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Operating manual LF 600 M1

Please read carefully before initial operation!

ORIGINAL OPERATING MANUAL



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1 General

This chapter contains information on your Liquid Fertilizer and on this operating manual.

1.1 About this operating manual

Validity and purpose

This operating manual is valid for Liquid Fertilizer implements manufactured by APV – Technische Produkte GmbH with the type designation LF 600 M1.

This operating manual provides anyone who will be handling the Liquid Fertilizer with the required information to be able to perform the following tasks properly and safely:

- Installation
- Commissioning
- Operation
- Maintenance
- Repairs
- Decommissioning, dismantling, recommissioning, storage and disposal

Target group

This operating manual is aimed at all those who will be handling the Liquid Fertilizer:

- Transporter
- Assembly personnel
- Operating personnel
- Maintenance and repair personnel

Parts of the document that must absolutely be read

To prevent injuries and damage to the implement, it is absolutely necessary to have read and understood the *Safety* chapter on page 10 before handling the implement.

Copyright

The copyright for this operating manual remains with the manufacturer:

APV - Technische Produkte GmbH
HEADQUARTERS
Dallein 15
A-3753 Hötzelstdorf
AUSTRIA

This operating manual contains regulations and technical drawings that may not, as a whole or in part, be reproduced, distributed or used in any unauthorised way for competitive purposes or passed on to others.

Passing on or reproduction of this operating manual, evaluation, and communication of its contents are not authorised unless explicitly agreed. Contraventions shall result in an obligation to provide compensation for damages.

Information on manufacturer liability

The manufacturer is not liable for damage and malfunctions resulting from non-compliance with this operating manual.

1.2 Identification of the implement

Clear identification

The Liquid Fertilizer can be clearly identified by the following information on the type plate:

- Description
- Model
- Production number

Position of the type plate

The type plate can be found at the bottom in the centre of the steel rack, close to the pump.

Figure with the type plate

The image shows the layout of the type plate:



Figure 1: Layout of the type plate

The data on the type plate have the following meaning:

No.	Meaning
1	Description
2	Model
3	Production number
4	Weight
5	Year of manufacture

1.3 Service

Service

Please contact our service address in the following cases:

- If you still have questions regarding the handling of the Liquid Fertilizer despite the information provided in this operating manual
- For spare parts orders
- To order maintenance and repair work

Service address

APV - Technische Produkte GmbH
HEADQUARTERS
Dallein 15
A-3753 Hötzelstdorf
AUSTRIA

Telephone: +43 (0) 2913 8001
Fax: +43 (0) 2913 8002
Email: service@apv.at
Web: www.apv.at

1.4 EC Declaration of Conformity

Manufacturer

APV - Technische Produkte GmbH
HEADQUARTERS
Dallein 15
A-3753 Hötzelstdorf
AUSTRIA

Implement

This Declaration of Conformity is valid for the following implements:

Liquid Fertilizer of type

- LF 600 M1

Observed Directives

The implements and the optional devices fulfil the requirements of the following European Directives:

- 2006/42/EC Machinery Directive
- 2014/30/EU EMC Directive

Applied standards

The following standards were applied:

- EN 14982 Agricultural and forestry machinery - Electromagnetic compatibility
- EN 15811 Agricultural machinery - Guards
- EN 349 Safety of machinery – Minimum gaps to avoid crushing of parts of the human body
- EN 60204-1 Safety of machinery – Electrical equipment
- ISO 12100 Safety of machinery; General principles for design; Risk assessment and risk reduction
- ISO 4254-1 Agricultural machinery - Safety - General requirements

2 Description

This section provides an overview of the technical characteristics of the Liquid Fertilizer.

2.1 Layout and operating principle of the Liquid Fertilizer

Liquid Fertilizer LF 600 M1

The Liquid Fertilizer with type designation LF 600 M1 is designed for spreading liquid fertilizers. A three-point hitch is used to mount it on the front of a tractor.

