Application of Liquid Fertilizer Recommendations
Nozzles and Accessories
Catalogue LF 2013
Lechler agricultural spray nozzles – for your success and for the good of the environment

Systems for the application of LF should account for the requirements of the crops/plants, the economy and the ecology. These systems should guarantee an even and precise distribution and a preservation of the crop. In combination with the application of pesticides the selected nozzle technology should be in line with the instructions of the pesticides.

This brochure would like to give some advices and guidelines for a successful application of LF. The requirements to the sprayer technology and the nozzles are relatively high.

Nozzles are now expected to offer a level of precision that no one would have believed just a few years ago – and Lechler has risen to the challenge with gusto.

Not for naught we are one of the world’s leading producers of precision nozzles. Many of our product innovations have emerged as trend setters for plant protection and liquid fertilizer technology – and we intend to keep things that way.

From the very start, we precisely and objectively define the functions and characteristics of our high-precision nozzles – all on the basis of ingenious measurement techniques and our own time-tested documentation system.

State-of-the-art engineering and simulating techniques guarantee the high utility value of our practice-oriented products.

With Lechler nozzles, one jet of spray is exactly like the next, because we take great pains to achieve identicality. Start-to-finish quality control, from material reception to product design, production and delivery, has always been a matter of course at Lechler.

Naturally, we are certified in accordance with DIN ISO 9001:2008.

Agricultural spray nozzles by Lechler satisfy the standards stipulated by the German Federal Research Center for cultivated plants (JKI), and all the requirements of the German plant protection law, European EN-Norms and international ISO-standards. Knowing this, major equipment manufacturers count themselves among our customers.

Our practice-oriented approach to the design of agricultural spray nozzles is based on a constant interchange of knowhow between ourselves and the competent testing authorities, sprayer manufacturers, chemical industry and fertilizer industry. Success often has lots of fathers.

Look and see at our professional product range for LF application in this brochure. If you have any questions – we’ll be happy to take your call!

All data regarding recommended application rates l/ha are based on a LF with a density of 1.28 means 36 kg N per 100 l LF.
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Accessories

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Benefits of Liquid Fertilizer

Economical advantages when used 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 option. 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.

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 in wider working widths and is less affected by wind conditions compared to a granulate spreader.

Higher efficiency of fertilizer – less losses to evaluation
LF can be absorbed also by the leaves. Especially in dry periods when 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.

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.

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
- Prevention of crop damage

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 instructions.
Constitution and characteristics of LF variances

**UAN (urea-ammonium nitrate)**

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 (+NH3) 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 nozzle tables of water are relevant. The mix ratio of water – LF should be 3 : 1 volume relation, better 4 : 1, otherwise the risk of treating the crop increases.

The higher densities of LF are increasing pressures on the sprayer tank and axes of the sprayer. Attention should be paid to the maximum technical loading data of the equipment. 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 corrected, sometimes between 0.1 and 1.0 bar. See table with correction calculators at page 12.

**LF with high level sulfur components**

Some LF has an additional component sulfur, which enables effective fertilizing in agricultural and nursery crops. The sulfur is available in 2 different chemical variances. Firstly as ammonium sulphate, this reacts very fast with the crop. The other variance is ammonium 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 for the crop), because it can be mixed with pesticides as well and has a high compatibility to the crop. The total content of sulfur can achieve a level of 20 – 27 % and the water soluble part is 3 – 8 %.

**LF with lower level of sulfur components**

Liquid ammonium sulphate includes minimum 6 % 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 : P2 : O5. For the NP as well as for the nitrogen LF the application tables for LF are relevant (see page 13).

**Liquid Urea**

LU is contrary to LF nitrogen or NP solution, an organic neutral liquid. Therefore this is less corrosive. The best crop adaptation can be achieved at a urea concentration of 0.5 – 3 %, for grain up to 10 %. A problem is the limited solution capability. The dilution of 10 kg N (= 22 kg urea) eludes so much energy from the water that with a water temperature of 15 degrees this 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 calculators (see page 12).

### Table: Type of LF

<table>
<thead>
<tr>
<th>Type of LF</th>
<th>Specific weight [kg per liter]</th>
<th>Nutritional value 110 Liter N-solution includes kg N</th>
<th>kg P/S</th>
</tr>
</thead>
<tbody>
<tr>
<td>LF-28 (N-solution)</td>
<td>1.28</td>
<td>36</td>
<td>-</td>
</tr>
<tr>
<td>NP-solution-10/34</td>
<td>1.38</td>
<td>14</td>
<td>48</td>
</tr>
<tr>
<td>LF-S-solution</td>
<td>1.28</td>
<td>31</td>
<td>5</td>
</tr>
<tr>
<td>LF-S 25/6</td>
<td>1.31</td>
<td>33</td>
<td>8</td>
</tr>
<tr>
<td>ASL-solution</td>
<td>1.24</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Liquid urea</td>
<td>1.10</td>
<td>22</td>
<td>-</td>
</tr>
</tbody>
</table>

**External temperature and behavior of LF**

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 separates. This causes a clogging of filters, nozzles and other sprayer components. LF with a density of 1.30 will crystallize at -9 degrees, and with a density of 1.32, 0 degrees.

For these variances the conditions of storage, transport and application should be above the depth of frost penetration.

**Urea-NH2**

Approximately 25 % is ammonium (NH4+), app. 50 % is water - LF has a minimum critical temperature. The higher densities of LF are increasing pressures on the sprayer. Attention should be paid to the maximum technical loading data of the equipment.
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 to the input via leaves and the risk of treating the crop too much by a salty solution. These facts can cause lower yields. 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 kept 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 has the highest adaption to the crops. The optimum concentration of sulfur is 3 – 5 %, because this concentration has the best compliance to the crops. The sulfur in LF is available immediately for the crop, very fast is sulfate, medium termed is the ammoniumthiosulfate.

Adaption 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 adaption of LF. The question if the N fertilizer application should be granulated or liquid aggregate is secondary, important is the price - N-level 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.

