LECHLER AGRICULTURAL SPRAY NOZZLES – GOOD FOR YOUR CROP, GOOD FOR THE ENVIRONMENT

Lechler is a world leader in nozzle technology. For over 135 years, we have pioneered numerous groundbreaking developments in the field of nozzle technology. Comprehensive nozzle engineering know-how is combined with a deep understanding of application-specific requirements to create products that offer outstanding precision, reliability and durability.

Modern plant protection involves more than just the use of environmentally friendly chemicals. It is above all a question of precision. In order to achieve uniform coverage, the droplets must reach the target as exactly as possible. Losses due to drift, run-off or evaporation should be avoided – in favour of the environmental protection.

The application technology and here particularly the plant protection nozzles must therefore meet very high requirements. Today, nozzles must offer a degree of precision that would have been considered impossible just a few years ago.

As a globally leading manufacturer of precision nozzles, Lechler is ideally prepared to meet this challenge. For decades now, our products have set the technological standards in the fields of crop protection and liquid fertilizer application. Through regular and extensive investment in research and development, we ensure that this will also remain the case in the future. The functions and characteristics of our precision nozzles are defined exactly and objectively right from the start. This process is based on sophisticated measuring techniques and our proven documentation system.

State-of-the-art design and simulation techniques guarantee practically-oriented products with a high practical value.

With Lechler nozzles, one spray jet is the same as the next. This demands a high level of precision and care in production. Our processes are therefore subject to permanent quality control measures, from the incoming goods department, through development and production right up to dispatch. Our quality management system is based primarily on the requirements of our customers and is certified in accordance with ISO 9001:2008. Lechler nozzles comply with the requirements of the Julius Kühn Institute, the German Plant Protection Act as well as European EN and international ISO standards.

Thanks to close cooperation and active exchange of information with official test institutes, the chemicals and liquid fertilizer industry, the equipment manufacturers and last but not least agricultural consultants, we also ensure that we are fully up-to-date on current practical requirements. After all, one thing is certain: solutions for practical applications can only be developed from practical knowledge.

This catalog contains our comprehensive Lechler agricultural spray nozzle and accessory range so see for yourself our product range.
Therefore success is not a final state for us, but simply a further step on the way to even greater perfection.

### CONTENT

<table>
<thead>
<tr>
<th>Issues and details about liquid fertilizer (LF)</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefits of LF</td>
<td>4</td>
</tr>
<tr>
<td>Constitution and characteristics of LF variances</td>
<td>5</td>
</tr>
<tr>
<td>Application of LF in a future orientated agriculture</td>
<td>7</td>
</tr>
<tr>
<td>Good agricultural praxis for application of LF</td>
<td>12</td>
</tr>
<tr>
<td>Nozzle guide for LF</td>
<td>13 – 17</td>
</tr>
<tr>
<td>Preparation of the mixture</td>
<td>18</td>
</tr>
<tr>
<td>Good agricultural praxis for application of LF</td>
<td>12</td>
</tr>
<tr>
<td>Nozzle guide for LF</td>
<td>13 – 17</td>
</tr>
<tr>
<td>Preparation of the mixture</td>
<td>18</td>
</tr>
<tr>
<td>Basics of nozzle technology</td>
<td>20</td>
</tr>
<tr>
<td>Product information</td>
<td></td>
</tr>
<tr>
<td>Air-injector flat spray nozzles ID3</td>
<td>22</td>
</tr>
<tr>
<td>Air-injector flat spray compact nozzles IDK/IDKN</td>
<td>24</td>
</tr>
<tr>
<td>Pre-emergence flat spray nozzle PRE</td>
<td>26</td>
</tr>
<tr>
<td>Liquid fertilizer nozzles FD</td>
<td>28</td>
</tr>
<tr>
<td>5-orifice nozzles FL</td>
<td>30</td>
</tr>
<tr>
<td>Hose drop system for boom sprayers</td>
<td>32</td>
</tr>
<tr>
<td>Hose drop system 5S</td>
<td>34</td>
</tr>
<tr>
<td>Accessories</td>
<td></td>
</tr>
<tr>
<td>VarioSelect®/VarioSelect® II</td>
<td>36</td>
</tr>
<tr>
<td>TopFlow II – Electro magnetic flow meter/Pumps</td>
<td>37</td>
</tr>
<tr>
<td>Characteristics of different LF nozzle types</td>
<td>38</td>
</tr>
</tbody>
</table>
BENEFITS OF LIQUID FERTILIZER

Economical advantages not only in combination with pesticides

The nitrogen price of LF is very often lower compared to the granulated fertilizer. The application of LF in combination with pesticides reduces additionally the operational costs. On average the price of LF has been 15 % below the granulate version. In addition the operational application costs can be reduced by 2.5 – 3 Euro per hectare with combined application and savings in transport and handling (SKW/2011).

Accurate and even distribution of LF with increased output

Flat fan or special fertilizer nozzles from the Lechler quality range guarantee a precise and unique application to the field borders. This can be achieved also with wider working widths and is less affected by wind conditions compared to a granulate spreader.

Higher efficiency of fertilizer – less leaching losses

LF can be absorbed also by the leaves. Especially in dry periods the fertilizer can be more effective. An adapted splitting on the crop request and growth stadium can be realized easily. This eliminates nitrogen leaching into the ground – important for areas with water protection requirements.

LF application in combination with pesticides

The mixture of LF with pesticides, nutrients and growth regulators has a number of advantages:
- Reduction of passes in the field
- Increased output in the high season
- Protection of environment
- Cost reduction in crop care

Less drift

By adding LF the droplet evaporation can be reduced and limits atmospheric pollution.

Improved efficiency of the added pesticides

LF improves the coverage at the crop and enhances the adhesion of droplets. The absorption of the pesticides via leaves is much higher. In combination with herbicides the LF enables a reduction of the herbicides quantity without loss of efficiency, in numerous cases.

Essential requirements for combined applications of LF and pesticides

The following criteria should be fulfilled for a successful combined application:
- Compliance for the manufacturers guide lines (LF & pesticide)
- Coherence of the time schedule (fertilizer – plant protection)
- Compatibility of the individual components
- Minimum application rate of 150 l/hectare
- Use of injector nozzles at low pressure level and high drift classification
- Crop tolerance of spray tank mixture

Important for a successful combined application are the quality of LF and the compliance of the pesticides manual instructions. This is especially related to the potential volume of pesticide reductions and the application conditions.
**CONSTITUTION AND CHARACTERISTICS OF LF VARIANCES**

<table>
<thead>
<tr>
<th>UAN (urea-ammonium nitrate)</th>
<th>External temperature and behavior of LF</th>
</tr>
</thead>
<tbody>
<tr>
<td>UAN (liquid urea-ammonium nitrate) is the most popular type of LF. Pure UAN includes 28 % N by weight nitrogen. 50 % of the nitrogen is amide (+NH₂), app. 25 % is ammonium (NH₄⁺) and the other quarter is nitrate (NO₃⁻). LF with premium quality should possess a high surface tension, a neutral pH value and a level of Biuret below 0.2 – 0.3 %. Amide nitrogen is available for the crop 1 – 2 days after application. The ammonium and nitrate components can be absorbed by the leaves and roots directly after the application. LF has a different density to water – this means at the same pressure level there are different flow rates. If LF is mixed with water the spray parameters of water are relevant. The mix ratio of water – LF should be 3 : 1 volume relation, better 4 : 1, otherwise the risk of scorching the crop increases. The higher densities of LF are increasing loads on the sprayer tank and axles of the sprayer. Attention should be paid to the maximum technical loading data of the equipment. LF has a minimum critical temperature. LF 28 for instance with a density of 1.28 g/cm³ is stable down to a temperature of -17 °C. Below this temperature particles are crystallizing and separate. This causes a clogging of filters, nozzles and other sprayer components. LF with a density of 1.30 will crystallize at -9 °C, and with a density of 1.32 at 0 °C. For these variances the conditions of storage, transport and application should be above the depth of frost penetration. It should be watered down; an excellent agitation system is required for this thinning process. Despite the density LF has a higher viscosity. In early spring time at low temperature conditions there is a larger difference between the pressure in the boom line and the pressure gauge. Sprayers without electronic measurement of the fluid (flow meter) should be calibrated by use of a measuring cup before starting the application. If necessary the pressure level should be adjusted and can be between 0.1 and 1.0 bar above spray table values.</td>
<td></td>
</tr>
</tbody>
</table>
**CONSTITUTION AND CHARACTERISTICS OF LF VARIANCES**

**LF with high level sulfur components**

Some LF has an additional sulfur component, which enables effective fertilizing in agricultural and nursery crops. The sulfur is available in 2 different chemical varieties. Firstly as ammonium sulphate, which is immediately available for the plant. The other variant is ammonium thio sulphate; this reacts more slowly with the soil. Step by step the crop absorbs the different components on request.