Implement layout

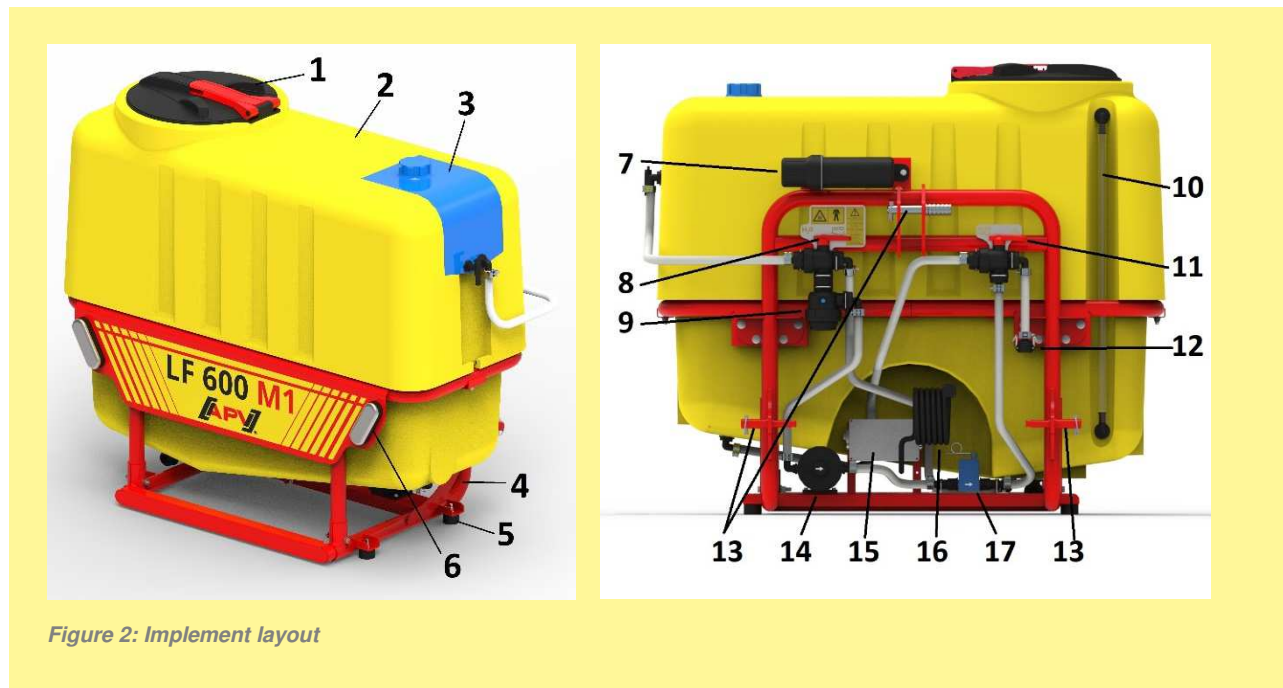


Figure 2: Implement layout

No.	Description	Function
1	Lid for the fertilizer tank with filling sieve	<ul style="list-style-type: none"> Covering the fertilizer tank Protecting the liquid fertilizer from escaping and foreign objects
2	Fertilizer tank	<ul style="list-style-type: none"> Carrying liquid fertilizer Feeding the liquid into the pump
3	Fresh water tank	<ul style="list-style-type: none"> For washing hands To flush the pump, hoses, and nozzles
4	Steel rack	<ul style="list-style-type: none"> Hooking on and connecting implement components
5	Parking legs	<ul style="list-style-type: none"> Ensure stability when the implement is not being used
6	Lighting	<ul style="list-style-type: none"> Limiting lights with indicators
7	Operating manual tube	<ul style="list-style-type: none"> The operating manual is stored in this tube
8	Ball valve 1	<ul style="list-style-type: none"> For switching between the fertilizer tank (during operation) or the fresh water tank (for cleaning)
9	Suction filter	<ul style="list-style-type: none"> Filters out contamination and lumps from the substrate so that no damage occurs to the pump
10	Fill level sensor	<ul style="list-style-type: none"> Indicates the fill level of the fertilizer tank
11	Ball valve 2	<ul style="list-style-type: none"> To switch between operating modes: <ol style="list-style-type: none"> Liquid is fed to the nozzles and to the agitator in the tank Liquid is pumped back to the tank
12	Fast coupler	<ul style="list-style-type: none"> For quickly uncoupling the feed line to the distributor head when uncoupling the implement from the tractor

No.	Description	Function
13	3-point hitch	<ul style="list-style-type: none"> The implement is attached to the tractor with these three points
14	Diaphragm pump	<ul style="list-style-type: none"> The pump produces the required flow for the medium to be spread
15	Distributor box	<ul style="list-style-type: none"> All of the cables are connected here
16	Implement cable	<ul style="list-style-type: none"> This cable is routed into the tractor and connected to the control box
17	Flow sensor	<ul style="list-style-type: none"> Measures the flow of the liquid and thus regulates the pump

Operating principle of the Liquid Fertilizer

To spread liquid fertilizer, the following process takes place:

Phase	Description
1	The operator sets the implement up for operation and fills the fertilizer tank with liquid fertilizer.
2	The operator activates the Liquid Fertilizer using the controls. Result: <ul style="list-style-type: none"> The pump rotates. The flow sensor measures the flow rate.
3	The liquid fertilizer is drawn from the tank through a filter. Using the pump, the medium is pressurised (max. 4 bar) and then pumped to the distributors.
4	The fertilizer is spread through the nozzles.

2.2 Scope of delivery

The scope of delivery includes all assembly groups and components that are delivered as a standard by APV - Technische Produkte GmbH.