LF quality supplies certainty
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 treatment is then very low under all conditions, also in very sensitive situations. This is also valid in combination with pesticide application. Positive collected experiences enable the farmer to repeat this in the following years. Premium quality LF should have a precise labeled nitrogen component.

Further positive characteristics are:

- high surface tension
- pH value should be 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 reliable crop adsorption
It is well known that upon critical application conditions and sensitive crop situations the quality of LF influences the crop adaption preferably.

<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>132</td>
<td>15</td>
<td>21</td>
<td>25</td>
<td>17</td>
<td>210</td>
</tr>
<tr>
<td>without N</td>
<td>68</td>
<td>73</td>
<td>90</td>
<td>82</td>
<td>94</td>
<td>75</td>
</tr>
<tr>
<td>KAS</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>yield</td>
<td>(800 dt/ha)</td>
<td>(100,5 dt/ha)</td>
<td>(419 dt/ha)</td>
<td>(822 dt/ha)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PIASAN® 28</td>
<td>100</td>
<td>101</td>
<td>102</td>
<td>101</td>
<td>102</td>
<td>100</td>
</tr>
</tbody>
</table>

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.

The application technology includes the opportunity 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.
Risk of lower yields can be eliminated
There have been a lot of field trials made with obvious wrong application features. The application by conventional flat fan nozzles on negative conditions (morning dew, permanent rain before) caused in late stadium in winter wheat leaf necrosis of 12 %. The consequences of this necrosis were lower yields of 4 – 8 %. 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 yields are not acceptable. The relation of yield losses compared to the treated crop surface is relatively small. Before every application it is important to identify the right application technology for minimizing treatment at the crop. Picture 3 demonstrates that identical application conditions with the same nozzles it is possible to cause damage. 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 treated much more the leaves and the result were lower yields. 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 cereal yields 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 eluviations. 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 adaption. 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.

<table>
<thead>
<tr>
<th>Yield (dt/ha)</th>
<th>80</th>
<th>85</th>
<th>90</th>
<th>95</th>
<th>100</th>
<th>105</th>
<th>110</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIASAN 28</td>
<td>13</td>
<td>8.8</td>
<td>9.2</td>
<td>9.6</td>
<td>10.0</td>
<td>10.5</td>
<td>11.0</td>
</tr>
<tr>
<td>LF with low surface extension</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OF-extension (mN/m)</td>
<td>60..70</td>
<td>20..25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leaf necrosis (%)</td>
<td>3</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 kinds of crop are well adapted 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 wax surface 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 ID/IDN 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 run to seed 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 Cercosporella or leaf diseases can be combined with LF. Morpho-lines 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, 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 hose/tube drop systems to exclude any leaf treatment. In general attention should be paid to the handling instructions of pesticides and the suitability of mixing with LF!

Nozzle guide at the beginning of vegetation 150 – 280 l/ha LF:
- FD 04 to 10
- FL grey with Dosing orifices 1.2/1.5/1.8
- ID/IDN 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:
- ID/IDN 120-01 to -05
- IDK/IDKN 120-015 to -06

Final application 140 – 170 l/ha LF:
- FL black with Dosing orifices 1.0/1.2 or FL grey with Dosing orifices 1.2/1.5
- Hose drop system with Dosing orifice 0.8
- Tube drop system with FL black and Dosing orifices 1.0/1.2 or FL grey and Dosing orifices 1.2/1.5

In general, attention has to be paid to the handling instructions of pesticides and the compatibility with LF!
In winter rape can be applied in total 200 kg N/ha, split into 2 applications during the vegetation period. This can be done by nozzles or hose/tube drop systems.

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

**2nd N-application until generation of buds 170 – 250 l/ha LF:**
- FL grey with Dosing orifices 1.2/1.5/1.8
- Hose drop system with Dosing orifice 1.0
- Tube drop system with FL grey and Dosing orifices 1.2/1.5/1.8

**Application during flowering 50 l/ha LF + water + fungicides/insecticides:**
- ID/IDN 120-025 to -05
- IDK/IDKN 120-03 to -06
- IDKT 120-03 to -05

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Fertilizer application of blossom

Max. 50 l/ha UAN + water + pesticide

UAN pure

BBCH growth stage
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 denitrification inhibitor is recommended. Later applications directly into the crop should be done by droplegs or hose/tube drop systems.

Nozzles guide before seeding until 3 days afterwards 280 – 500 l/ha LF:
- FD 04 to 15
- ID 120-04 to -08
- IDK 120-05 to -06

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

2nd N-application until 7 leaves stadium 80 – 170 l/ha:
- DroplegUL with FT 1.5-408 to 3.0-528 or FL grey with Dosing orifices 1.2/1.5/1.8
- Hose drop system with Dosing orifice 0.8
- Tube drop system with Dosing orifices 1.0/1.2
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 can be applied up to 120 kg N/ha. During the vegetation period from 4 leaves stadium onward should be applied not more than 40 kg N/ha (≈ 110 l LF, 1.28 density) per application, but the sugar beets have to be dry and in a well condition.

The lapse of time to the herbicide applications should be min. 3 days before or after the herbicide applications. This aspect is very important if oil attitudes 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 guide before 1 week of seeding 170 – 335 l/ha (total amount of nitrogen):
- FD 04 to 10
- FL grey with Dosing orifices 1.2/1.5/1.8
- ID/IDN 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 04 to 06
- ID/IDN 120-025 to -05
- IDK/IDKN 120-03 to -06

Combined application of LF (max. 50 l/ha) + water + insecticides:
- ID/IDN 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:
- Hose drop system with Dosing orifice 0.8
- FL black with Dosing orifices 0.8/1.0
- ID/IDN 120-015 to -03
- IDK/IDKN 120-02 to -04
Nozzle recommendation in potatoes

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 10 kg N/ha LF to every application against Phytophthora

Nozzle guide before planting 170 – 335 l/ha LF:
- FD 03 to 10
- FL grey with Dosing orifices 1.2/1.5/1.8
- ID/IDN 120-025 to -08
- IDK/IDKN 120-03 to -06

2nd N-application 110 – 170 l/ha pure LF or in mixture with water and herbicides:
- FD 03 bis 05 (pure LF)
- ID/IDN 120-02 to -05
- IDK/IDKN 120-025 to -06

Combined application of LF (max. 30 l/ha) + water + fungicides:
- ID/IDN 120-025 to -05
- IDK/IDKN 120-03 to -06
- IDK 120-03 to -05
Preparation of the mixture

**LF in combination with pesticides**
The coverage upon 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 loss of effect. 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 tilling run to seeds 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 have to be taken into account. These instructions allow very often only a maximum rate of 30 l/ha LF.