This sulfur LF can be sprayed like pure LF (gentle application of UAN on the crop), because it can be mixed with pesticides as well and has a high compatibility to the crop. The total content of nitrogen can achieve a level of 20 – 27 % and the water soluble sulfur is 3 – 8 %.

**LF with lower level of sulfur components**

Liquid ammonium sulphate includes minimum 8 % ammonium nitrogen and 9 % water soluble sulfur. If this LF is applied by a field sprayer onto the leaves the pH value should have a level of 5.5 – 6. Attention: Liquid ammonium sulphate can be very acidic! This LF is often sprayed to accelerate the straw rotting process by spraying 280 l/ha, the rate of nitrogen is then 30 kg N/ha. This type of LF cannot be mixed with fluid potassium fertilizer or alkaline partner components.

**N-P solutions**

This LF has 34 % phosphor by weight and 10 % ammonium nitrogen share. Both components can be absorbed also via the leaves. Often NP is mixed with nitrogen LF. The relation of mixing is flexible and should be done on the crop request N : P₂O₅.

For the NP as well as for the mixture with nitrogen LF the application tables for LF are relevant (see page 21).

**Liquid Urea**

LU is contrary to LF nitrogen or NP solution, an organic, almost neutral liquid. Therefore this is less corrosive. The best crop tolerance can be achieved at an urea concentration of 0.5 – 3 %, for grain up to 10 %. A problem is the limited solution capability. The dilution process of 10 kg N (= 22 kg urea) takes so much energy from the water that a water temperature of 15 °C will drop to zero. During this diluting process the temperature declines and the dilution is getting worse again. A professional agitation system is evidently required. Mostly this process is managed by stationary equipment, not by the sprayer. The application rate can be determined by the application tables of water using the correcting factors (see page 21).

<table>
<thead>
<tr>
<th>Type of LF</th>
<th>Specific weight [kg per liter]</th>
<th>Nutritional value 110 Liter N-solution includes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>kg N</td>
<td>kg P/S</td>
</tr>
<tr>
<td>LF-28 (N-solution)</td>
<td>1.28</td>
<td>36</td>
</tr>
<tr>
<td>NP-solution-10/34</td>
<td>1.38</td>
<td>14</td>
</tr>
<tr>
<td>LF-S-solution</td>
<td>1.28</td>
<td>31</td>
</tr>
<tr>
<td>LF-S 25/6</td>
<td>1.31</td>
<td>33</td>
</tr>
<tr>
<td>ASL-solution</td>
<td>1.24</td>
<td>10</td>
</tr>
<tr>
<td>Liquid urea</td>
<td>1.10</td>
<td>22</td>
</tr>
</tbody>
</table>
APPLICATION OF LF IN A FUTURE ORIENTATED AGRICULTURE

Guest comment of Mr. Fuchs, SKW, LF application research department

The demands of the worldwide markets force the farms to optimize the special intensity, means also lowering costs. One opportunity is the substitution of granulated fertilizer by liquid variances. The advantages are not only based on the cheaper nitrogen price.

LF includes further positive characteristics which contribute to a positive result. One characteristic is the same but mostly higher efficiency of LF compared to granulate. But in practice there is still uncertainty about the uptake via leaves and the risk of scorching. High scorching will lead to lower yield. Therefore the right choice out of the variances of LF is required for a successful fertilizing.

Additionally the right nozzle and application technology contributes to a positive result.

Impact of LF

In Germany the percentage of LF in relation to the total nitrogen market stayed on average last 10 years at a level of 13 – 15 % constantly. In the same period the granulated KAS dropped down from 61 to 50 %. The most applied LF was a LF with a share of 28 – 30 % nitrogen. This kind of LF is tolerated best by the crops.

Very positive effects can be gained with the new PAISIN-S 25/6 and Alzon Liquid - S25/6 (25% N, 6% S).

The optimum concentration of sulfur is 3 – 5 %, due to crop tolerance. The sulfur in the combined N-/S-LF is available immediately for the crop, as sulfate or ammoniumthiosulfate.
APPLICATION OF LF IN A FUTURE ORIENTATED AGRICULTURE
Guest comment of Mr. Fuchs, SKW, LF application research department

Uptake via soil (roots) or leaves

Researches of industry and governmental institutes verify the efficiency of LF in comparison to granulated fertilizers. (See table 1) Scientific researches confirm that during a vegetation period the kind of fertilizer used influence on the yields is only marginal, but in the average a number of years there is no significant difference. But in a dry spring and early summer time periods LF has evident advantages compared to granulated ones.

The reason is related on a higher level of leaves uptake of LF.

The question if the N fertilizer application should be granulated or liquid is secondary. Important is the price-ratio performance and the technical resources of the farm. From the experience there are no big differences between the most common fertilizers KAS, nitrogen-LF and urea. This is valid if all basic rules and requirements have been fulfilled.

Table 1: Comparison of yields fertilized without or different types of nitrogen, average of yields 1993 – 2010, 3 different test areas in Saxonia, Niedercunnersdorf, Trossin and Rosenow.

<table>
<thead>
<tr>
<th></th>
<th>Cereal</th>
<th>Rapeseed</th>
<th>Corn</th>
<th>Potatoes</th>
<th>Sugar beets</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of tests</td>
<td>155</td>
<td>15</td>
<td>25</td>
<td>28</td>
<td>21</td>
<td>244</td>
</tr>
<tr>
<td>without N</td>
<td>67</td>
<td>73</td>
<td>90</td>
<td>82</td>
<td>94</td>
<td>74</td>
</tr>
<tr>
<td>PIASAN® 28</td>
<td>100 (90.1 dt/ha) yield</td>
<td>100 (40.6 dt/ha) yield</td>
<td>100 (97.7 dt/ha) yield</td>
<td>100 (432 dt/ha) yield</td>
<td>100 (677 dt/ha) yield</td>
<td>100</td>
</tr>
<tr>
<td>KAS</td>
<td>100</td>
<td>99</td>
<td>99</td>
<td>99</td>
<td>99</td>
<td>100</td>
</tr>
</tbody>
</table>

LF quality secures yield

LF is a pressure less fluid which can be applied by conventional plant protection sprayers. Besides the application technology the quality of the LF is important for a successful crop adaption. The risk of scorching is then very low under all conditions, also in very sensitive situations. This is also valid in combination with pesticide application.

Positive experiences enable the farmer to repeat this in the following years. Premium quality LF, like PAISIN® 28 from SKW guarantees beside a precise labeled nitrogen component:

- High surface tension
- pH value close to neutral
- Low level of Biuret content

These quality characteristics are not mentioned in the governmental fertilizer directives but are essential for the successful application of LF.
LF quality essential for crop tolerance

It is well known that upon critical application conditions and sensitive crop situations the quality of LF influences the crop tolerance preferably. Pictures 1 and 2 show the LF application in winter wheat at BBCH stadium 32 – 37, the first with high the other one with low surface tension. The farmer can easily see this. LF with high surface tension creates big drops on the leaf. With low surface tension there is a complete coverage.

The application technology should be chosen to adapt to different situation. The basic rule is: The more sensitive the crop surface is the use of coarse drops at reduced spraying pressure should be used.

Picture 1: LF application with high surface tension (70 mN/m)
Picture 2: LF application with low surface tension (30 mN/m)
APPLICATION OF LF IN A FUTURE ORIENTATED AGRICULTURE

Guest comment of Mr. Fuchs, SKW, LF application research department

Risk of lower yields can be eliminated

There have been a lot of field trials made with obvious wrong application features. The application with conventional flat fan nozzles on negative conditions (morning dew, permanent rain before) caused in late stadium in winter wheat leaf necrosis on average of 13%. The consequences of this necrosis were lower yields of 10%.

This compared to test variances of LF applied by hose drops or KAS granulates. There was no difference in the level of raw protein. Nevertheless these losses of yield are not acceptable. The relation of yield losses compared to the scorched crop surface is relatively small. Before every application it is important to identify the right application technology for minimizing scorching on the crop. Picture 3 shows that identical application conditions with the same nozzles the quality of the LF becomes important. The differences between the variances are caused by the quality of LF, in this case the physical characteristic of surface tension. The LF with lower surface tension scorched much more leaves and the result were lower yield. Before buying the LF the quality characteristics have to be checked.