Pos.	Rate	Description
1	1	Basic implement
1.1	1	Steel rack
1.2	1	Fertilizer tank
1.3	1	Fresh water tank
2	1	Visual fill level indicator
3	1	Diaphragm pump
4	1	Flow sensor
5	1	Suction filter
6	1	Hose
7	1	Distributor
8	1	Nozzles

2.3 Technical data

Mechanical data

Implement version	Size	Value
LF 600 M1	Max. tank content	600 l
	Weight	120 kg
	Dimensions (H x W x D in cm)	130 x 145 x 80

Electrical data

Values for the pump:

Size	Value
Supply voltage	12 V
Supply current	25 A
Power consumption of the pump	25 A when starting

Spreading widths

Recommended spreading width: 1 - 6 m

Mounting categories

CAT I - II

3 Safety

This section contains all requirements and measures that ensure safe operation of the Liquid Fertilizer.

3.1 Safety instructions in this document

What are safety instructions?

Safety instructions are information that serve to prevent personal injuries. Safety instructions contain the following information:

- Type of danger
- Possible consequences in case of non-compliance with the instructions
- Measures to prevent personal injury

3.2 Basic safety regulations

Target group for these regulations

These regulations are aimed at all those who will be handling the Liquid Fertilizer.

Purpose of these regulations

These regulations aim to ensure that all persons who will be handling the Liquid Fertilizer are thoroughly informed about the dangers and safety measures and observe the safety instructions in the operating manual and on the implement. If you do not follow these regulations, you are at risk of injury and material damage.

Handling the operating manual

Observe the following regulations:

- Read the Safety section and the section relating to your work completely. You must understand these contents.
- Always keep the operating manual close to the implement for reference purposes. There is a container for this installed on the Liquid Fertilizer.
- When passing on the implement, be sure to pass on the operating manual.

Handling the Liquid Fertilizer

Observe the following regulations:

- Only persons who fulfil the requirements defined in this operating manual may handle the Liquid Fertilizer.
- Only use the implement for the intended purpose.
- Never use the Liquid Fertilizer for any other purpose, even if it may seem similar.
- Observe all of the safety measures that are indicated in this operating manual and on the implement.
- Do not make any modifications to the Liquid Fertilizer, e.g. by removing parts or mounting unauthorised parts.
- When replacing defective parts, only use original spare parts or standard parts approved by the manufacturer.
- Due to toxic vapours in the fertilizer tank, climbing into the tank is forbidden.

Operator obligations toward the personnel

As the operator, you have to ensure the following:

- The personnel fulfils the requirements corresponding to his work.
- All personnel have read and understood this operating manual before handling the Liquid Fertilizer.
- The regulations applicable in your country for safety at work are being observed.

Procedure in case of accident

The Liquid Fertilizer is designed and built so that the personnel can work without risk. Despite all precautions, however, unforeseeable accidents can still occur under unfavourable circumstances. Always observe your company's guidelines regarding accidents.

More information on the subject of

- *Intended use* in Chapter 3.3, page 11
- *Personnel requirements* in Chapter 3.4, page 11
- *Dangers and safety measures* in Chapter 3.7, page 14

3.3 Intended use

The Liquid Fertilizer LF 600 is used to spread liquid fertilizers with different consistencies and viscosities on the open field.

The implement is designed solely for normal use in agricultural operations. Any other use is considered to be non-intended. The manufacturer is not liable for any resulting damage, the operator alone bears the associated risk.

Intended use also includes compliance with the conditions for operation, maintenance, and repairs prescribed by the manufacturer.

The applicable accident prevention regulations as well as the other general safety-related and occupational health regulations must also be observed.

The manufacturer is not liable for any damage resulting from unauthorised modifications and the use of components and auxiliary parts.

3.4 Personnel requirements

The implement may only be used, maintained and repaired by persons who have relevant experience and were instructed on the risks. The safety instructions must also be handed over to other users.

Qualification

Persons who will be handling the Liquid Fertilizer must fulfil the following requirements:

Personnel	Activities	Required qualification
Forwarder	<ul style="list-style-type: none">• Transport of the implement from one farm to another	<ul style="list-style-type: none">• Experience with transport of machinery• Qualification of a transport specialist for machinery
Transporter	<ul style="list-style-type: none">• Transport of the implement within the farm	<ul style="list-style-type: none">• Forklift driver• Experience with handling the suitable lifting gear
Installer	<ul style="list-style-type: none">• Installation and commissioning of the implement	<ul style="list-style-type: none">• Trained mechanic
Setter	<ul style="list-style-type: none">• Setting up the implement	<ul style="list-style-type: none">• Experience in the agricultural field• Experience in handling the Liquid Fertilizer implement
Operator	<ul style="list-style-type: none">• Operating the implement while it is running• Cleaning the implement	<ul style="list-style-type: none">• Trained assistant
Maintenance personnel	<ul style="list-style-type: none">• Performing maintenance work• Performing repair work	<ul style="list-style-type: none">• Trained mechanic
Disposer	<ul style="list-style-type: none">• Disposing of the implement	<ul style="list-style-type: none">• Disposal specialist