**Requirements of tank mixtures with pesticides**
- Compliance of the application period/date
- Adherence of the instructions LF/pesticide
- Physical miscibility
- Minimum application rate of 150 l/ha
- Crop adaption of the mixture
- Spraying with injector nozzles with high drift reduction/coarse droplets

**LF partial amounts**
A common procedure 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 glue effect and to reduce the thermal drift.

**Application instructions**
Attention has to be taken of detailed manufacturer’s instructions with diverse ingredients. This information can be read in the pesticides manuals or in the internet. For LF nitrogen with a density of 1.28 kg/m³ can be taken the Lechler nozzle tables. 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 nozzle 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 in low amounts (surfactant)**

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 common nozzle tips. The choice of the right nozzle type is related on following basic principles:

- The more the wax coating of the crop is stronger the application can be done by injector flat fan nozzles
- 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

ID, IDN, 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.

Hose-/tube drop systems 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:

### Wax coverage
- Straw fertilizing
- Fertilizing onto the blanket soil 3 days after seeding
- Grain
- Greenland
- Rapeseed
- Dry frozen crop or strongly covered by white frost
- Sugar beets
- Potatoes
- Maize/corn
- Weak wax coating
- 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 %


Aligned application technology from LECHLER guarantees and improves the economical result of LF application:

- Reduced drift
- Precise even distribution
- Higher yields
- Reduction of passes in the field
- Improved efficiency of pesticides
- Reduced risk of nitrogen leaching into the ground
- Sufficient economical logistics
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 common 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 (Polyoxy-methylene) 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 by 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.

Correlation factors for various liquid density
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 significant.

<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</th>
<th>1.31</th>
<th>1.32</th>
<th>1.38</th>
<th>1.44</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correction factor</td>
<td>1.09</td>
<td>1.02</td>
<td>1.00</td>
<td>0.95</td>
<td>0.90</td>
<td>0.88</td>
<td>0.87</td>
<td>0.87</td>
<td>0.85</td>
<td>0.83</td>
</tr>
</tbody>
</table>

For conversion:

Flow rate water (Table value) \times Correction factor = Real flow rate of N-solution

Done
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 system</th>
<th>Flat fan nozzle</th>
<th>Orifice nozzle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nozzle type</td>
<td>ID/IDN/IDK/IDKN</td>
<td>ID/IDK</td>
</tr>
<tr>
<td>Spray angle</td>
<td>120°</td>
<td>90°</td>
</tr>
<tr>
<td>A = 0.50 m</td>
<td>40–50–70</td>
<td>60–75–90</td>
</tr>
<tr>
<td>A = 1.00 m</td>
<td>*</td>
<td>*75</td>
</tr>
</tbody>
</table>

* The spraying height for deflector nozzles is influenced by the positioning. A single overlapping is requested for an even transversal distribution.
Rule of thumb: If there are modifications to the mentioned distance A, the relation of a flat fan nozzle 120° spraying angle.
Spraying height is 1:1, for 90° it is 1:1.5.
Spray table for UAN (Urea-ammonium nitrate (28/1.28 kg/l)) for ID, IDN, IDK, IDKN, FD nozzles

<table>
<thead>
<tr>
<th>ID</th>
<th>Pressure (bar)</th>
<th>Water</th>
<th>UAN</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>-015 ID DK (60 M)</td>
<td>1.5</td>
<td>0.42</td>
<td>0.37</td>
<td>89</td>
<td>74</td>
<td>63</td>
<td>56</td>
<td>44</td>
<td>37</td>
<td>32</td>
<td>28</td>
<td>25</td>
</tr>
<tr>
<td></td>
<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>
<td>42</td>
<td>36</td>
<td>32</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>2.5</td>
<td>0.54</td>
<td>0.48</td>
<td>115</td>
<td>96</td>
<td>82</td>
<td>72</td>
<td>58</td>
<td>48</td>
<td>41</td>
<td>36</td>
<td>32</td>
</tr>
<tr>
<td></td>
<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>
<td>52</td>
<td>45</td>
<td>39</td>
<td>35</td>
</tr>
<tr>
<td></td>
<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>
<td>60</td>
<td>51</td>
<td>45</td>
<td>40</td>
</tr>
<tr>
<td>-02 ID DK (60 M)</td>
<td>1.5</td>
<td>0.56</td>
<td>0.49</td>
<td>118</td>
<td>98</td>
<td>84</td>
<td>74</td>
<td>59</td>
<td>49</td>
<td>42</td>
<td>37</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>2.0</td>
<td>0.65</td>
<td>0.57</td>
<td>137</td>
<td>114</td>
<td>98</td>
<td>86</td>
<td>68</td>
<td>57</td>
<td>49</td>
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</tr>
<tr>
<td></td>
<td>2.5</td>
<td>0.73</td>
<td>0.64</td>
<td>154</td>
<td>128</td>
<td>110</td>
<td>96</td>
<td>77</td>
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<td>43</td>
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<tr>
<td></td>
<td>3.0</td>
<td>0.80</td>
<td>0.70</td>
<td>168</td>
<td>140</td>
<td>120</td>
<td>105</td>
<td>84</td>
<td>70</td>
<td>60</td>
<td>53</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>4.0</td>
<td>0.87</td>
<td>0.76</td>
<td>192</td>
<td>160</td>
<td>132</td>
<td>112</td>
<td>91</td>
<td>78</td>
<td>67</td>
<td>56</td>
<td>49</td>
</tr>
<tr>
<td>-025 ID DK (60 M)</td>
<td>1.5</td>
<td>0.70</td>
<td>0.62</td>
<td>129</td>
<td>104</td>
<td>90</td>
<td>74</td>
<td>62</td>
<td>52</td>
<td>45</td>
<td>39</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>2.0</td>
<td>0.81</td>
<td>0.71</td>
<td>170</td>
<td>142</td>
<td>122</td>
<td>107</td>
<td>85</td>
<td>71</td>
<td>61</td>
<td>53</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>2.5</td>
<td>0.91</td>
<td>0.80</td>
<td>192</td>
<td>160</td>
<td>137</td>
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<td>60</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>3.0</td>
<td>0.99</td>
<td>0.87</td>
<td>209</td>
<td>174</td>
<td>149</td>
<td>131</td>
<td>104</td>
<td>87</td>
<td>75</td>
<td>65</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>4.0</td>
<td>1.15</td>
<td>1.01</td>
<td>242</td>
<td>202</td>
<td>173</td>
<td>152</td>
<td>121</td>
<td>101</td>
<td>87</td>
<td>76</td>
<td>67</td>
</tr>
</tbody>
</table>