Application at late stadium in winter grain – no problem

The technical development has helped a lot to eliminate any possible damage during the last nitrogen application in winter grain shortly before the ears are appearing. Orifice nozzles, FD nozzles, hose drop or tube drop systems offer the opportunity to apply LF also in the late stadium between 32 – 49/51. There is no difference in the level of raw protein or yield of winter wheat fertilized by granulate or LF.

A couple of scientific researches support these facts.

When the ears have appeared the LF should be applied only by hose drop or tube drop systems. A combination with pesticide application is not possible under these conditions.

Precise application on the target

LF offers a positive opportunity to fulfill the ever increasing environmental consciousness of the farmers and directives from society. With extremely precise calibration and distribution a sustainable application in the field, precisely ending at the field border is achieved.

No uncontrolled application can occur outside the boundaries of the field. New technologies with N-sensors or GPS connection realize an application on partial areas demand, this means precision farming. Meanwhile there are nitrogen stabilized LF available which contribute to positive environmental effects and avoid uncontrolled leaching. FD nozzles are well prepared for partial area application. Changes in the pressure don’t influence the droplet size negatively; the extremely coarse drops remain and are excellent for the crop tolerance.

A higher pressure does not affect the impact of the droplets when the droplets touch the leaves. The droplets fall down only by gravity and not by the pressure of the sprayer.
**LF and precision farming**

Spreaders for granulate and sprayers for LF are able to apply on partial areas in the field. Sprayers are equipped with valves which can adapt very fast and precise to the crop/GPS map demand. For instance Vario Select is able to add or reduce number of nozzles without modifying the pressure.

This system allows varying the application rate in a range of 500 % and this at a constant low pressure level and precisely within the working width.

**Fertilizer systems for the future**

Precision farming is the answer to a lot of economical and environmental questions. One integral part of this future agriculture will be new technologies which improve the efficiency of nitrogen fertilizer including precision farming via GPS. Further new variances of N fertilizer with more stabilized components support modern agriculture, means saving costs and preserve the environment. Balanced nutrients reduce not only the pollution of environment.

This means also to utilize full virility of fertilizer and to rescue the fertility of the soil. LF is an excellent tool especially due to precise calibration and application. As there is no significant difference between the fertilizers variances it is not the most important question which N fertilizer should be applied. Much more important is to follow up the different application guide lines and to work on the conditions of best practice.

---

**Picture 3: Relationship between surface extension of LF and the treatment level of the crop, yields and crude protein level, average of 5 tests during 2004 – 2008.**
Which crop is not suited to LF application?

LF can be applied in nearly all crops if the application rate is applied at the right time by the correct technology.

Before the application is started attention has to be paid to the growth stadium of the crop and the application technology.

Optimum conditions are:

- Medium to coarse droplet sizes
- Application into dry crops, preferably in the afternoon, early evening (not onto morning dew or directly after rainy period)
- Wait 1 – 2 days after a rainy period that the waxy layer is regenerated
- External temperature should be in a range of min. -5 ° and max. 25 °Celsius
- Strong dry frozen crop, but not on partially frozen crop or if the process of defrosting has already started
- Mixture water : LF min. in a ratio 3 : 1
- Application before germination max. up to 3 days after seeding
- Pure UAN application onto crop up to 250 l/ha with ID3 or IDK/IDKN. > 250 l/ha with FD.
In winter grain LF can be applied during the dormancy period onto the frozen crop, the rate can be 60 – 100 kg N/ha. The crop should have min. 3 – 4 leaves and should possess an excellent strong root system. Further combinations of LF are possible with growth regulators. If the stem elongation has started, the max. rate of LF in combination with pesticides should be max. 50 l/ha LF, density 1.28 kg/m3.

The relation water : LF should be min. 3 : 1. The following spraying jobs against Cercospora or leaf diseases can be combined with LF. Morpholines should be not in the mixture. If an application of over 50 l/ha LF (i.e. 150 l/ha) in the later vegetation is required, injector nozzles should not be used. Orifice or FD nozzles, DroplegUL, hose/tube drop systems are preferably in use. When the ears are appearing respectively the leaf sheaths are opening LF applications should be done only by DroplegUL, hose/tube drop systems to exclude any leaf scorching. In general attention should be paid to the handling instructions of pesticides and the suitability of mixing with LF!

In general, attention has to be paid to the handling instructions of pesticides and the compatibility with LF!

---

**Nozzle recommendation at the beginning of vegetation 150 – 280 l/ha LF:**
- FD 03 to 10, PRE
- FL grey with Dosing orifices 1.2/1.5/1.8
- ID3 120-025 to -08
- IDK/IDKN 120-03 to -06

**2nd N-application 60 – 170 l/ha pure LF or in combined application of LF + water + PSM:**
- FD 03 to 06 (pure LF)
- ID3 120-01 to -05
- IDK/IDKN 120-015 to -06

**Final application 140 – 170 l/ha LF:**
- FD 03 to 05, PRE
- FL black with Dosing orifices 1.0/1.2 or FL grey with Dosing orifices 1.2/1.5
- Hose drop system SS with Dosing orifice 1.0/1.2
- Hose drop system with Dosing orifice 0.8
- DroplegUL with FL black and Dosing orifices 1.0/1.2 or FL grey and Dosing orifices 1.2/1.5
In winter rape in total 200 kg N/ha can be applied, spitted into 2 applications during the vegetation period. This can be done with pure UAN by nozzles or hose/tube drop systems.

**Nozzle recommendation at the start of germination 220 – 350 l/ha:**
- FD 04 to 10, PRE
- FL grey with Dosing orifices 1.5/1.8
- ID3 120-04 to -08
- IDK 120-05 to -06

2nd N-application until generation of buds 170 – 280 l/ha LF:
- FD 03 to 08, PRE
- FL grey with Dosing orifices 1.2/1.5/1.8
- Hose drop system 5S with Dosing orifice 1.2
- Hose drop system with Dosing orifice 1.0

Application during flowering 50 l/ha LF + water + fungicides/insecticides:
- IID3 120-025 to -05
- IDTA 120-025 to -05
- IDK/IDKN 120-03 to -06
- IDKT 120-03 to -06
Corn is very sensitive to the application of LF directly onto the leaves. An application before germination in combination with herbicides is no problem. The addition of a dinitrification inhibitor is recommended. Later applications directly into the crop should be done by DroplegUL or hose drop systems.

Nozzle recommendation before seeding until 3 days afterwards 280 – 500 l/ha LF:
- FD 04 to 15, PRE
- ID3 120-04 to -08
- IDK 120-05 to -06

Combined application of LF + pesticides (before germination) 200 – 400 l/ha:
- ID3 120-03 to -08
- IDK/IDKN 120-04 to -06

2nd N-application until 8 leaves stadium 80 – 170 l/ha:
- Hose drop system 5S with Dosing orifice 1.0/1.2
- Hose drop system with Dosing orifice 0.8
- DroplegUL with FT 1.5-408 to 3.0-528 or FL grey with Dosing orifices 1.2/1.5/1.8
In sugar beets the LF can improve the total yield as well as the increase of sugar content compared to granulated fertilizer KAS. With the basic application before seeding up to 120 kg N/ha can be applied. During the vegetation period from 4 leaves stadium onward not more than 40 kg N/ha (≈ 110 l LF, 1.28 density) per application, should be applied after dry periods.

The interval of time to the herbicide applications should be min. 3 days before or after the herbicide application. This aspect is very important if oil adjuvants are applied in the mixture with herbicides. In combination with insecticides LF can be applied to a max. level of 50 l/ha in combination with a water rate of 150 – 200 l/ha.

Nozzle recommendation before 1 week of seeding 170 – 335 l/ha (total amount of nitrogen):
- FD 03 to 10, PRE
- FL grey with Dosing orifices 1.2/1.5/1.8
- ID3 120-025 to -08
- IDK/IDKN 120-03 to -06

Until 3 days after seeding 220 l/ha:
- FL grey with Dosing orifices 1.2/1.5
- FD 03 to 06, PRE
- ID3 120-025 to -05
- IDK/IDKN 120-03 to -06

Combined application of LF (max. 50 l/ha) + water + insecticides:
- ID3 120-02 to -03
- IDTA 120-02 to -03
- IDK/IDKN 120-025 to -04
- IDKT 120-025 to -04

2nd N-application from 6 leaves stadium until end of May shortly before the rows are closing 80 – 110 l/ha LF:
- FD 03
- Hose drop system 5S with Dosing orifice 1.0
- Hose drop system with Dosing orifice 0.8
- FL black with Dosing orifices 0.8/1.0
- ID3 120-015 to -03
- IDK/IDKN 120-02 to -04
In potatoes the combination of pesticide and LF application is evident to reduce the number of passes.