3.5 Personal protective equipment

The personnel must be equipped with the following personal protective equipment and wear it for the following tasks:

- When mixing the liquid fertilizer
- When cleaning / changing the spray nozzles
- For all work involved with cleaning the Liquid Fertilizer after spreading the fertilizer

Always observe the manufacturer specifications for wearing the required protective clothing. Please use:

- Chemical-resistant gloves
- Chemical-resistant overalls
- Waterproof footwear
- Breathing protection
- Safety glasses
- Mask
- Skin protection product

3.6 Safety devices

Meaning of the safety devices

The Liquid Fertilizer has safety devices that protect the user from danger. All safety devices must be fitted and functional when operating the implement.

Location of the guards

- Parking legs on the underside of the Liquid Fertilizer

Function of the safety devices

The safety devices have the following function:

No.	Description	Function
1	Parking legs	Prevent the parked implement from falling over.

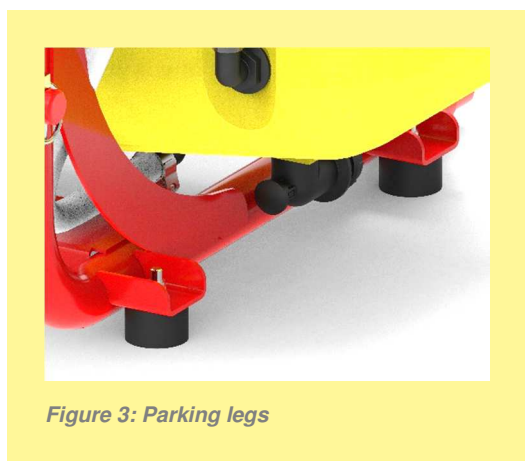


Figure 3: Parking legs

3.6.1 Warning signs

Purpose

Warning signs on the implement warn about danger points. The warning signs must always be present and legible.

Overview

This figure shows the position of the warning signs.



Figure 4: Position of the warning signs

The table shows all warning signs that are installed on the Liquid Fertilizer and their meaning.

Appearance of the sign	Meaning of the sign
 <p>(D) Vor Inbetriebnahme die Betriebsanleitung und Sicherheitshinweise lesen und beachten.</p> <p>(F) Lire le mode d'emploi et les conseils de sécurité avant la mise en marche de l'appareil et en tenir compte pendant son fonctionnement.</p> <p>(GB) Carefully read the operators manual prior to operating. Observe all operating and safety warnings!</p> <p>(I) Leggere attentamente il libretto delle istruzioni e le misure di sicurezza prima della messa in moto e tenerne in debito conto durante il funzionamento.</p> <p>(NL) Voor ingebruikname gebruiksaanwijzing en veiligheidsvoorschriften goed lezen en in acht nemen.</p> <p>Art.Nr. 00601-3-639</p>	<p>Read and observe the operating manual before operating the implement! Operating errors can lead to serious injuries.</p>
 <p>Art. Nr. 00601-3-937</p>	<p>Hazard due to contact with harmful substances caused by improper handling of harmful substances! This hazard can cause severe injuries, possibly even death.</p> <ul style="list-style-type: none"> ➤ Put on protective clothing before you come into contact with harmful substances. ➤ Observe the manufacturer's safety instructions for the substances to be processed.
 <p>Art. Nr. 00601-3-938</p>	<p>Hazard due to contact with harmful substances caused by improper use of the clear water from the hand wash tank. This hazard can cause severe injuries, possibly even death!</p> <ul style="list-style-type: none"> ➤ Never use the clear water from the hand wash tank as drinking water.
 <p>Art. Nr. 00601-3-939</p>	<p>Hazard due to breathing in harmful substances caused by toxic vapours in the fertilizer tank! This hazard can cause severe injuries, possibly even death.</p> <ul style="list-style-type: none"> ➤ Never climb into the fertilizer tank.

3.7 Dangers and safety measures

Overview

The Liquid Fertilizer is designed such that the user is protected from all avoidable dangers that are practical in design terms. Due to the purpose of the implement, however, there are residual dangers that require precautionary measures to be avoided.

In the following, you will be informed about the types of these residual dangers and their effects.

Transport

Danger	Where and in which situations does the danger occur?	Countermeasure
Risk of crushing due to the weight of the implement	When lifting and lowering the implement	The implement may only be transported by personnel trained for this task.

Installation

Danger	Where and in which situations does the danger occur?	Countermeasure
Risk of crushing due to the weight of the implement	When lifting and lowering the implement	The implement may only be transported with a forklift or lift truck by personnel trained for this task.
Risk of slipping, stumbling and falling	When mounting the implement on a soil tillage implement or on the tractor	Work must be performed on sturdy steps with non-slip safety shoes.