**Application parameter**

The values in the neighbouring spraying table are significant for a lateral nozzle distance of A = 0.5 m. For other distances the following formulas should be considered:

- **Application rate M (l/ha)**
  \[ M = \frac{300 \times \sqrt{v}}{A} \]

- **Flow rate/Nozzle V (l/min)**
  \[ V = \frac{1}{600} \]

- **Lateral nozzle distance A (m)**

- **Travel speed v (km/h)**

**Example:**

- **180 l/ha UAN, A = 0.5 m, 7 km/h**
  \[ 180 \text{ l/ha} \times 0.5 \text{ m} = 7 \text{ km/h} = 1.05 \text{ l/min} \]

**Recommendation:**

- **ID/IDN 120-03 (3.0 bar)**
- **ID/IDN (04/05/06 > 1.0 bar)**
- **ID/IDN (07/08 > 2.0 bar)**
- **ID/IDN (09/10 > 3.0 bar)**
- **ID/IDN (01/02 > 4.0 bar)**

- **Pressure directly at the nozzle with diaphragm valve**
- **Lateral nozzle distance = 0.5 m**
- **Sprayer check by nozzle calibration before the season**
- **Take care that in multiple nozzle holders**
- **The requested nozzles are unique**
- **The values in the neighbouring table are valid for a density of 1.28**
Air-injector nozzles ID
Air-injector nozzles IDN

Spray angle: 120°/90°
Material: POM, ceramic

Features
- Air-injector flat-spray nozzle
- Extremely low drift potential, even for higher pressures
- Significantly improved deposition structure thanks to aerated droplets
- Application in field crops and special cultures
- Pressure range ID-01 to -08 : 2.0 to 3.5 bar
  IDN-025 to -03 : 2.0 to 4.0 bar
- Fits all bayonet cap systems with 10 mm AF and threaded caps
- Combines with ID end nozzle (of equal size), for sharply defined edges
- Included in the lists of »Drift-and-loss-reducing Techniques«
  LERAP, JKI, Staatscourant, SPF, Hjälpreda, ÖAIP and
  Equipement de limitation de la dérive de pulvérisation

Range of application
- Application of plant protectants and growth regulators
- Particularly well-suited for application of liquid fertilizer (UAN);
  pressure range for pure UAN: ID 2.0 to 3.5 bar;
  IDN 2.0 to 4.0 bar
- Fits all bayonet cap systems with 10 mm AF and threaded caps
- Combines with IS end nozzle (of equal size), for sharply defined edges
- Included in the lists of »Drift-and-loss-reducing Techniques«
  LERAP, JKI, Staatscourant, SPF, Hjälpreda, ÖAIP and
  Equipement de limitation de la dérive de pulvérisation

Main benefits of ID nozzles
- Sturdy design
- Easily removable injector (e.g. for cleaning)
- Two aeration orifices, precluding all danger of clogging
- Hard-wearing and non-clogging thanks to round bores and ample free cross sections
- Same biological efficacy as that of conventional flat-spray nozzles
- Very good deposition structure and crop-canopy penetration
- Timely application, even under adverse weather conditions
- Designed for “good modern practice”, i.e. for use at wind speeds up to 5 m/s and higher sprayer speeds

Additional benefits of IDN nozzles
- Maximum drift reduction up to 90 % for standard liter-per-hectare rate of 200 l/ha
- Extended pressure range thanks to a new type of internal geometry, producing relatively coarser droplets than the comparable ID nozzle size
- Meets the required buffer zone regulations without changing the concentration of spray liquid and without changing the nozzles for the standard liter-per-hectare rate of 200 l/ha

Sample order

<table>
<thead>
<tr>
<th>Type</th>
<th>Spray angle</th>
<th>intl nozzle size</th>
<th>material</th>
<th>order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>120°</td>
<td>025</td>
<td>(POM)</td>
<td>ID 120-025</td>
</tr>
<tr>
<td>IDN</td>
<td>120°</td>
<td>025</td>
<td>(POM)</td>
<td>IDN 120-025</td>
</tr>
<tr>
<td>IDN</td>
<td>120°</td>
<td>025</td>
<td>(ceramic)</td>
<td>ID 120-025 C</td>
</tr>
</tbody>
</table>

Lechler ID/IDN are rated in several countries for drift reduction 90/75/66/50 %.
Current List under www.lechler-agri.com

Sharp demarcation along field boundaries
Lechler offers IS Air-injector off centre nozzles for sharp demarcation along field boundaries in combination with ID/IDN 120 of same nozzle size in a boom.
Same drift regulations are applied as for ID/IDN 120 of same size.
Please ask for IS leaflet.
**Spray angle**: 120°/90°