1. Application before planting
2. Application of 60 l/ha pure LF or in combination with herbicides
3. Add up to 10 kg N/ha LF to every application against Phytophthora

Nozzle recommendation before planting
- 170 – 335 l/ha LF: FD 03 to 10, PRE, FL grey with Dosing orifices 1.2/1.5/1.8, ID3 120-025 to -08, IDK/IDKN 120-02 to -05

2nd N-application 110 – 170 l/ha pure LF or in mixture with water and herbicides:
- FD 03 bis 05 (pure LF), PRE (Pre emerge with Clomazone), ID3 120-02 to -05, IDK/IDKN 120-03 to -06

Combined application of LF (max. 30 l/ha) + water + fungicides:
- ID3 120-025 to -05, IDTA 120-025 to -05, IDK/IDKN 120-03 to -06, IDKT 120-03 to -05

Before crop cover:
- Hose drop system 5S with Dosing orifice 1.0
- Hose drop system with Dosing orifice 0.8

Max. 30 l/ha UAN together with potato blight application
PREPARATION OF THE MIXTURE

LF in combination with pesticides

The coverage on the crop (leaves, stem, a.o.) and the adhesion of pesticides can be improved by adding LF. The adsorption of the pesticides via leaves will be higher. This allows sometimes a reduction of the pesticide input without losing efficacy. Further the addition of LF reduces the thermal drift. A splitting of the LF application into diverse single applications, pure or mixed with pesticides is possible during the complete vegetation period. The combined application saves a lot of costs especially the direct application costs in the high crop care season of a farm.

LF pure

LF nitrogen N or with a phosphorus element NP, can be mixed with pesticides instead of water. Herbicides which are applied relatively early are good partners to mix with LF. The instructions of pesticides manufacturers have to be followed strictly, as effect of chemical may become stronger with LF. The label has to be checked for the possibility of reducing chemicals. Those applications must be sprayed with nozzles and cannot be done by hose/tube drop systems.

Tank mixtures

During the periods of tillering and stem elongation tank cocktails are very common. The relation of water to LF should be at 3 : 1, better 4 or 5 : 1. Mixtures with herbicides, fungicides, insecticides and growth regulators are possible. All the instructions of each component has been taken into account. These instructions allow very often only a maximum rate of 30 l/ha LF or less.

Requirements of tank mixtures with pesticides

- Coincidence of the application period/date
- Compliance of the instructions LF/pesticide
- Physical mixability
- Minimum application rate of 150 l/ha
- Crop tolerance of the mixture
- Spraying with injector nozzles with high drift reduction/coarse droplets

LF partial application

A common procedure in spraying is the addition of 10 – 20 kg N/ha (app. 30 – 60 l/ha LF, dens. 1, 28 kg/m³). The main target is to capitalize the leaf effect to accelerate the adsorption by the crop, to initiate a sticker effect and to reduce the thermical drift.
**Application instructions**

Attention has to be taken of detailed manufacturer’s instructions with diverse ingredients. This information can be found in the pesticides manuals or in the internet. For LF nitrogen with a density of 1.28 kg/m³, the Lechler spray table UAN is suitable. These tables can be taken from the dealer free of charge or directly from the Lechler website www.lechler-agri.com. For cocktails with water the spray tables for water are relevant.

**Process of tank fill operation**

**Pure LF + pesticides**

1. LF  
2. Pesticides + (water)  
3. Filling up completely with LF  

Fill the tank 50% with LF, add pesticides and fill up then completely with LF. Agitation should operate permanently during filling operation and on the way to the field. If requested dissolve at first the pesticides externally with water.

**LF + water + pesticides**

1. Water  
2. Pesticides  
3. Filling up completely with LF  

The mix ratio between LF and water should be min. 1:3, better 1:4 – 5. First fill up the tank with water, add the pesticides if necessary dissolved externally then fill up completely with LF. The agitation should operate permanently.

**LF + pesticide + water**

1. Water  
2. Pesticides  
3. Add LF  

Firstly fill the tank with the total water amount then add the LF 30 – 60 l/ha. The agitation should operate permanently.
BASICS OF NOZZLE TECHNOLOGY FOR PURE LF APPLICATION

LF can be applied easily by state of the art nozzle tips. The choice of the right nozzle type is related on following basic principles:

- The better the waxy layer on leaf surfaces of the crop is formed the more gentle coarse droplet application with air injector flat fan nozzles are.
- In advanced growth stadium the crop is more and more sensitive to injector flat fan nozzles or orifice nozzles.
- The more the crop is in a sensitive condition increased attention should be paid to the range of application: injector flat fan < FL nozzle < FD nozzle < hose/tube drop system.

ID3, IDK and IDKN injector flat fan nozzles can apply at lower pressure both LF pure and LF in combination with pesticides or nutrients.

FL and FD nozzles can only apply pure LF, not in combination with pesticides. The advantage is that they are delivering very coarse droplets, which reduces the risk of crop scorching.

Dropleg® and Hose drop systems 5S guarantee the highest security. They are taken dominantly in the late vegetation period or in worse weather conditions.

If there is nevertheless a necrosis in the crop the plants can compensate and repair this during the following vegetation period. At the beginning of the vegetation period 10 % necrosis is acceptable, later on max. 5 %. At this or below this level there are no consequences regarding yield level.

The LF preservation is getting lower in the following range:

- Waxy layer
  - Fertilizing onto the blank soil 3 days after seeding
  - Grain
  - Greenland
  - Rapeseed
  - Dry frozen crop or strongly covered by white frost
  - Sugar beets
  - Potatoes
  - Maize/corn
  - Weak waxy layer
  - Damaged plants

- Growth stages
  - 3 days after seeding
  - 3 leaves stadium
  - High osmotic difference in the plants (strong frost or drought period)
  - Relation LF : water = 1 : 3
  - High amount of green and the shape of leaves

Consequences for the plants depending on different nozzle technology

Application with hose system
- Leaf necrosis 0 – 0.5 %

Scientifically initiated application in a wet wheat crop after the appearance of ears
- Leaf necrosis 8 – 9.5 %

Further kinds of crop you can find at www.lechler-agri.com/duesenempfehlung

and on pages 13 – 17.
## BASICS OF NOZZLE TECHNOLOGY

### Nozzle type

<table>
<thead>
<tr>
<th>Nozzle type</th>
<th>ID3</th>
<th>IDK</th>
<th>IDKN</th>
<th>FD</th>
<th>PRE</th>
<th>FL black/grey for Dripleg UL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spray pressure bar (size of dosing orifice)</td>
<td>2.0 – 4.0</td>
<td>1.5 – 2.5</td>
<td>1.0 – 2.5 (04 to 06)</td>
<td>1.0 – 2.5</td>
<td>1.5 – 4.0</td>
<td>1.0 – 5.0 (0.8/1.0)</td>
</tr>
<tr>
<td>Hose drop system</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.0 – 4.0 (1.2)</td>
</tr>
<tr>
<td>Hose drop system 5S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.0 – 3.0 (1.5/1.8)</td>
</tr>
</tbody>
</table>

### Spray pressure

- **DropletUL**
- **Hose drop system**
- **Hose drop system 5S**

### Beware of scorching of the leaves! The risk is the lowest if:
- Application is coarse
- Pressure is low
- Nozzle size is big

To avoid scorching of the crop the state of the art plant protection nozzles should be operated in a lower pressure range for LF compared to pesticide application. The percentage of coarse droplets increases, fine droplets are reduced.

### Nozzle material and maintenance

The materials POM (Polyoxymethylene) or ceramic are well suited for LF. Steel or brass nozzles cannot be used for LF application. The pressure gauge and control unit should be suitable for the salty LF. When the application is finished the sprayer should be cleaned with a high amount of water.

### Advice

LF is a salty and corrosive solution. Galvanized parts, brass, blank standard steel on the sprayer should be protected or preferably not used. The best materials are plastics, stainless steel and well painted steel parts. LF will also clean the sprayer from pesticide residuals; this can cause clogging at the beginning. In addition LF has degreasing characteristics, important for all valves in a sprayer. Pay attention to the operating instructions of the sprayer.