Set-up

Danger	Where and in which situations does the danger occur?	Countermeasure
Danger due to defective implement parts	When operating the implement	Before operating the implement, always check for fractures, cracks, chafe marks, leaks, loose bolts, vibrations, sounds, and functionality.

Operation

Danger	Where and in which situations does the danger occur?	Countermeasure
Risk of injury due to fertilizer being thrown out	While spreading fertilizer	Always ensure that there is nobody standing in the spreading range of the implement.
Risk of slipping, stumbling and falling	When handling the implement during operation	Only enter the implement area using sturdy steps with non-slip safety shoes.
Risk of poisoning due to toxic fertilizer	While spreading fertilizer	When handling toxic fertilizers, wear personal protective equipment.

Cleaning

Danger	Where and in which situations does the danger occur?	Countermeasure
Risk of poisoning with toxic fertilizers	When cleaning the implement with water	Wear personal protective equipment when handling toxic fertilizers. Do not climb into the tank.

Maintenance and repairs

Danger	Where and in which situations does the danger occur?	Countermeasure
Incorrectly or inadequately performed maintenance work with limited visibility	Under poor light conditions	If necessary, maintenance must be performed with additional lighting.

4 Installation and commissioning

Overview

In this section, you will learn which work steps must be performed for the installation and commissioning of the Liquid Fertilizer and what must be done and observed.

4.1 Attaching the Liquid Fertilizer implement to a tractor

Purpose

For field operation, the Liquid Fertilizer can be attached directly to the front of a tractor using the 3-point hitch.

Requirements

The following requirement must be fulfilled for this work step:

The implement is disconnected from the power source, see *Disconnecting the Liquid Fertilizer* from the power source on page 29 for more information.

Required components, tools and materials

For this work step, the following components, tools and materials are required:

- Cat. 2 top link
- Top link pin with linchpin
- 2x linchpin for the lower link attachment

Procedure for attachment

To attach the Liquid Fertilizer to a tractor:

Step	Description	Explanation/illustration
1	Drive the tractor towards the implement.	
2	Connect the two lower links to the LF 600 M1.	
3	Adjust the Cat. 2 top link to the right length and couple onto the implement using the top link pin.	During operation, the LF should be aligned vertically to achieve optimal emptying.

4.2 Installing nozzles on the soil tillage implement

Purpose

The nozzles are used to spread the liquid fertilizer in the right position on the soil tillage implement or seed drill.

Requirements

The following requirements must be met for optimal fertilizer distribution:

- The distributor must be installed horizontally on the implement in working position.
- The pressure gauge must be installed where it can be checked from the driver's seat during operation.



Required components, tools and materials

For this work step, the following components, tools and materials are required:

- Distributor with bracket
- Connecting hose
- Pressure gauge with bracket
- Nozzle holder
- Nozzle
- Hexagon key

Procedure for installation

To install the nozzles on the soil tillage implement or seeding units:

Step	Description	Explanation/illustration
1	Distribute the nozzles evenly across the entire working width or on the seeding units of the implement.	
2	Fasten the nozzle holder (plug connector) on the implement.	
3	Connect the hoses to the nozzle holder (plug connector), see Connecting the hoses for more information (page 17).	

4.3 Connecting the hoses

Purpose

The hoses carry the liquid fertilizer from the pump unit to the soil on the field. Before initial operation, all hoses must be cut to an equal length between the distributor and the grooves and must be connected to the nozzle holders.

For checking purposes, a pressure gauge is inserted in a hose between the distributor and nozzle holder using a T-piece.

Requirements

The following requirement must be fulfilled for this work step:

- None



Required components, tools and materials

For this work step, the following components, tools and materials are required:

- Hose roll
- Hose cutter

Procedure

To connect the hoses to the distributor:

Step	Description	Illustration
1	Using a sharp cutting tool, cut hose sections from the hose roll in the equal lengths required respectively. The cut edge on the hose must be at 90°.	
2	Insert the cut-off hoses into the plug connections on the distributor up to the end stop and pull lightly to make sure they are firmly attached.	
3	At the other end, the hoses are fastened to the nozzle holders using plug connectors. Between the distributor and nozzle holder, a hose needs to be severed and connected to the pressure gauge using a T-piece and another piece of hose.	
4	The feed line between the pump unit and distributor must be adjusted to the desired length. It can be closed off at the pump unit using the quick fastener when uncoupling the soil tillage implement.	

5 Control box

In this chapter, you will learn which settings need to be made on the control box to be able to operate the Liquid Fertilizer and set the required spread rate.

5.1 Items included and connection

Information about the items included and the electric connection can be found in the operating manual that is included with the control box.

5.2 Basic settings

To be able to operate the Liquid Fertilizer, you must select implement type "LF" on the control box. There are two ways to do this:

- When you switch on the control box for the first time, you will be asked about the implement type, among other things. Here, you must select "LF" using the +/- keys and confirm with OK.
- If the control box has already been used, you must make this setting in the Programming menu. To do so, when the control box is switched off, press and hold the ON/OFF button until "0. Implement type" appears on the display. Here, you must also select "LF" using the +/- keys and confirm with OK.

