing orifice 1.2: **1–4** bar
- Dosing orifice 1.5–1.8: **1–3** bar

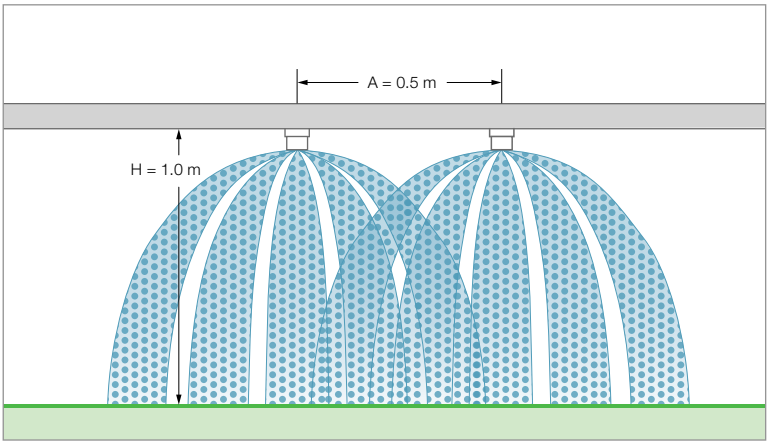
Recommended strainer
25 M

Droplet size
Ultra coarse

Width across flats
10 mm

Spray height
100 cm





Ø [mm]		[l/min] Water	[l/min] UAN	UAN [l/ha] 5.0 km/h	6.0 km/h	7.0 km/h	8.0 km/h	9.0 km/h	10.0 km/h	11.0 km/h	12.0 km/h	14.0 km/h	16.0 km/h	18.0 km/h
0.8/32	1.0	0.31	0.27	66	55	47	41	37	33	30	27	23	20	18
	2.0	0.43	0.38	91	76	65	57	51	46	41	38	33	29	25
	3.0	0.53	0.47	112	94	80	70	62	56	51	47	40	35	31
	4.0	0.61	0.54	129	108	92	81	72	65	59	54	46	40	36
	5.0	0.68	0.60	144	120	103	90	80	72	66	60	52	45	40
1.0/39	1.0	0.46	0.41	98	81	70	61	54	49	44	41	35	30	27
	2.0	0.65	0.57	138	115	98	86	77	69	63	57	49	43	38
	3.0	0.80	0.71	170	141	121	106	94	85	77	71	61	53	47
	4.0	0.92	0.81	195	163	139	122	108	98	89	81	70	61	54
	5.0	1.03	0.91	218	182	156	137	121	109	99	91	78	68	61
1.2/48	1.0	0.67	0.59	142	118	102	89	79	71	65	59	51	44	39
	2.0	0.95	0.84	202	168	144	126	112	101	92	84	72	63	56
	3.0	1.16	1.03	246	205	176	154	137	123	112	103	88	77	68
	4.0	1.34	1.18	284	237	203	178	158	142	129	118	102	89	79
1.5/59	1.0	0.98	0.87	208	173	148	130	115	104	94	87	74	65	58
	2.0	1.38	1.22	293	244	209	183	163	146	133	122	105	91	81
	3.0	1.69	1.49	359	299	256	224	199	179	163	149	128	112	100
1.8/72	1.0	1.39	1.23	295	246	211	184	164	147	134	123	105	92	82
	2.0	1.96	1.73	416	346	297	260	231	208	189	173	148	130	115
	3.0	2.40	2.12	509	424	364	318	283	255	231	212	182	159	141

- Operating pressure at the dosing orifice (measured with diaphragm valve)
- Lateral nozzle spacing 0.5 m
- Verify the table values by gauging the flow rates prior to every spraying season
- Make sure that the same dosing orifices are fitted in the nozzles
- The stated liter-per-hectare rates apply to UAN (28/1.28 kg/l)

Ordering

When ordering, please specify the order numbers of the nozzle and also the dosing orifice.

Recommendation

Use only gray 5-orifice nozzles **(Order no. 500.179.56.01.00)** in combination with large dosing orifices (1.5 and 1.8 mm).