### Correction factors for various liquid density

<table>
<thead>
<tr>
<th>Density of N-solution (kg/l)</th>
<th>0.84</th>
<th>0.96</th>
<th>1.00</th>
<th>1.11</th>
<th>1.24</th>
<th>1.28 LF (28)</th>
<th>1.32 LF (30)</th>
<th>1.38 NP-Solution</th>
<th>1.44</th>
<th>1.50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correlation factor</td>
<td>1.09</td>
<td>1.02</td>
<td>1.00</td>
<td>0.96</td>
<td>0.90</td>
<td>0.88</td>
<td>0.87</td>
<td>0.85</td>
<td>0.83</td>
<td>0.81</td>
</tr>
</tbody>
</table>

For conversion:

\[
\text{Flow rate water (Table value) } \times \text{ Correction factor } = \text{ Real flow rate of N-solution}
\]

For finding the accurate spraying pressure a calibration of the nozzle flow rate is necessary. At lower temperatures the pressure difference between pressure gauge and nozzles is higher.

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

### Density

All table values of flow rates are based on water (density 1.0 kg/l). Liquids with differing densities should be corrected by the mentioned factors. The density of LF can be read in the instructions of the LF manufacturer.

### Spraying height h: min. – optimum – max. (cm) at a lateral nozzle distance A (m)

<table>
<thead>
<tr>
<th>Nozzle type</th>
<th>Flat fan nozzle</th>
<th>Orifice nozzle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spray angle</td>
<td>ID3/IDK/IDKN 120°</td>
<td>ID/IDK 90°</td>
</tr>
<tr>
<td>A = 0.50 m</td>
<td>40-50-70</td>
<td>60-75-90</td>
</tr>
</tbody>
</table>
Air-Injector flat spray nozzles ID3

Extremely low-drift, air-injector flat spray nozzle for professional use.

Advantages
- 90% drift reduction
- ID-120-025 to 05
- Long injector design ensures high drift stability even at high pressures up to 8 bar
- Timely application even under adverse weather conditions
- Increased workrate due to flexible use over a wide pressure range
- Adaptation by changing the driving speed and l/ha rate without nozzle changes
- Very good deposition structure and crop penetration

Nozzle size
- 01 – 08

Spray angle
- 120°

Material
- POM, ceramic

Pressure range
- ID-01 to -015: 3 – 4 – 8 bar
- ID-02 to -08: 2 – 4 – 8 bar
- UAN: 2 – 4 (– 8) bar

Recommended filters
- 80 M 01
- 60 M 02 – 04
- 25 M 05 – 08

Droplet size
- Extreme coarse – medium

Width across flats
- 10 mm

Application areas
- Plant protection products and growth regulators
- Liquid fertilizer
- Border application can be combined with border nozzle IS 80
- Golf course

Recommended filters
- G 1965
- G 1966
- G 1968
- G 1969
- G 1970
- G 1971
- G 1972
- G 1973
- G 1974

Dosing orifice
- Liquid
- Air
- Injector
- O-ring
- Nozzle body
- Tip

Tooless removable injector

Aeration effect
### Spray table for UAN

Air-injector flat spray nozzles ID3

<table>
<thead>
<tr>
<th>ID-120-015 (50 M)</th>
<th>ID-120-02 (60 M)</th>
<th>ID-120-025 (60 M)</th>
<th>ID-120-03 (50 M)</th>
<th>ID-120-04 (50 M)</th>
<th>ID-120-05 (25 M)</th>
<th>ID-120-06 (25 M)</th>
<th>ID-120-08 (25 M)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I/min</strong></td>
<td><strong>Water</strong></td>
<td><strong>UAN</strong></td>
<td><strong>UAN</strong></td>
<td><strong>Water</strong></td>
<td><strong>UAN</strong></td>
<td><strong>Water</strong></td>
<td><strong>UAN</strong></td>
</tr>
<tr>
<td>2.0</td>
<td>0.48</td>
<td>0.42</td>
<td>101</td>
<td>84</td>
<td>72</td>
<td>63</td>
<td>50</td>
</tr>
<tr>
<td>2.5</td>
<td>0.54</td>
<td>0.48</td>
<td>115</td>
<td>98</td>
<td>82</td>
<td>72</td>
<td>58</td>
</tr>
<tr>
<td>3.0</td>
<td>0.59</td>
<td>0.52</td>
<td>125</td>
<td>104</td>
<td>89</td>
<td>78</td>
<td>62</td>
</tr>
<tr>
<td>4.0</td>
<td>0.68</td>
<td>0.60</td>
<td>144</td>
<td>120</td>
<td>103</td>
<td>90</td>
<td>72</td>
</tr>
</tbody>
</table>

**Drift reduction:**
90/75/50 %

- Spray pressure at the nozzle tip (gauged with a diaphragm valve)
- The stated liter-per-hectare rates apply to water.
- Prior to each spraying season, verify the table data by gauging the flow rates.
- Make sure that all nozzles have the same settings.

**Example of ordering**

Type + spray angle + int'l nozzle size + material = order number

<table>
<thead>
<tr>
<th>ID3</th>
<th>120°</th>
<th>025</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID-120-025</td>
<td>C (ceramic)</td>
<td>ID-120-025 C</td>
</tr>
</tbody>
</table>

**Online nozzle calculator**

[Android](https://play.google.com/store/apps)  [Apple](https://apps.apple.com)
Air-injector flat spray compact nozzles IDK
Air-injector flat spray compact nozzles IDKN

Very low-drift, compact air-injector flat spray nozzle with wide droplet spectrum (from extreme coarse to fine).

**Advantages**
- 90% drift reduction
  - IDK 120-05 to 06
  - IDKN 120-03 to 04
- Very low drift and loss-reducing in the pressure range up to 3.0 bar (depending on size)
- Inexpensive alternative to conventional standard nozzles
- Very good deposition structure and crop penetration

* IDK-characteristic: body with white stripe

**Nozzle size**
01 – 06

**Spray angle**
90°, 120°

**Material**
POM, ceramic

**Pressure range**
- IDK-01 to -03: 1.5 – 3 – 6 bar
- IDK-04 to -06: 1 – 1.5 – 3 – 6 bar
- IDKN-03 to -04: 1 – 1.5 – 3 – 6 bar
- UAN: 1.5 – 2.5 bar

**Recommended filters**
80 M 01
60 M 015 – 04
25 M 05 – 06

**Droplet size**
Extreme coarse – fine

**Width across flats**
8 mm

**Application areas**
- Plant protection products and growth regulators
- Liquid fertilizer
- Spray frame
- Border application can be combined with border nozzle IDKS 80
- Golf course
- Backpack sprayer
- Greenhouse

**Toolless removable injector**

**ISO**

**Liquid**

**Air**

**Nozzle body**
### Spray table for UAN

Air-injector flat spray compact nozzles IDK / IDKN

<table>
<thead>
<tr>
<th>UAN l/ha</th>
<th>0.5m</th>
<th>0.60</th>
<th>0.64</th>
<th>0.70</th>
<th>0.80</th>
<th>0.90</th>
<th>1.00</th>
<th>1.50</th>
<th>3.00</th>
<th>4.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 bar</td>
<td>144</td>
<td>192</td>
<td>192</td>
<td>192</td>
<td>160</td>
<td>160</td>
<td>160</td>
<td>160</td>
<td>160</td>
<td>160</td>
</tr>
<tr>
<td>1.5 bar</td>
<td>111</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>111</td>
<td>111</td>
<td>111</td>
<td>111</td>
<td>111</td>
<td>111</td>
</tr>
<tr>
<td>2.0 bar</td>
<td>85</td>
<td>85</td>
<td>85</td>
<td>85</td>
<td>85</td>
<td>85</td>
<td>85</td>
<td>85</td>
<td>85</td>
<td>85</td>
</tr>
<tr>
<td>2.5 bar</td>
<td>69</td>
<td>69</td>
<td>69</td>
<td>69</td>
<td>69</td>
<td>69</td>
<td>69</td>
<td>69</td>
<td>69</td>
<td>69</td>
</tr>
<tr>
<td>3.0 bar</td>
<td>53</td>
<td>53</td>
<td>53</td>
<td>53</td>
<td>53</td>
<td>53</td>
<td>53</td>
<td>53</td>
<td>53</td>
<td>53</td>
</tr>
<tr>
<td>4.0 bar</td>
<td>41</td>
<td>41</td>
<td>41</td>
<td>41</td>
<td>41</td>
<td>41</td>
<td>41</td>
<td>41</td>
<td>41</td>
<td>41</td>
</tr>
</tbody>
</table>

* 1.0 bar only for IDKN

### Drift reduction: 90/75/50 %

- Spray pressure at the nozzle tip (gauged with a diaphragm valve)
- The stated liter-per-hectare rates apply to water.
- Prior to each spraying season, verify the table data by gauging the flow rates.
- Make sure that all nozzles have the same settings.

Best Protection of IDK/IDKN/IDKS/IDKT nozzles through long side walls of MultiCap.