As soon as you have selected LF once as the implement type, it remains stored. If you should want to use the same control box to operate other implement series, you can change the setting again in the Programming menu as described above.

5.3 Main display

When you switch on the box, the main screen appears on the display (= the Work screen). It shows the current motor speed in %, the set forward speed, and the set spread rate.

The Work screen looks slightly different depending on whether you are working with or without a speed sensor:



Figure 5: Work screen without speed sensor



Figure 6: Work screen with speed sensor

Figure 5 shows the Work screen without a speed sensor. To reach the desired spread rate, the set forward speed must be precisely maintained!

Figure 6 shows the Work screen with a speed sensor. Here, the actual driven speed can deviate from the preset value - the differences are calculated and compensated for by the control box.

As a result, you always apply the desired quantity per area.

5.4 Settings

By pressing the arrow keys, you can reach the other menu points. To make further settings, press an arrow key until the Settings menu point is reached. You can enter the Settings menu by pressing the OK button. The following items can be found there, which can be scrolled through using the arrow keys:

<p>5.4.1 Spread rate (l/ha) In this menu point, the desired spread rate can be set by pressing the + or – key. By holding the + or - key, the value is changed more quickly.</p>	
<p>5.4.2 Working width In this menu point, the desired working width can be set by pressing the + or – key. By holding the + or - key, the value is changed more quickly.</p>	
<p>5.4.3 Forward speed In this menu point, the desired forward speed can be set by pressing the + or – key. By holding the + or - key, the value is changed more quickly.</p>	
<p>5.4.4 Pulses per litre In this menu point, the pulses per litre that are emitted by the flow sensor can be set by pressing the + or – key. By holding the + or - key, the value is changed more quickly. The value can be seen on the flow sensor and should remain set at 400 pulses per litre (default value). If, contrary to expectations, the actual spread rate should consistently deviate from the target spread rate, corrections can be made by adjusting this value. For example, if the spread rate is 5% too high, this value must be reduced by 5% and vice-versa.</p>	
<p>5.4.5 To the Main menu Select this menu point with the OK button to go back to the Main/Work screen.</p>	

5.5 Emptying

The Emptying menu is reached by pressing the arrow keys. By pressing the OK button, the pump is switched on and operated at full speed. Depending on the position of the stop taps, this function can either be used to stir the tank contents or also to empty the tank.

5.6 Trip and total counters

By pressing the arrow keys on the Main screen, different counter readings can be called up. By pressing and holding the OK button for 5 seconds, the trip counter can be set to zero. Beside the quantity counter, there is also a counter for the area and the operating hours. The trip counter can also be set to zero here by pressing and holding the OK button.



5.7 Changing the spread rate during operation

By pressing the + or – key on the Main screen, the preset spread rate can be changed in 5%-increments to a maximum of +/- 50%. The change is shown on the Work screen:



5.8 Switching on the pump

By pressing the "Start metering unit" button (at the bottom right on the control box), spreading is started. Based on the forward speed, the working width, and the set spread rate, the control box calculates the required flow rate and adjusts the system accordingly. This can be seen by the fluctuating motor speed. Slight fluctuations are normal here and show that the parameters are being continuously measured and the system readjusted. If the pump is not able to reach or maintain the desired spread rate, a warning is issued through a corresponding error message. If this should be the case, the nozzles must be adapted to the application case.

5.9 Emergency operation

If there are difficulties with the flow sensor, it can be deactivated and the pump speed can then be adjusted manually. To do so, the pulses per litre (see Point 5.4.4) must be set to 0. Then the motor speed can be adjusted manually on the Work screen using the + and – keys. Please note: The flow rate changes depending on the counter-pressure. If the spread rate needs to be precisely maintained, the liquid must be collected at the nozzles and the spread rate per unit of time must be checked. Feeding the liquid through the ball valve directly into a bucket does not provide sufficiently accurate results, as there is no counter-pressure.

6 Operation

In this section, you will learn how to properly configure the Liquid Fertilizer and the fertilizer flow rate, and how to adjust it during operation.

6.1 Setting and adjusting the spread rate

Purpose

The spread rate setting has significant effects on the spreading results.

Requirements

The following requirement must be fulfilled for this work step:

- None

Procedure

To set and adjust the spread rate:

Step	Description
1	To set the desired spread rate, the required data such as the working width, speed, and l/ha must be entered in the control box under the "Calibration test" menu point.
2	A calibration test does not need to be performed, as the pump is regulated by a flow sensor.
3	The pulses for the flow sensor (2.5 - 50 l/min) must be set at 400 pulses/l on the control box.