Designation	Order no.
5-orifice nozzles FL (supplied without dosing orifices, please order separately)	
Stainless steel for all dosing orifice sizes	**500.179.16.00.00**
POM for dosing orifices with dia. 0.8/1.0/1.2 mm	**500.179.56.00.00**
POM for dosing orifices with dia. 1.2/1.5/1.8 mm	**500.179.56.01.00**
Dosing orifices	
0.8 mm/32 stainless steel	**050.030.1C.00.00**
1.0 mm/39 stainless steel	**050.030.1C.01.00**
1.2 mm/48 stainless steel	**050.030.1C.03.00**
1.5 mm/59 stainless steel	**050.030.1C.02.00**
1.8 mm/72 stainless steel	**050.030.1C.04.00**

Nozzle calculator app

The apps for Lechler agricultural nozzles make selection and use of the optimum nozzle even easier. Find out more here: **www.lechler.com/de-en/service/apps**

Hose drop system
5S and 5SL

Crop production

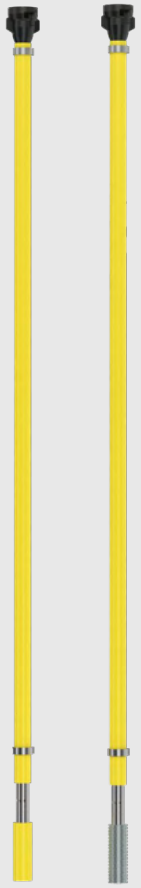
- Flexible hose drop system for late liquid fertilizer application

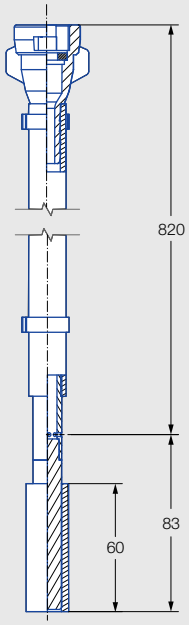
Advantages

- No scorching because weight-loaded 5-orifice tip is submerged in crop
- 5-orifice tip distributes the liquid fertilizer uniformly in the crop with 0.5 m hose spacing
- Lower boom loading when pulling through the crop in comparison with 0.25 m hose drop system
- Compliance with transport width through ideal adaption of the hose when the boom is folded
- Extension as spacer with hose attachment prevents paint damage to the sprayer when folded in
- Including bayonet cap system MULTIJET (incl. gasket) as standard

Series 5S/5SL

Dimensions in mm.





Application:

Liquid fertilizer delivery
- 5S: 50–300 l/ha UAN
- 5SL: 180–550 l/ha UAN

Technical data:

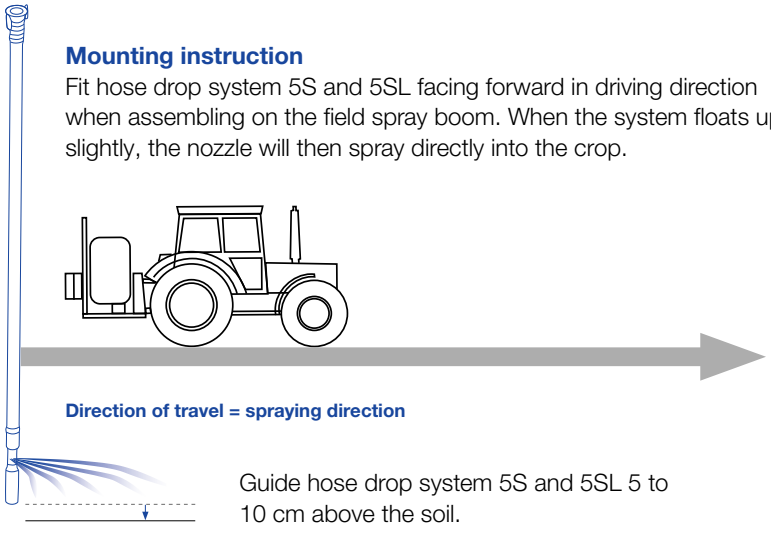
Hose spacing
- 0.5 m cereal crops, rapeseed
- 0.75 m corn

ISO dosing orifice
- 5S: 02 and 03
- 5SL: 04, 05 and 06

Spray angle
160°

Pressure ranges
1–5 bar

Assembly



Mounting instruction

Fit hose drop system 5S and 5SL facing forward in driving direction when assembling on the field spray boom. When the system floats up slightly, the nozzle will then spray directly into the crop.