**Online nozzle calculator**

**Example of ordering**

<table>
<thead>
<tr>
<th>Type + spray angle</th>
<th>int’l nozzle size</th>
<th>material</th>
<th>order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDK 120° 01 (POM)</td>
<td>209</td>
<td>-</td>
<td>IDK 120-01</td>
</tr>
<tr>
<td>IDK 120° 01 C (ceramic)</td>
<td>209</td>
<td>-</td>
<td>IDK 120-01 C</td>
</tr>
<tr>
<td>IDK 120° 03 (P)</td>
<td>209</td>
<td>-</td>
<td>IDK 120-03 PP</td>
</tr>
<tr>
<td>MultiCap IDK 120° 01 (POM)</td>
<td>209</td>
<td>-</td>
<td>MultiCap IDK 120-01</td>
</tr>
</tbody>
</table>
Pre-emergence flat spray nozzle PRE

Extremely low-drift flat spray nozzle for timely application of pre-emergence herbicides.

Advantages
- 95% drift reduction from 1.5 to 5 bar
- Flexible adaption to buffer zones
- Wide pressure range from 1.5 – 8 bar
- High workrate through simple adaptation of l/ha rate and driving speed
- Timely application even under adverse weather conditions

Nozzle size
- 05

Spray angle
- 130°

Material
- POM

Pressure range
- 1.5 – 8 bar
- UAN: 1.5 – 4 bar

Recommended filters
- 25 M

Droplet size
- Extreme coarse

Application areas
- Herbicides pre-emerge
- Liquid fertilizer
- Golf course
## Spray table for UAN
### Pre-emergence flat spray nozzle PRE

**Example of ordering**

<table>
<thead>
<tr>
<th>Type</th>
<th>Spray angle</th>
<th>int’l nozzle size</th>
<th>material</th>
<th>order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRE</td>
<td>130°</td>
<td>05</td>
<td>POM</td>
<td>PRE 130-05</td>
</tr>
</tbody>
</table>

**Drift reduction:**
- 95/90%

**Current list under:**
- [www.lechler-agri.com](http://www.lechler-agri.com)

<table>
<thead>
<tr>
<th>Bar l/min</th>
<th>Water 5.0 km/h</th>
<th>Water 6.0 km/h</th>
<th>Water 7.0 km/h</th>
<th>Water 8.0 km/h</th>
<th>Water 10.0 km/h</th>
<th>Water 12.0 km/h</th>
<th>Water 14.0 km/h</th>
<th>Water 16.0 km/h</th>
<th>Water 18.0 km/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>1.30</td>
<td>1.23</td>
<td>2.83</td>
<td>2.44</td>
<td>2.09</td>
<td>1.43</td>
<td>2.04</td>
<td>1.52</td>
<td>1.22</td>
</tr>
<tr>
<td>2.0</td>
<td>1.61</td>
<td>1.42</td>
<td>3.41</td>
<td>2.84</td>
<td>2.33</td>
<td>1.70</td>
<td>1.84</td>
<td>1.25</td>
<td>1.06</td>
</tr>
<tr>
<td>2.5</td>
<td>1.80</td>
<td>1.58</td>
<td>3.79</td>
<td>3.14</td>
<td>2.65</td>
<td>2.06</td>
<td>1.37</td>
<td>1.43</td>
<td>1.33</td>
</tr>
<tr>
<td>3.0</td>
<td>1.97</td>
<td>1.73</td>
<td>4.15</td>
<td>3.46</td>
<td>2.87</td>
<td>2.20</td>
<td>1.50</td>
<td>1.58</td>
<td>1.47</td>
</tr>
<tr>
<td>4.0</td>
<td>2.28</td>
<td>2.01</td>
<td>4.82</td>
<td>4.00</td>
<td>3.35</td>
<td>2.64</td>
<td>1.91</td>
<td>1.72</td>
<td>1.51</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UAN l/ha</th>
<th>5.0 km/h</th>
<th>6.0 km/h</th>
<th>7.0 km/h</th>
<th>8.0 km/h</th>
<th>10.0 km/h</th>
<th>12.0 km/h</th>
<th>14.0 km/h</th>
<th>16.0 km/h</th>
<th>18.0 km/h</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>1.30</td>
<td>1.23</td>
<td>2.83</td>
<td>2.44</td>
<td>2.09</td>
<td>1.43</td>
<td>2.04</td>
<td>1.52</td>
<td>1.22</td>
</tr>
<tr>
<td>2.0</td>
<td>1.61</td>
<td>1.42</td>
<td>3.41</td>
<td>2.84</td>
<td>2.33</td>
<td>1.70</td>
<td>1.84</td>
<td>1.25</td>
<td>1.06</td>
</tr>
<tr>
<td>2.5</td>
<td>1.80</td>
<td>1.58</td>
<td>3.79</td>
<td>3.14</td>
<td>2.65</td>
<td>2.06</td>
<td>1.37</td>
<td>1.43</td>
<td>1.33</td>
</tr>
<tr>
<td>3.0</td>
<td>1.97</td>
<td>1.73</td>
<td>4.15</td>
<td>3.46</td>
<td>2.87</td>
<td>2.20</td>
<td>1.50</td>
<td>1.58</td>
<td>1.47</td>
</tr>
<tr>
<td>4.0</td>
<td>2.28</td>
<td>2.01</td>
<td>4.82</td>
<td>4.00</td>
<td>3.35</td>
<td>2.64</td>
<td>1.91</td>
<td>1.72</td>
<td>1.51</td>
</tr>
</tbody>
</table>

- Spray pressure at the nozzle tip (gauged with a diaphragm valve)
- The stated liter-per-hectare rates apply to water.
- Prior to each spraying season, verify the table data by gauging the flow rates.
- Make sure that all nozzles have the same settings.
Liquid fertilizer nozzles FD

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

Advantages
- Gentle liquid fertilizer application thanks to extremely low spray impact
- Minimum risk of crop scorching due to extremely coarse-droplet application
- No streaking due to optimum cross-distribution
- Nozzle in cap for standard bayonet connection system MULTIJET
- Nozzle sizes ISO color-coded

Toolless removable dosing orifice

Recommended filters
- 60 M FD 03 – 04
- 25 M FD 05 – 20

Droplet size
- Extreme coarse

Application areas
- Liquid fertilizer
- Greenhouse
- Golf course

Nozzle size
- 03 – 20

Spray angle
- 130°

Material
- POM

Pressure range
- UAN: 1.5 – 4 bar

FD-04 Cross distribution on patternator (with water)
Spray pressure: 2 bar – spray height: 600mm – CV: 3.4 %
**Spray table for UAN**  
**Liquid fertilizer nozzles FD**

<table>
<thead>
<tr>
<th>I/min</th>
<th>FD 03 (50 M)</th>
<th>FD 04 (60 M)</th>
<th>FD 05 (25 M)</th>
<th>FD 06 (25 M)</th>
<th>FD 08 (25 M)</th>
<th>FD 10 (25 M)</th>
<th>FD 15 (25 M)</th>
<th>FD 20 (25 M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>UAN</td>
<td>Water</td>
<td>UAN</td>
<td>Water</td>
<td>UAN</td>
<td>Water</td>
<td>UAN</td>
<td>Water</td>
</tr>
<tr>
<td>1.5</td>
<td>0.85</td>
<td>0.75</td>
<td>1.5</td>
<td>1.13</td>
<td>1.00</td>
<td>1.5</td>
<td>1.70</td>
<td>1.90</td>
</tr>
<tr>
<td></td>
<td>0.86</td>
<td>0.86</td>
<td>2.0</td>
<td>1.31</td>
<td>1.15</td>
<td>2.0</td>
<td>1.96</td>
<td>2.11</td>
</tr>
<tr>
<td>2.0</td>
<td>1.20</td>
<td>1.06</td>
<td>2.0</td>
<td>2.31</td>
<td>2.03</td>
<td>2.0</td>
<td>2.40</td>
<td>2.24</td>
</tr>
<tr>
<td></td>
<td>1.22</td>
<td>1.22</td>
<td>2.5</td>
<td>3.21</td>
<td>2.03</td>
<td>2.5</td>
<td>3.0</td>
<td>3.15</td>
</tr>
<tr>
<td></td>
<td>4.0</td>
<td>2.88</td>
<td>4.0</td>
<td>4.0</td>
<td>3.52</td>
<td>4.0</td>
<td>4.0</td>
<td>3.52</td>
</tr>
</tbody>
</table>

**Example of ordering**

- **Type** + int / nozzle size + material = order number  
- FD 06 nozzle size (POM) = FD 06

**Intermediate and extension adaptor**

- **Intermediate adaptor** System Rau (092.163.56.00.21.1)  
  Extension: 43 mm
- **Intermediate adaptor** System Hardi (092.163.56.00.20.1)  
  Extension: 17 mm
- **Extension adaptor** System Multijet (092.163.56.00.23.1)  
  Extension: 32 mm

- **Spray pressure at the nozzle tip** (gauged with a diaphragm valve)
- **The stated liter-per-hectare rates apply to UAN (28/1.28 kg/ha)**
- **Nozzle spacing 0.5 m**
- **Prior to each spraying season, verify the table data by gauging the flow rates**
- **Make sure that all nozzles have the same settings**

---

**Intermediate and extension adaptor**

- Intermediate adaptor* Sys. Lechler Twistloc (092.163.56.00.22.1)  
  Extension: 22 mm  
  *incl. gasket

---

**Liquid fertilizer nozzles FD**

- FD 03 (50 M)
- FD 04 (60 M)
- FD 05 (25 M)
- FD 06 (25 M)
- FD 08 (25 M)
- FD 10 (25 M)
- FD 15 (25 M)
- FD 20 (25 M)
5-orifice nozzles FL
(for liquid fertilizers)

Five-orifice nozzle with horizontal spray formation.