**Material**: POM, PP, ceramic

**Features**
- Air-injector flat-spray nozzle
- **Pressure range**: IDK-01 to -03: 1.5 to 6.0 bar
  - IDK-04 to -06: 1.0 to 6.0 bar
  - IDKN-03/-04: 1.0 to 6.0 bar
- Very low drift potential and loss-reducing effect in pressure range up to 3.0 bar (according to size)
- At pressures above 3 bar, less drift resistance than other well-known ID/IDN nozzles, i.e., coarse-to-fine droplet size characteristic
- Very compact design (8 mm width across flats, 22 mm long)
- Fits all bayonet cap systems with 8 mm AF and threaded caps
- Included in the lists of «Drift-and-loss-reducing Techniques» LERAP, JKI, Staatscourant, SPF, Hjälpreda, ÖAIP and Equipement de limitation de la dérive de pulvérisation

**Range of application**
- Application of plant protectants and growth regulators
- Well-suited for application of liquid fertilizer (UAN); pressure range for pure UAN:
  - IDK-01 to -03: 1.5 to 2.5 bar,
  - IDK-04 to -06: IDKN-03/-04: 1.0 to 2.5 bar

**Main benefits of IDK nozzles**
- Inexpensive alternative to conventional standard-type nozzles
- Easy installation, with no adapter necessary
- One-piece nozzle with reproducibly fixed-position injector for toolless removal
- Hard-wearing and non-clogging thanks to lateral air-aspirating channels of ample size
- Very good deposition structure and canopy penetration
- Designed for «good modern practice», i.e., for use at wind velocities up to 5 m/s and higher sprayer speeds

**Additional benefits of IDKN Nozzles**
- Maximum drift reduction up to 90 % (JKI approved)
- Very low drift potential at 1.0 to 3.0 bar
- Meets the required buffer zone regulations without changing the concentration of spray liquid and without changing the nozzles

**Sharp demarcation along field boundaries**
Lechler offers IDKS Air-injector off centre compact nozzles for sharp demarcation along field boundaries in combination with IDK/IDKN 120 of same nozzle size in a boom. Same drift regulations are applied as for IDK/IDKN 120 of same size. Please ask for IDKS leaflet.

**Sample order**

<table>
<thead>
<tr>
<th>Type + Spritzwinkel + Infl. nozzle size</th>
<th>+ material</th>
<th>= order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDK 120* 01</td>
<td>C (ceramic)</td>
<td>= IDK 120-01 C</td>
</tr>
<tr>
<td>IDK 120* 03</td>
<td>PP</td>
<td>= IDK 120-03 PP</td>
</tr>
<tr>
<td>IDKN 120* 04</td>
<td>POM</td>
<td>= IDK 120-04</td>
</tr>
</tbody>
</table>
Liquid fertilizer nozzles FD

Sample order
Type + infl nozzle size + material = order number
FD 06 (POM) = FD 06

Features
- Nozzle and cap one piece, fits to standard nozzle holder system MULTIJET
- Extension adapter System MULTIJET (Order-no.: 092.163.56.00.23.1)
- Intermediate adapter for other nozzle holder systems:
  - Lechler TWISTLOC (Order-no.: 092.163.56.00.22.1)
  - Rau (Order-no.: 092.163.56.00.21.0)
  - Hardi (Order-no.: 092.163.56.00.20.1)
- Nozzle sizes 03 to 20
- Pressure range: 1.5 to 4.0 bar
- Hard wearing and corrosion resistant
- ISO colour coded for easy identification
- Height of spray boom: 50 – 70 cm at 50 cm nozzle spacing

FD-04 – Cross distribution on patterner (water)
Pressure: 2.0 bar
Spray height: 600 mm
Coeff. of variation: 3.4%

Benefits of FD nozzles
- Extremely gentle application of fertilizer by horizontal jet formation
- Danger of crop scorch reduced to a minimum by extreme coarse droplets
- Optimised cross distribution across the spray boom according to JKI requirements for flat spray nozzles
- No striation in the crop
- Considerable less clogging than multi orificenozzles
- Fits to all current boom types as the nozzle tip is placed distinct lower
- Toolless removal of dosing orifice for cleaning purpose

<table>
<thead>
<tr>
<th></th>
<th>Water</th>
<th>UAN</th>
<th>6.0 km/h</th>
<th>8.0 km/h</th>
<th>10.0 km/h</th>
<th>14.0 km/h</th>
<th>18.0 km/h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>I/min</td>
<td>UAN I/ha</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[bar]</td>
<td></td>
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<tr>
<td>FD 03</td>
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</tr>
<tr>
<td>(60 M)</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1.5</td>
<td>0.85</td>
<td>0.75</td>
<td>150</td>
<td>113</td>
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Conversion factors and formula see page 16
Installation advice: Upturn labeling of dosing orifice.

### 5-orifice nozzles FL (for liquid fertilizers)

**Features**
- 5-orifice nozzle with horizontal jet formation
- Nozzle sizes grey and black
- Pressure range dosing orifice
  - 0.8 to 1.0: 1.0 to 5.0 bar
  - 1.2: 1.0 to 4.0 bar
  - 1.5 to 1.8: 1.0 to 3.0 bar
- Fits all bayonet cap systems with 10 mm AF and threaded caps
- Height of spray boom: 1.0 m
- Drift prevented by large drops
- Easy adjustment of liter-per-hectare rate via exchange of dosing orifices
- Dosing orifices made of solid stainless steel and, hence, resistant to wear and corrosion
- Plant-protective spraying of fertilizer thanks to extremely coarse (dribble) application
- Uniform distribution of fertilizer across the entire effective width

### Descriptions and Order Numbers

**5-orifice nozzles FL (excl. dosing orifice)**
- Stainless steel
- POM (black) for dosing orifices 0.8/1.0/1.2 mm Ø
- POM (grey) for dosing orifices 1.2/1.5/1.8 mm Ø

<table>
<thead>
<tr>
<th>Dosing orifices</th>
<th>Stainless steel</th>
<th>POM (black)</th>
<th>POM (grey)</th>
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<tbody>
<tr>
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<td>500.179.56.00</td>
<td>500.179.56.01</td>
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</table>

**Dosing orifices**
- 0.8 mm/32 stainless steel
- 1.0 mm/39 stainless steel
- 1.2 mm/48 stainless steel
- 1.5 mm/59 stainless steel
- 1.8 mm/72 stainless steel