Direction of travel = spraying direction

Guide hose drop system 5S and 5SL 5 to 10 cm above the soil.

	Ø [mm]		[l/min]		UAN (28) [l/ha] 0.5 m					UAN (28) [l/ha] 0.75 m				
			Water	UAN (28)	5.0 km/h	6.0 km/h	7.0 km/h	8.0 km/h	10.0 km/h	5.0 km/h	6.0 km/h	7.0 km/h	8.0 km/h	10.0 km/h
5S	02	1.0	0.46	0.41	98	81	70	61	49	65	54	46	41	33
		2.0	0.65	0.57	138	115	98	86	69	92	77	66	57	46
		3.0	0.80	0.71	170	141	121	106	85	113	94	81	71	57
		4.0	0.92	0.81	195	163	139	122	98	130	108	93	81	65
		5.0	1.03	0.91	218	182	156	137	109	146	121	104	91	73
	03	1.0	0.69	0.61	146	122	105	91	73	98	81	70	61	49
		2.0	0.97	0.86	206	171	147	129	103	137	114	98	86	69
		3.0	1.19	1.05	252	210	180	158	126	168	140	120	105	84
		4.0	1.37	1.21	291	242	208	182	145	194	161	138	121	97
		5.0	1.54	1.36	327	272	233	204	163	218	181	156	136	109
5SL	04	1.0	0.91	0.80	193	161	138	121	97	129	107	92	80	64
		2.0	1.29	1.14	274	228	195	171	137	182	152	130	114	91
		3.0	1.58	1.40	335	279	239	209	168	223	186	160	140	112
		4.0	1.82	1.61	386	322	276	241	193	257	214	184	161	129
		5.0	2.04	1.80	433	361	309	270	216	288	240	206	180	144
	05	1.0	1.14	1.01	242	202	173	151	121	161	134	115	101	81
		2.0	1.61	1.42	342	285	244	213	171	228	190	163	142	114
		3.0	1.97	1.74	418	348	299	261	209	279	232	199	174	139
		4.0	2.27	2.01	482	401	344	301	241	321	268	229	201	161
		5.0	2.54	2.25	539	449	385	337	269	359	299	257	225	180
	06	1.0	1.36	1.20	288	240	206	180	144	192	160	137	120	96
		2.0	1.93	1.71	409	341	292	256	205	273	227	195	171	136
		3.0	2.36	2.09	501	417	358	313	250	334	278	238	209	167
		4.0	2.73	2.41	579	483	414	362	290	386	322	276	241	193
		5.0	3.05	2.70	647	539	462	404	324	431	359	308	270	216

Description		Order no.
Hose drop system 5S		092.173.00.00.00
Dosing orifices		
ISO 02 (formerly: 1.0/39)[1]		600.500.56.02.40
ISO 03 (formerly: 1.2/48)[1]		600.500.56.03.40
Hose drop system 5SL		092.173.00.01.00
Dosing orifices		
ISO 04 (formerly: 1.5/59)[1]		600.500.56.04.40
ISO 05		600.500.56.05.40
ISO 06 (formerly: 1.8/72)[1]		600.500.56.06.40

Liter per hectare rates as for FL nozzle (see page 33).
[1] Stainless steel dosing orifice up to 2019.

Accessories

Description		Order No.
Securing clip		092.164.56.00.10
Extra-high 4 mm gasket		095.015.6C.02.85
Intermediate adapter for system Lechler TWISTLOC		092.163.56.00.22
Intermediate adapter for system Rau		092.163.56.00.21
Intermediate adapter for system Hardi		092.163.56.00.20
Intermediate adapter for system Agrifac		092.163.56.00.29

- Operating pressure at the dosing orifice (measured with diaphragm valve)
- Hose spacing 0.5/0.75 m
- Verify the table values by gauging the flow rates prior to every spraying season
- Make sure that the same dosing orifices are fitted in the hoses
- The stated liter-per-hectare rates apply to UAN (28/1.28 kg/l)

Recommendation
Relocation kit for variable row adaptation.