**Advantages**
- Black and gray nozzle sizes can be combined with dosing orifices
- Change in delivery rate by replacing the dosing orifice
- No leaf damage due to extremely coarse droplets

**Bore diameter**
0.8 – 1.8 mm

**Spray angle**
160°

**Material**
- Nozzle body: POM, stainless steel
- Dosing orifice: stainless steel

**Pressure range**
- 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 filters**
25 M slotted strainer

**Droplet size**
Extreme coarse

**Width across flats**
10 mm

**Application area**
Liquid fertilizer
## Spray table for UAN
5-orifice nozzles FL (for liquid fertilizers)

### Ordering
When ordering, please include both order numbers, that of the nozzle and that of the dosing orifice.

### Recommendation
Please use grey 5-orifice nozzles (order no. 500.179.56.01) for combination with large dosing orifices (1.2, 1.5 and 1.8 mm)

### Descriptions

<table>
<thead>
<tr>
<th>Description</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-orifice nozzles FL (excl. dosing orifice)</td>
<td></td>
</tr>
<tr>
<td>Stainless steel</td>
<td>500.179.16</td>
</tr>
<tr>
<td>POM (black) for dosing orifices 0.8/1.0/1.2 mm Ø</td>
<td>500.179.56.00</td>
</tr>
<tr>
<td>POM (grey) for dosing orifices 1.2/1.5/1.8 mm Ø</td>
<td>500.179.56.01</td>
</tr>
</tbody>
</table>

### Dosing orifices

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Material</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.8 mm/32</td>
<td>Stainless steel</td>
<td>050.030.1C.00.00</td>
</tr>
<tr>
<td>1.0 mm/39</td>
<td>Stainless steel</td>
<td>050.030.1C.01.00</td>
</tr>
<tr>
<td>1.2 mm/48</td>
<td>Stainless steel</td>
<td>050.030.1C.03.00</td>
</tr>
<tr>
<td>1.5 mm/59</td>
<td>Stainless steel</td>
<td>050.030.1C.02.00</td>
</tr>
<tr>
<td>1.8 mm/72</td>
<td>Stainless steel</td>
<td>050.030.1C.04.00</td>
</tr>
</tbody>
</table>

### Assembly instructions

Inscription on dosing orifice must face upwards when inserted in the bayonet cap!
Hose drop system for boom sprayers

**Advantages**
- No risk of scorching of upper plant parts
- Greater independence from the influence of the weather
- Partial area-specific fertilization with N-sensor
- N-fertilization according to CULTAN method by line deposition on the soil
- Thin tube hoses slide easily through the crop

---

**Tube spacing**

0.25 m

**Pressure range**

- UAN: 1 – 10 bar

**Application area**

Liquid fertilizer

---

**Spray pressure at dosing orifice (gauged with a diaphragm valve)**

Prior to each spraying season verify the table data by gauging the flow rates

<table>
<thead>
<tr>
<th>Pressure range (bar)</th>
<th>Spr. pressure at dosing orifice</th>
<th>Flow rate (litres per hour)</th>
<th>Flow rate (litres per minute)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>0.1</td>
<td>120</td>
<td>2</td>
</tr>
<tr>
<td>0.6</td>
<td>0.15</td>
<td>180</td>
<td>3</td>
</tr>
<tr>
<td>0.8</td>
<td>0.20</td>
<td>240</td>
<td>4</td>
</tr>
<tr>
<td>1.0</td>
<td>0.30</td>
<td>360</td>
<td>6</td>
</tr>
<tr>
<td>1.5</td>
<td>0.50</td>
<td>600</td>
<td>10</td>
</tr>
<tr>
<td>2.0</td>
<td>0.75</td>
<td>900</td>
<td>15</td>
</tr>
<tr>
<td>3.0</td>
<td>1.20</td>
<td>1800</td>
<td>30</td>
</tr>
<tr>
<td>4.0</td>
<td>2.00</td>
<td>3600</td>
<td>60</td>
</tr>
</tbody>
</table>

*Additional spray table on request*

- Prior to each spraying season verify the table data by gauging the flow rates
- Make sure that in all hoses the same dosing orifice are fitted
- Lateral hose spacing 0.25 m
- Spray pressure at dosing orifice (gauged with a diaphragm valve)
- The stated liter-per-hectare rates apply to UAN (28/1.29 kg/l)
<table>
<thead>
<tr>
<th>Item</th>
<th>Qty.</th>
<th>Description</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – 11</td>
<td>1</td>
<td>Hose drop system complete (excl. dosing orifices and bayonet cap)</td>
<td>092.160.00.00</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>Tee</td>
<td>095.016.56.09.41</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>Fabric hose, L = 80 mm</td>
<td>–</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>2-eye clamp</td>
<td>095.016.1.0.04.44</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>Hose shank</td>
<td>095.016.56.07.49</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>2-eye clamp</td>
<td>095.009.1.13.67</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>Gasket Ø 11 x Ø 18 x 2.0</td>
<td>095.015.73.06.92</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>Threaded cap M 20 x 1.5</td>
<td>095.016.56.09.42</td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td>Hose shank with vent bore</td>
<td>095.009.56.10.44</td>
</tr>
<tr>
<td>9</td>
<td>4</td>
<td>Hose clamp</td>
<td>095.009.1.10.45</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
<td>Pipe, L = 686 mm</td>
<td>095.009.50.13.47</td>
</tr>
<tr>
<td>11</td>
<td>2</td>
<td>Fabric hose, L = 713 mm</td>
<td>–</td>
</tr>
</tbody>
</table>

**Bayonet cap**

<table>
<thead>
<tr>
<th>Item</th>
<th>Qty.</th>
<th>Description</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>1</td>
<td>– System Twistloc, (cf. page 107) (incl. gasket 062.242.73.00)</td>
<td>065.002.56.11.00</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>– System: MULTIJET etc (cf. page 104) (incl. 3.0 gasket A.402.200.04.00)</td>
<td>A.402.904.10</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
<td>optional 4.0 mm gasket**</td>
<td>095.015.6.02.85.0</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>– System RAU</td>
<td>095.016.56.05.93.0</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
<td>Gasket</td>
<td>095.015.73.04.61.0</td>
</tr>
<tr>
<td>14</td>
<td>1</td>
<td>Safety stirrup</td>
<td>095.016.16.05.94.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Qty.</th>
<th>Description</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>2</td>
<td>Dosing orifices</td>
<td></td>
</tr>
<tr>
<td>D = 0.8 mm/32; OD = 17.4 mm</td>
<td>050.033.1.00.00***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D = 1.0 mm/39; OD = 17.4 mm</td>
<td>050.033.1.01.00***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D = 1.2 mm/48; OD = 14.8 mm</td>
<td>050.030.1.03.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D = 1.5 mm/59; OD = 14.8 mm</td>
<td>050.030.1.02.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D = 1.8 mm/72; OD = 14.8 mm</td>
<td>050.030.1.04.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** for tight fit of bayonet cap
*** outer diameter 17.4 mm; adapted to Pos. 7

---

**Assembly instruction**

Inscription on dosing orifice must face upwards when inserted in the bayonet cap!
Flexible hose drop system with weight loaded 5-orifice tip 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
- In comparison with 0.25 m hose drop system, lower boom loading when pulling through the crop
- Compliance with transport width by ideal adaption of the hose when boom is folded
- Extension as spacer with hose attachment prevents paint damage to the sprayer when folded in
- Including bayonet cap system MULTIJET as standard
- Selection of l/ha rate by nozzle plates