Calculating the spread rate

The spread rate can be calculated using the following formula:

$$SpR = \frac{Q_{des} \times V_{tractor} \times W_{work}}{600}$$

SpR: Spread rate in l/min
Q_{des}: Desired quantity (desired spread rate) in l/ha
V_{tractor}: Tractor speed in km/h
W_{work}: Working width in m

6.2 Checking the spread rate

Purpose

The spread rate can be checked, but it is not absolutely necessary as the flow sensor manages this task.

Requirements

The following requirement must be fulfilled for this work step:

- None

Required components, tools and materials

For this work step, the following components, tools and materials are required:

- Collection bucket for each outlet (nozzle)
- Scale or measuring cup
- Timer

Procedure

To check the spread rate:

Step	Description
1	Set the desired parameters on the control box (spread rate in l/ha, speed, and working width).
2	Place a cup under each outlet (nozzle) to collect the liquid.
3	Start the pump on the control box and let it run for approx. 30 sec. so that the pump can adjust itself.
4	Empty all of the cups and put them back under the nozzles.
5	Start the pump and the timer simultaneously. Stop again simultaneously after 1-2 minutes.
6	Empty all of the cups in a measuring cup and check the spread quantity with the formula shown on page 22.
7	If there is a difference to the set values, the percentage of the deviation must be determined and this percentage must then be added or deducted from the pulses/litre.

6.3 Selecting the right nozzles

Purpose

Fertilising results are significantly improved by selecting the right nozzle which is suitable for the spread rate.

Requirements

The following requirement must be fulfilled for this work step:

- None

Required components, tools and materials

For this work step, the following components, tools and materials are required:

- None



TIP!

Grooves can be seen on the nozzles. The number of grooves can be used to determine the diameter: 1 groove = 1 mm nozzle, 2 grooves = 2 mm nozzle, 3 grooves = 3 mm nozzle (see also Figure 7).



Figure 7: 1 mm nozzle with 1 groove, 2 mm nozzle with 2 grooves, 3 mm nozzle with 3 grooves



CAUTION!

It is important to select the combination of nozzles such that the motor power on the control box is ideally between 20% and 80%. This ensures good regulation and homogeneous delivery of the liquid fertilizer even with ground speed-related spreading at very low or high speeds.

6.4 Replacing nozzles

Purpose

The spreading results are significantly improved by installing the right nozzle.

Requirements

The following requirements must be fulfilled for this work step:


- The implement is disconnected from the power source, see *Disconnecting the Liquid Fertilizer from the power source* (page 29) for more information.

Required components, tools and materials

For this work step, the following components, tools and materials are required:

- None

Procedure

Step	Description	Illustration
1	Push back the blue stop on the plug connector.	
2	Remove the nozzle.	
3	Push the new nozzle into the plug connector. The nozzle engages automatically.	
4	Check that the nozzle is firmly seated by pulling on it slightly.	

6.5 Filling the tank

Purpose

The fertilizer tank contains the fertilizer to be spread.

The fresh water tank contains fresh water for cleaning and flushing the pump and nozzles.

Requirements

The following requirement must be fulfilled for this work step:

- The implement is disconnected from the power source, see *Disconnecting the Liquid Fertilizer from the power source* (page 29) for more information.

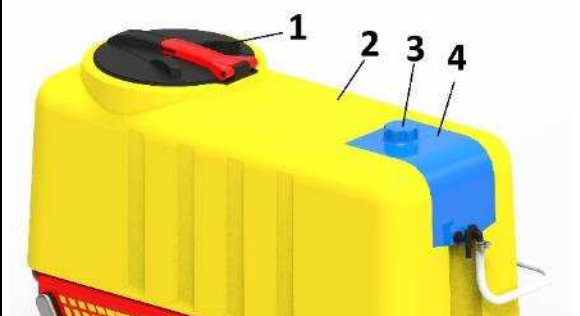
Required components, tools and materials

For this work step, the following components, tools and materials are required:

- Liquid fertilizer
- Fresh water

Overview

No.	Description
1	Lid of the fertilizer tank
2	Fertilizer tank
3	Lid for the fresh water tank
4	Fresh water tank



Procedure

To fill both tanks:

Step	Description	Explanation
1	Turn the lid (1) counterclockwise to open the fertilizer tank and fold it away to the rear by 180°.	
2	Fill the liquid fertilizer into the fertilizer tank (2) through the filling sieve.	
3	To close the fertilizer tank, fold the lid (1) to the front and turn it clockwise.	
4	To open the fresh water tank, turn the lid (3) counterclockwise.	
5	Fill fresh water into the tank.	This must only ever be filled with fresh water.
6	To close the fresh water tank, turn the lid (3) clockwise.	

6.6 Switching between the fertilizer tank and the fresh water tank

By switching over the ball valve, the fertilizer tank or the fresh water tank ("H₂O") can be activated. During operation, the ball valve must be set to the fertilizer tank (see Figure 9: Setting to the fertilizer tank).