Order no.:
092.174.00.00.00
(see page 37).

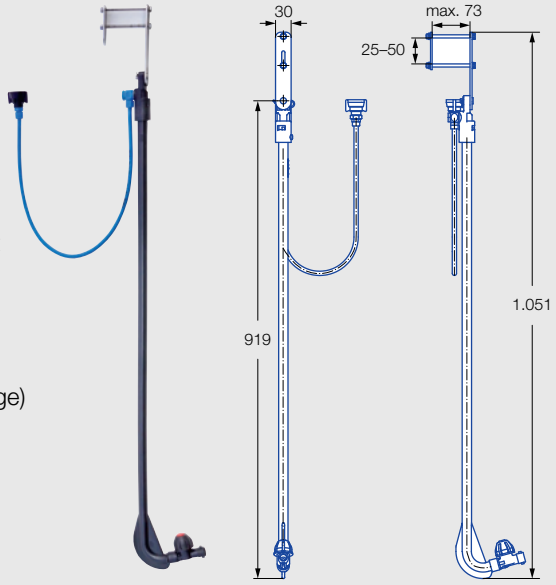
Nozzle calculator app

The apps for Lechler agricultural nozzles make selection and use of the optimum nozzle even easier. Find out more here:
www.lechler.com/de-en/service/apps

Accessories
Dropleg^{UL} with Y-Kit

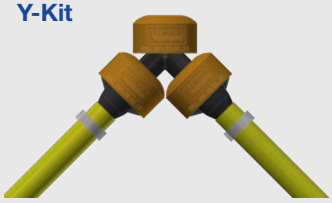
- Hose system for targeted application of liquid fertilizer in row crops

Advantages
- No scorching due to fertilizer application close to the ground
- Better N efficiency due to direct deposition on the row
- Higher yields due to fertilizer application at the ideal time (corn has the highest nutrient requirement from the 8-leaf stage)
- Easier compliance with fertilizer regulations
- Lower N losses due to application splitting



Dimensions in mm.

Y-Kit



Liter per hectare rates as for FL nozzle (see page 30).
[1] Stainless steel dosing orifice up to 2019.

Designation	Order No.
Y-Kit	092.176.00.00.00
Dropleg^{UL}	092.171.56.00.00
Dosing orifices	
ISO 02	600.500.56.02.40
ISO 03	600.500.56.03.40
ISO 04 (formerly: 1.5/59)[1]	600.500.56.04.40
ISO 05	600.500.56.05.40
ISO 06 (formerly: 1.8/72)[1]	600.500.56.06.40

Application:

Liquid fertilizer application

Technical data:

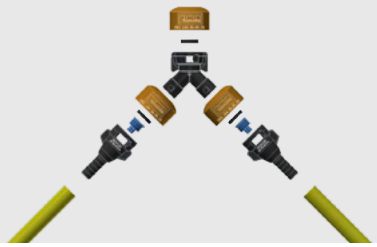
Dropleg^{UL} spacing
Flexible adaptation to row spacing

Pressure range
1–8 bar

ISO dosing orifice
02–06

Installation instruction for Y-Kit

Two metering orifices are needed for each Y-Kit.