**Assembly instruction**
Inscription on dosing orifice must face upwards when inserted in the bayonet cap!

**Assembly instruction**
Fit hose drop system 5S facing forwards 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.

**Tube spacing**
0.25 and 0.5 m (depending on boom)

**Dosing orifice**
1.0 and 1.2 mm

**Spray angle**
160°

**Pressure range**
1 – 5 bar

**Application area**
Liquid fertilizer 80 – 250 l/ha UAN
### Spray Table

**Hose drop system 5S**

<table>
<thead>
<tr>
<th>Ø mm</th>
<th>l/min</th>
<th>UAN (28) l/ha</th>
<th>UAN (28) l/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5,0 km/h</td>
<td>6,0 km/h</td>
<td>7,0 km/h</td>
</tr>
<tr>
<td>1,0</td>
<td>6.0</td>
<td>98</td>
<td>62</td>
</tr>
<tr>
<td>1,5</td>
<td>5.5</td>
<td>120</td>
<td>100</td>
</tr>
<tr>
<td>2,0</td>
<td>5.0</td>
<td>139</td>
<td>116</td>
</tr>
<tr>
<td>2,5</td>
<td>4.5</td>
<td>156</td>
<td>130</td>
</tr>
<tr>
<td>3,0</td>
<td>4.0</td>
<td>170</td>
<td>141</td>
</tr>
<tr>
<td>3,5</td>
<td>3.5</td>
<td>182</td>
<td>154</td>
</tr>
<tr>
<td>4,0</td>
<td>3.0</td>
<td>19/1</td>
<td>164</td>
</tr>
<tr>
<td>4,5</td>
<td>2.5</td>
<td>209</td>
<td>174</td>
</tr>
<tr>
<td>5,0</td>
<td>2.0</td>
<td>246</td>
<td>161</td>
</tr>
<tr>
<td>1,0/39</td>
<td>5,0</td>
<td>226</td>
<td>181</td>
</tr>
<tr>
<td>1,2/48</td>
<td>4,5</td>
<td>302</td>
<td>252</td>
</tr>
<tr>
<td>1,0</td>
<td>4,0</td>
<td>317</td>
<td>264</td>
</tr>
</tbody>
</table>

### Description

- **Description**
- **Order no.**

#### Hose drop system 5S

- **Order no.:** 092.173.00

#### Dosing orifices

- **1,0 mm/39 stainless steel:** 050.030.1C.01.00
- **1,2 mm/48 stainless steel:** 050.030.1C.03.00

#### Relocation kit nozzle holder

- **Order no.:** 092.174.00.00.00.0

---

NEW

- **Description:** Row width adaption (e.g. corn 0.75 cm row spacing) with relocation kit nozzle holder

- **Assembly to wet boom (20 - 22 mm)**

---

**Find further information in our manual:**

www.lechler-agri.com/montageanleitungen
VarioSelect®/ VarioSelect® II
2- and 4-way nozzle holder
for variable location-specific plant protectant,
growth regulator and liquid fertilizer applications

2-way or 4-way nozzle holder with pneumatic control for variable application rate control.

Advantages
- Operation optionally in „Vario“ or „Select“ mode
  - Vario: Fully-automatic control of nozzles/nozzle combination and continuously variable adaptation of the application rate and pressure
  - Select: Manual activation and deactivation of individual nozzles/nozzle combinations
- V2 in new more compact design with proven PSV valve technology (see page 100)
- V4 in modular design
- Single valve located directly in front of the nozzle
- Central liquid supply

Material
- POM, POM fibre glass reinforced, EPDM, Viton, FPM, stainless steel

Pressure range
- Max. 8 bar

VarioSelect® II
2-way nozzle holder
(pneumatic quick-action connectors optional)

VarioSelect® II
4-way nozzle holder
(pneumatic quick-action connectors optional)

Note: Fit all valve bodies on the boom in the same nozzle configuration (size, type), perfect operation of the VarioSelect® requires oil in the pneumatic system.

Example of ordering
- V2, 1/2" with Y pneumatic connection 065.284.56.21.Y0.0
- V4, 3/4" with 90° pneumatic connection 065.286.MN.27.A0.0

Code for pipe diameter:
- 20 mm 20
- 25 mm 25
- 1/2", 22 mm 21
- 3/4" 27
- 1" 34

Code for pre-assembled pneumatic quick-action connection (optional):
- 90° A
- Basis B
- Y Y
- Others on request.

Example of ordering
- V2, 1/2" with Y pneumatic connection 065.284.56.21.Y0.0
- V4, 3/4" with 90° pneumatic connection 065.286.MN.27.A0.0

Nozzle equipping ID 120

UAN l/ha

1.5 2 2.5 3 3.5 4 4.5

bar

- 015
- 02
- 025
- 05
- 015+02
- 015+025
- 02+05
- 02+025+05
- 015+02+025+05
Features:
- Display of overall volume and volume flow
- 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 PPP

Includes manifold fittings
- 1", 2" or 3" FP manifold
- flange with FIXLOC male adapter
- FP worm screw clamp
- FP gasket EPDM

Note: Please consider manual.

Order. no.
1": B.MFM. 100.CO.M
2": B.MFM. 220.CO.M
3": B.MFM. 300.CO.M

Pumps

<table>
<thead>
<tr>
<th>Pumps</th>
<th>Description</th>
<th>Order. no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PB 200 pump with base (excl. motor)</td>
<td>Connector: 2&quot; female</td>
<td>095.016.00.07.82</td>
</tr>
<tr>
<td>PB 200 pump with three-phase a.c. motor</td>
<td>Connector: BSP 2&quot; female</td>
<td>095.016.00.08.02</td>
</tr>
<tr>
<td>PB 200 pump with hydraulic motor</td>
<td>Connector: BSP 2&quot; female</td>
<td>095.016.00.08.01</td>
</tr>
<tr>
<td>PB 200 pump with gasoline engine</td>
<td>Connector: 2&quot; female</td>
<td>095.016.00.07.81</td>
</tr>
<tr>
<td>PB 300 pump with base (excl. motor)</td>
<td>Connector: BSP 3&quot; female</td>
<td>095.009.00.12.21</td>
</tr>
<tr>
<td>PB 300 pump with three-phase a.c. motor</td>
<td>Connector: BSP 3&quot; female</td>
<td>095.009.00.12.20</td>
</tr>
<tr>
<td>PB 300 pump with hydraulic motor</td>
<td>Connector: BSP 3&quot; female</td>
<td>095.009.00.12.22</td>
</tr>
</tbody>
</table>

Intermediate and extension adaptor

Intermediate adaptor* Sys. Lechler
Twistloc (092.163.56.00.22.1)
Extension: 22 mm
*incl. gasket

Intermediate adaptor* Sys. Rau
(092.163.56.00.21.0)
Extension: 43 mm

Intermediate adaptor* Sys. Hardi
(092.163.56.00.20.1)
Extension: 17 mm

Extension adaptor* System Multijet
(092.163.56.00.23.1)
Extension: 32 mm
### Characteristics of different LF nozzle types

<table>
<thead>
<tr>
<th>Nozzle Type</th>
<th>Droplet Size</th>
<th>Risk of Scorch</th>
<th>Distribution</th>
<th>Harmful Impact</th>
<th>Risk of Stripping Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-orifice nozzle, spraying vertical</td>
<td></td>
<td>-</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Lechler 5-orifice nozzle, spraying horizontal</td>
<td>++</td>
<td>+</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>7-orifice nozzle, spraying horizontal</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>Lechler FD liquid fertilizer nozzle, spraying horizontal</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
</tr>
</tbody>
</table>

Unique, optimum transversal distribution and scorch avoiding application using the FD 06:
YOU CAN FIND MORE INFORMATION IN OUR CATALOGUE
AGRICULTURAL SPRAY NOZZLES AND ACCESSORIES

Information is available for various applications in our catalogue.
All documents can be downloaded from our website at www.lechler.com. We would also be happy to send you the catalogue.

FULL INFORMATION IN JUST A CLICK AWAY:
THE LECHLER WEBSITE

Our website contains further information on our products as well as useful resources. In addition to technical data, there is also a droplet-size/dosage calculator and nozzles recommendations for many crops to help you in your search for the adequate nozzle.

www.lechler-agri.com

Nozzle calculator app

Apple
Android

Our general terms and conditions you can find at www.lechler-agri.com. On request we can also send them to you. Our general security advice please also see on our website www.lechler-agri.com.
LECHLER WORLD-WIDE

Scan the competence in nozzle technology
www.lechler-agri.com