**Order number**
- 500.179.16
- 500.179.56.00
- 500.179.56.01
- 050.030.1C.00.00
- 050.030.1C.01.00
- 050.030.1C.02.00
- 050.030.1C.03.00
- 050.030.1C.04.00

**Features**
- 5-orifice nozzle with horizontal jet formation
- Nozzle sizes grey and black
- Pressure range dosing orifice
  - 0.8 to 1.0: 1.0 to 5.0 bar
  - 1.2: 1.0 to 4.0 bar
  - 1.5 to 1.8: 1.0 to 3.0 bar
- Fits all bayonet cap systems with 10 mm AF and threaded caps
- Height of spray boom: 1.0 m
- Drift prevented by large drops
- Easy adjustment of liter-per-hectare rate via exchange of dosing orifices
- Dosing orifices made of solid stainless steel and, hence, resistant to wear and corrosion
- Plant-protective spraying of fertilizer thanks to extremely coarse (dribble) application
- Uniform distribution of fertilizer across the entire effective width

**Description**
- **Water UAN**
- **Spray angle:** 160°
- **Material:** nozzle body stainless steel, POM grey
- **Materials:** dosing orifice stainless steel (only made of POM grey)
- **Cap:** stainless steel, POM grey
- **Coarse (dribble) application**
- **Nozzle body:** stainless steel
- **POM:** grey, black

**Dosing orifice Ø mm**

<table>
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<th>Dosing orifice Ø mm</th>
<th>[bar]</th>
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<th>UAN</th>
<th>UAN l/ha</th>
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**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 (1.5 and 1.8 mm).

- Spray pressure at the nozzle tip (gauged with a diaphragm valve).
- Lateral 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.
- The stated liter-per-hectare rates apply to UAN (28/1.28 kg/l).
# Tube drop system for boom sprayers

**Features**
- Tube-to-tube spacing on boom: 0.5 m or rather 0.25 m
- Hinged nipple to prevent tube breakage
- Pressure range 1.0 to 5.0 bar

**Benefits of tube drop system**
- Uniform application of liquid fertilizer thanks to broadcasting 5-orifice nozzles FL respectively liquid fertilizer nozzle FD
- Underleaf application of herbicides with low drift flat fan nozzles to prevent damage of the crop
- Robust, sturdy design
- Mounts easily on any boom sprayer
- Less load for big booms
- No danger of upper-leaf burn

### Tube Drop System Components

<table>
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<tr>
<th>Item</th>
<th>Description</th>
<th>Material</th>
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<td>EPDM</td>
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<td>Stainl. steel</td>
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<td>Hose clamp</td>
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<td>Bayonet body</td>
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<td>Bayonet cap – Spray boom</td>
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<td>System Lechler, TWISTLOC (incl. gasket 065.242.73)</td>
<td>POM</td>
<td>065.202.56.11.00.0</td>
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<td>8b</td>
<td>System: MULTIJET* + Hose shank 13 mm/AG 1/4&quot; + Bayonet cap G 1/4&quot; (incl. 3.0 mm gasket A.400.200.04.00) + Bayonet cap (incl. 3.0 mm gasket A.400.200.04.00) + optional: 4.0 mm gasket for tight fit of bayonet cap</td>
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<td>Fertilizer nozzles FD</td>
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</table>

*Please see UAN spray tables for FD and FL nozzles on page 20/21

* Please note correct alignment when bayonet cap (8) is assembled
Hose drop system for boom sprayers

Spray table for hose drop system

The stated liter-per-hectare rates apply to U A N  (28/1.28 kg/l)

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

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

Make sure that in all hoses the same dosing orifice are fitted

Benefits of hose drop system

- Suitable for precision-farming application of fertilizer via
  N sensor or other techniques
- Quick mounting/removal
- Robust, sturdy design, made of corrosion-resistant materials
- No danger of upper-leaf burn in wet conditions
- Less dependence on weather conditions
- Thin hoses are sliding easily through the canopy allowing higher forward speeds without risk of upward movement
- N-fertilisation according to CULTAN strategy by deposition as line on the soil

Spray table for hose drop system

lateral hose spacing: 0.25 m

<table>
<thead>
<tr>
<th>Item</th>
<th>Qty.</th>
<th>Description</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
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<td>098.009.1.13.67</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>Gasket Ø 8 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>095.016.56.00.42</td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td>Hose shank with vent bore</td>
<td>095.009.10.14.44</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 = 886 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>
<tr>
<td>12</td>
<td></td>
<td>Bayonet cap</td>
<td>095.016.56.11.00</td>
</tr>
</tbody>
</table>

**Installation advice:** Uptight labeling of dosing orifice.

**Note:**

- 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 U A N  (28/1.28 kg/l)

---

**Hose drop system features:**

- Hose spacing: 0.25 m
- Pressure range 1.0 to 10.0 bar
- Strong fabric hose avoids coming up in the canopy
VarioSelect®/VarioSelect® II
2- and 4-way nozzle holder
for variable location specific
plant protectant, growth regulator
and liquid fertilizer applications

Sensor based systems for variable rate application of liquid fertilizer and plant growth regulators in arable crops e.g. cereals, rapeseed etc. are becoming more and more important. Crucial for its practical use is their robustness and ease of use. Non-contact systems for measurement of biomass and chlorophyll as well as mechanical systems for measurement of plant biomass of cereals are distinguished.

A benefit of 100 € / ha for variable location specific fertilisation and plant growth regulator application in cereals is practicable considering the complete cropping system and the produced quality (Feiffer, Getreidezirazin 2/2005; Bröker, topagrar 2/2011; Leithold, Neue Landwirtschaft 5/2009).