Nozzle calculator app

Ø [mm]		[l/min]		UAN (28) [l/ha] 0,75 m				
		Water	AHL (28)	5.0 km/h	6.0 km/h	7.0 km/h	8.0 km/h	10.0 km/h
02	1.0	0.46	0.41	65	54	46	41	33
	2.0	0.65	0.57	92	77	66	57	46
	3.0	0.80	0.71	113	94	81	71	57
	4.0	0.92	0.81	130	108	93	81	65
	5.0	1.03	0.91	146	121	104	91	73
03	1.0	0.69	0.61	98	81	70	61	49
	2.0	0.97	0.86	137	114	98	86	69
	3.0	1.19	1.05	168	140	120	105	84
	4.0	1.37	1.21	194	161	138	121	97
	5.0	1.54	1.36	218	181	156	136	109
04	1.0	0.91	0.80	129	107	92	80	64
	2.0	1.29	1.14	182	152	130	114	91
	3.0	1.58	1.40	223	186	160	140	112
	4.0	1.82	1.61	257	214	184	161	129
	5.0	2.04	1.80	288	240	206	180	144
05	1.0	1.14	1.01	161	134	115	101	81
	2.0	1.61	1.42	228	190	163	142	114
	3.0	1.97	1.74	279	232	199	174	139
	4.0	2.27	2.01	321	268	229	201	161
	5.0	2.54	2.25	359	299	257	225	180
06	1.0	1.36	1.20	192	160	137	120	96
	2.0	1.93	1.71	273	227	195	171	136
	3.0	2.36	2.09	334	278	238	209	167
	4.0	2.73	2.41	386	322	276	241	193
	5.0	3.05	2.70	431	359	308	270	216

Accessories
Top Flow II
Electromagnetic flow meter

- Display of overall volume and flow rate
- Temperature range -15 °C to +65 °C
- Measuring accuracy 99%:
  1": 8–400 l/min
  2": 25–1.100 l/min
  3": 60–2.500 l/min
- Max. pressure: 10 bar at 20 °C

Advantages
- Self-calibrating
- Independent of density and viscosity
- Simple and fast assembly via manifold and FIXLOC connection
- Suitable for UAN and plant protection products

Including the following manifold fittings:

Manifold male adapter 1", 2" or 3" FP

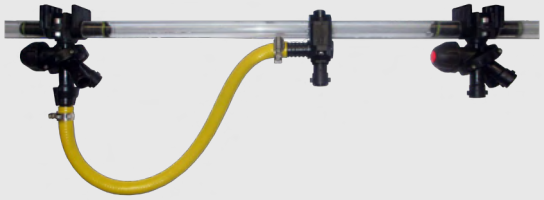
Manifold clamp

Manifold gasket EPDM

Designation	Order no.
1"	BMFM.100.CO.M0.00
2"	BMFM.220.CO.M0.00
3"	BMFM.300.CO.M0.00

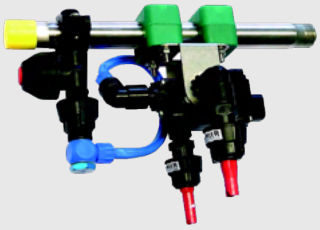
Note
Please observe the installation instructions.

Relocation kit



Description	Order no.
Variable row adaptation (e.g., corn 0.75 m row spacing) with relocation kit Installation on wet boom 1/2" (20–22 mm) 3/4" (25–28 mm) on request	092.174.00.00.00

Electric border nozzle kit



Description	Order no.
• Retrofittable, compact 3-way valve with integrated nozzle holders • Can be electrically controlled from the driver's seat • Ideally suited for FB nozzles in combination with FD nozzles	065.290.00.00.00

Good to know

You can find further information and our assembly instructions here:
www.lechler.com/de-en/support

Accessories
Useful aids

Nozzle cleaning brush

Order no.: **095.009.50.10.89**

Nozzle assembly wrench

Order no.: **092.179.56.40.91**

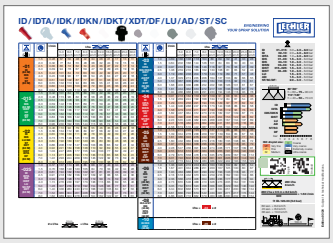
Sample bag

Field crops
Order no.: **092.251.00.00.00 / 872585**

Viticulture, orchard and specialty crops
Order no.: **092.251.00.10.00 / 872586**