Features and benefits
- V2 in new and more compact design in proven PSV valve technology
- V4 in modular design
- Single valve directly in front of the nozzle, immediate jet set up due to constant pressure in the pipe
- Liquid enters centrally or tangentially
- Various attachment possibilities on the spray boom thanks to modular design
- Suitable for operation with ring line, e.g. circulation and flushing
- Pneumatic connections G 1/8” (pre-fitted quick-action connectors on request, single valve “open” by compressed air (min. 4.5 bar) and “closed” by spring force
- Folding clamps for pipe diameter as per DIN 2462 and ISO 1127 for 20 mm, 1/2” incl. 22 mm, 3/4” and 1” mounts to a 9.5 mm hole in the pipe; 1” with 11 mm hole on request
- Max. spray pressure 8 bar, max. volumetric flow 10 l/min (1/2”) or 25 l/min (1” with 11 mm hole), pressure loss max. 0.4 bar

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.

For site specific application of liquid fertilizer with boom sprayers besides adequate sensor and control technique a flexible nozzle holder technique is necessary. Lechler VarioSelect multiple nozzle holders switch within a split of a second precisely nozzles in order to adapt differing l/ha rates matching the need of plants at the point of passing. The stepless adaption of liquid fertilizer from 60 to 620 l/ha or even more depending on nozzle size equipping is feasible. For location specific application the complete range of characteristic curves can be used. The principle of control is quite easy since increasing target quantity increases spray pressure of a nozzle to the programmed maximum flow rate switching then by the controller automatically to the bigger nozzle or nozzle combination. In the reverse direction a down regulation is also possible.
**Electro magnetic flow meter/Pumps**

**Top Flow II – Electro magnetic flow meter with digital read out**

- Material: Polypropylene glass reinforced

**Features**

- Displays overall total volume & batch total volume!
- Flow rate allows for Gallons or Liters Per Minute
- Magnetic style meter
- Temperature range from -15 °C to 65 °C
- Measuring accuracy 1 % at:  
  - 1": 8 - 400 l/min  
  - 2": 25 - 1100 l/min  
  - 3": 60 - 2500 l/min
- 1", 2" FP and 3" FP Full Port manifold
- Maximum pressure: 10 bar at 20° C

**Main benefits**

- Self calibrating meter
- Measures liquid fertilizer and spray mixtures
- No moving parts to fail during use
- Easy to change six (6) AA batteries
- Easy to use, robust design
- Manifold fittings enable:  
  - quick and easy assembly  
  - easy on/off hose connection  
  - 360° orientation

**Order no.**

- 1": B.MFM. 100.COM
- 2": B.MFM. 220.COM
- 2": B.MFM. 300.COM

**Pumps**

- Material: Polypropylene

**Description**

<table>
<thead>
<tr>
<th>Description</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PB 200 pump with base (excl. motor) Connector: 2&quot; female</td>
<td>095.016.00.07.82</td>
</tr>
<tr>
<td>PB 200 pump with three-phase a.c. motor Connector: BSP 2&quot; female</td>
<td>095.016.00.08.02</td>
</tr>
<tr>
<td>PB 200 pump with hydraulic motor Connector: BSP 2&quot; female</td>
<td>095.016.00.08.01</td>
</tr>
<tr>
<td>PB 200 pump with 200P6PRO gasoline engine Connector: 2&quot; female</td>
<td>095.016.00.07.81</td>
</tr>
<tr>
<td>PB 300 pump with base (excl. motor) 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 Connector: BSP 3&quot; female</td>
<td>095.009.00.12.20</td>
</tr>
<tr>
<td>PB 300 pump with hydraulic motor Connector: BSP 3&quot; female</td>
<td>095.009.00.12.22</td>
</tr>
</tbody>
</table>

Also available with Viton gaskets, e.g., for pumping rape-seed oil.
## Characteristics of different LF nozzle types

<table>
<thead>
<tr>
<th>Droplet size</th>
<th>Risk of treatment</th>
<th>Verteilung</th>
<th>Deleterious impact</th>
<th>Risk of a band distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-orifice nozzle, spraying vertical</td>
<td>+</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Lechler 5-orifice nozzle, spraying horizontal</td>
<td>+</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>7-orifice nozzle, spraying horizontal</td>
<td>--</td>
<td>+</td>
<td>+</td>
<td>○</td>
</tr>
<tr>
<td>Lechler FD liquid fertilizer nozzle, spraying horizontal</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>++</td>
</tr>
</tbody>
</table>

Unique, optimum transversal distribution and crop preserving application using the example of FD 06:

++ = excellent / very low  
+ = good / low  
○ = sufficient  
- = high  
-- = extremely high / very poor

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.
§ 1 Scope of Terms and Conditions, Exclusion of Liability

1. Our General Terms and Conditions for sale and payment apply to all our offers, deliveries, and performances.

2. The following Terms and Conditions shall only apply if the Customer has negotiated or agreed to a different set of conditions publicly as a matter of principle or in writing and the Customer explicitly acknowledges the applicability of such different conditions. The Customer shall promptly submit any written counter-offers to us.

3. Our general terms, our General Terms and Conditions apply exclusively. Any conflicting, opposing or additional general terms and conditions used by the Customer are expressly excluded and regarded as not having been agreed.

4. Contract of Sale, Credit, and Delivery

Prohibition of Assignment

1. Our offers or contracts for sale and delivery shall not be subject to any assignment. In order to become binding, offers or orders agreeable to these General Terms and Conditions shall only be subject to any amendment, change or modification upon our written confirmation.

2. All information about our products, in particular pictures, photographs, or drawings, which are included in our offers or brochures shall be regarded as approximate values. Silhouettes in quantity, weight, number of pieces and dimensions are only approximate. The Customer shall never have any claims against us due to any error or omission.

3. Our written order confirmation or, in the event of lack of such order confirmation, our delivery shall be regarded as the sole determining factor as to the service and the service to be rendered.

4. Any agreement, side agreement, warranty or modification to the contract shall be effective only if and to the extent we agree to it in writing.

5. Any documents such as drawings, pictures, descriptives, or similar documents that may form the basis of our order shall only become part of the contract if and to the extent we agree to it in writing. Any other modifications and specifications of weight and dimensions which may be subject to the extent such modifications are not essential and the essential specifications of the contract shall apply to the contract.

6. The Customer shall not be entitled to assign or transfer any claims or rights resulting from the business relationship with us to third parties without our express prior consent.