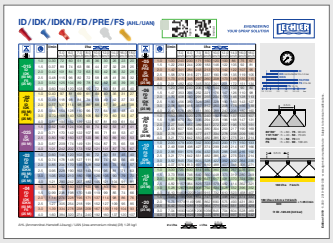
Spray table for arable crops

DIN A4



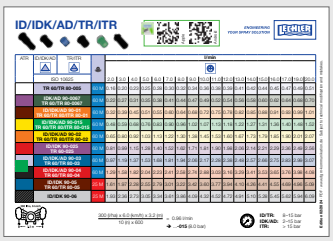
Spray table for arable crops UAN

DIN A4



Spray table for viticulture, orchard and specialty crops

DIN A5



VR assembly tool

The Lechler VR assembly tool facilitates aligned installation of the VR insert (stainless steel) including gasket.
Order no.: **6VR.000.56.10.00**

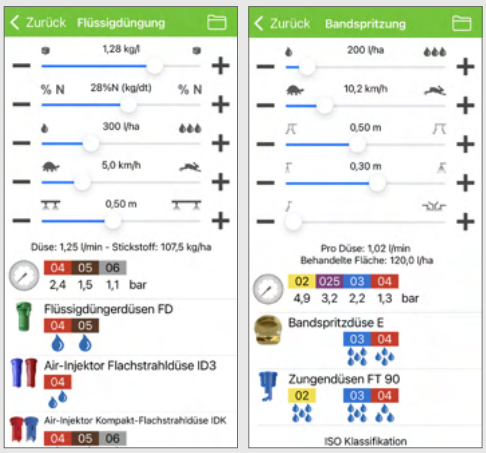
Nozzle calculator app

The Lechler agricultural nozzle app makes it easy to select the right nozzle for your application.

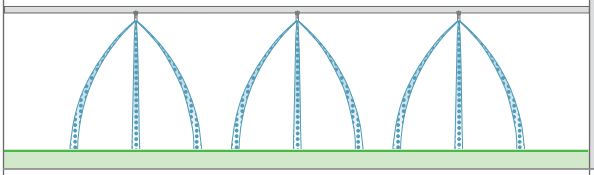
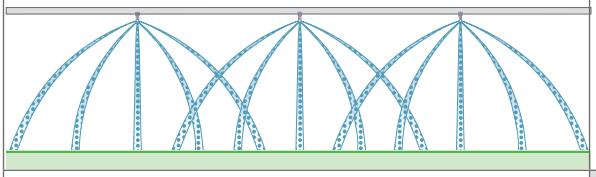
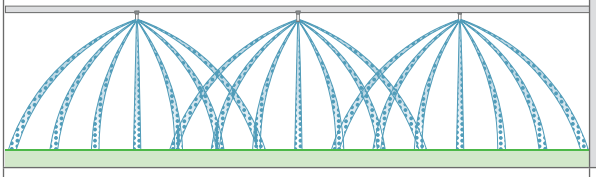
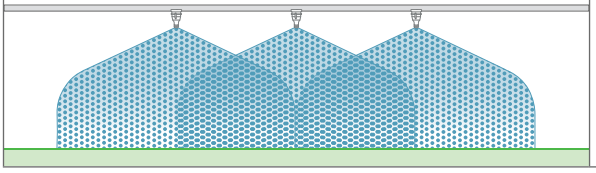
On the basis of the selected sprayer speed and application rate, the nozzle shows you the suitable nozzles and corresponding droplet size categories. This allows you to quickly find the suitable Lechler nozzle and thus optimize your application.

All values are based on measurements with water.

Apple Android



CHARACTERISTICS OF DIFFERENT LIQUID FERTILIZER NOZZLE TYPES

	Droplet size	Risk of scorching	Distribution	Harmful impact	Risk of striping effect
3-orifice nozzles (vertical jet) 		+	– –	– –	– –
  **Lechler 5-orifice nozzles (FS: vertical jet; FL: horizontal jet)** 		+	○	○	○
7-orifice nozzles (horizontal jet) 		–	○	+	○
 **Lechler liquid fertilizer nozzlesFD/VR (horizontal spray)** 		++	++	++	++

++ = very good/very low
+ = good/low
○ = satisfactory
– = high
– – = very high/poor

Optimum and uniform lateral distribution and plant-friendly liquid fertilizer application using FD 06:

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Edition 04/25 · EN · PDF · www.dgm-kommunikation.de
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