7. Our invoices are immediately due for payment. For payments made within 14 days after the invoice date, we give a discount of 3% of the invoice amount. If the payment is made after the due date, interest at a rate of 1% per month (or part thereof) shall be immediately due for payment without any discounts.

8. In the event of payments outstanding from the Customer, we may render our delivery against advance payment or, in the event of any other additional costs, have to be paid in addition.

9. Where our Customer is in delay with payments, in particular with payments due within 14 days and in respect to the goods or services we have provided, we shall also be entitled to demand the return of the goods or services or to retain them.

10. § 3 Prices, Payment, Set Off and Rights of Set Off

1. Our prices are net prices and shall be on an Ex Works basis. If and to the extent our prices do not contain value-added tax, the Customer shall pay value-added tax at the rate applicable at the time (even if not separately shown), costs for packaging, transport, insurance, customs duties, any costs for bank or payment transactions, including any other additional costs, which have to be paid in addition.

2. If any part of our goods is immediately due for payment, for payments made within 14 days after the invoice date, we give a discount of 3% of the invoice amount. If the payment is made after the due date, interest at a rate of 1% per month (or part thereof) shall be immediately due for payment without any discounts.

3. In the event of payments outstanding from the Customer, we may render our delivery against advance payment or, in the event of any other additional costs, have to be paid in addition.

4. Where our Customer is in delay with payments, in particular with payments due within 14 days and in respect to the goods or services we have provided, we shall also be entitled to demand the return of the goods or services or to retain them.

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6. Our written order confirmation or, in the event of lack of such order confirmation, our delivery shall be regarded as the sole determining factor as to the service and the service to be rendered. The foregoing shall also apply to a waiver of the right to demand payment of interest and costs.

7. Any documents such as drawings, pictures, descriptives, or similar documents that may form the basis of our order shall only become part of the contract if and to the extent we agree to it in writing. Any other modifications and specifications of weight and dimensions which may be subject to the extent such modifications are not essential and the essential specifications of the contract shall apply to the contract.

8. The Customer shall not be entitled to assign or transfer any claims or rights resulting from the business relationship with us to third parties without our express prior consent.

9. Our invoices are immediately due for payment. For payments made within 14 days after the invoice date, we give a discount of 3% of the invoice amount. If the payment is made after the due date, interest at a rate of 1% per month (or part thereof) shall be immediately due for payment without any discounts.

10. In the event of payments outstanding from the Customer, we may render our delivery against advance payment or, in the event of any other additional costs, have to be paid in addition.

11. Where our Customer is in delay with payments, in particular with payments due within 14 days and in respect to the goods or services we have provided, we shall also be entitled to demand the return of the goods or services or to retain them.

5. Pasing of Risk, Delivery, Packaging

1. Unless agreed upon instead, our deliveries are to be carried out on an Ex Works basis.

2. The risk including the risk of seizure passes in all cases of delivery or dispatch of the delivery item to the Customer in the ordinary course of business provided that the extended retention of title to the delivered goods is subject to the same conditions as a particular pledge, lease, rent or transfers by way of particular security and that the Customer shall immediately disclose to us all the information concerning the delivery item with respect to its intended use and has caused the building's insurance policies to be extended accordingly.

3. If the delivery item is delayed beyond a com m ensurate period of tim e or if the Customer has expired unsuccessfully, the Customer has the right to withdraw from the contract if the item  to be delivered has left our premises and the Customer is in delay with any payments, the invoice shall hereby be paid in addition.

4. Interest and costs shall be borne by the Customer.

6. § 6 Retention of Title

1. In case of our delivery of goods, the Customer shall be excluded from the right to alienate, pledge, or dispose of the goods without our prior written consent.

2. If the risk of loss foreseeable and typical for this kind of delivery item has not been passed to the Customer, the risk of loss shall pass to the Customer upon notification of the delivery item to the Customer.

3. If the delivery item is delayed beyond a com m ensurate period of tim e or if the Customer has expired unsuccessfully, the Customer has the right to withdraw from the contract if the item  to be delivered has left our premises and the Customer is in delay with any payments, the invoice shall hereby be paid in addition.

4. Interest and costs shall be borne by the Customer.

7. Warranty

1. If and to the extent we are responsible for material damages and delicts of title according to the following provisions.

2. Certain characteristics shall only be considered as non-conformity if expressly confirmed in writing. A guarantee shall only be deemed issued if explicitly denominated as such in writing.

3. For any defects and delicts of title which are subject to the contract shall generally be a warranty against concealed defects and delicts of title.

4. The warranty period shall be limited to the period of the defect's appearance or the period of the defect's cause.

5. The Customer shall immediately inform us in writing about any non-conformity or any defect of title; the Customer may be entitled to claim damages if we are notified of the defect or if we have failed to claim the defect or if the Customer has expired unsuccessfully, the Customer has the right to withdraw from the contract if the item  to be delivered has left our premises and the Customer is in delay with any payments, the invoice shall hereby be paid in addition.

6. Interest and costs shall be borne by the Customer.

8. Compensation for damages, costs and expenses awarded against or in our favor.

9. Unless provided otherwise in the relevant contract, all claims, documents, or other intellectual property rights in application and registration as well as the use of such documents, these documents may not be passed to third parties or be used for our own purpose or the purpose of third parties. If the Customer has not complied with these obligations, we reserve the right to assert claims and to demand damages, costs, and expenses awarded against or in our favor.

10. Intellectual Property Rights, Tools

1. Any tools or other intellectual property rights in application and registration as well as the use of such documents, these documents may not be passed to third parties or be used for our own purpose or the purpose of third parties. If the Customer has not complied with these obligations, we reserve the right to assert claims and to demand damages, costs, and expenses awarded against or in our favor.

11. Assembly

With respect to compliant, the standard terms of the relevant special condition of our customer, the Third Party, or the relevant special condition of our customer, the Third Party, or the relevant special condition of our customer, the Third Party, or the relevant special condition of our customer, the Third Party, or the relevant special condition of our customer, the Third Part