The fresh water from the fresh water tank is used to clean the pump, the hoses, and the nozzles. When cleaning the implement, the valve must be set to the fresh water tank (see Figure 8: Setting to the fresh water tank (H₂O)) to flush the pump and the nozzles with fresh water and to prevent clumps.



Figure 9: Setting to the fertilizer tank

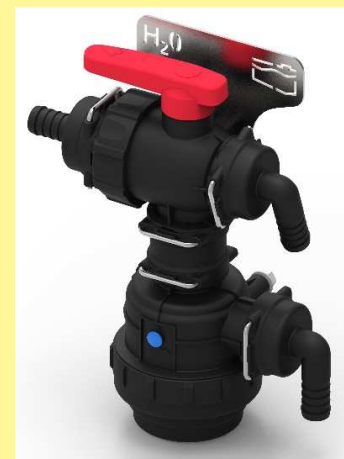


Figure 8: Setting to the fresh water tank (H₂O)

6.7 Switching between nozzles and agitator

Switching this ball valve regulates whether the liquid fertilizer is fed to the nozzles or back to the fertilizer tank.

It is beneficial to pump the liquid in a circle to prevent material settling on the bottom with fertilizers that tend to settle on the floor of the tank.



Figure 10: Setting to nozzles



Figure 11: Setting to agitator

When the implement is to be cleaned, switching to the agitator function allows fresh water to be fed into the fertilizer tank to dilute the liquid fertilizer in it. To do so, the second ball valve must be set to the "H2O" function (fresh water).

6.8 Filter units

Purpose

The filters prevent unintentional soiling and damage to the pump and nozzles.

Requirements

The following requirements must be fulfilled for this work step:


- The implement is disconnected from the power source, see *Disconnecting the Liquid Fertilizer from the power source* on page 29 for more information.


Required components, tools and materials

For this work step, the following components, tools and materials are required:

- None


Overview

No.	Description	Explanation	Illustration
1	Filling sieve	It is located directly at the filling lid and holds back coarse contamination.	

2	Suction filter	It is installed under the first ball valve where the liquid supply can be switched over.	
---	----------------	--	---

6.9 Cleaning the suction filter when the tank is empty

Overview

No.	Meaning	
1	Ball valve	
2	Union nut	
3	Filter cup	


Procedure

To clean the suction filter when the tank is empty:

Step	Description
1	Switch the ball valve towards the fertilizer tank
2	Unscrew the union nut
3	Pull out the filter cup by jiggling slightly to the right and left
4	Pull out the filter insert and clean with water
5	Check the O-rings for damage
6	Reassemble in reverse order

6.10 Cleaning the suction filter when the tank is filled

Overview

No.	Meaning	
1	Ball valve	
2	Union nut	
3	Filter cup	

Procedure

To clean the suction filter when the tank is empty:

Step	Description
1	Switch the ball valve between the liquid and fresh water tank
2	Unscrew the union nut
3	Pull out the filter cup by jiggling slightly to the right and left
4	Pull out the filter insert and clean with water
5	Check the O-rings for damage
6	Reassemble in reverse order
7	Switch the ball valve over to the fertilizer tank

7 Faults

In this section, you will find information for eliminating faults that may occur during operation.

7.1 Fault overview

Problem	Cause	Remedy
The pump is not sucking in	<ul style="list-style-type: none">• Blockage on the suction side (suction filter, suction hose)	<ul style="list-style-type: none">• Eliminate the blockage.
	<ul style="list-style-type: none">• The pump is sucking in air	<ul style="list-style-type: none">• Check the hose connection on the suction hose for leaks.
The pump has no output	<ul style="list-style-type: none">• Suction filter is soiled	<ul style="list-style-type: none">• Clean the suction filter.
	<ul style="list-style-type: none">• Valves are stuck or damaged	<ul style="list-style-type: none">• Replace the valves.
	<ul style="list-style-type: none">• The pump is sucking air, with visible air bubbles in the fertilizer tank	<ul style="list-style-type: none">• Check the hose connections on the suction hose for leaks.
The required entered spread rate is not reached	<ul style="list-style-type: none">• Forward speed is too high	<ul style="list-style-type: none">• Reduce the forward speed.
	<ul style="list-style-type: none">• The nozzles are too small or too big	<ul style="list-style-type: none">• Use the right nozzles.

You can find more information on other faults in the operating manuals for the respective control boxes. If the problem could not be fixed, please contact the manufacturer. More information on this can be found under *Service* on page 5.

8 Cleaning, maintenance, and repairs

In this section, you will learn how to clean and maintain the Liquid Fertilizer and what to do in case of damage or failure of the implement.

8.1 Disconnecting the Liquid Fertilizer from the power source

Purpose

Setup and maintenance work often require the Liquid Fertilizer to be disconnected from the power source.

Requirements

The following requirements must be fulfilled for this work step:

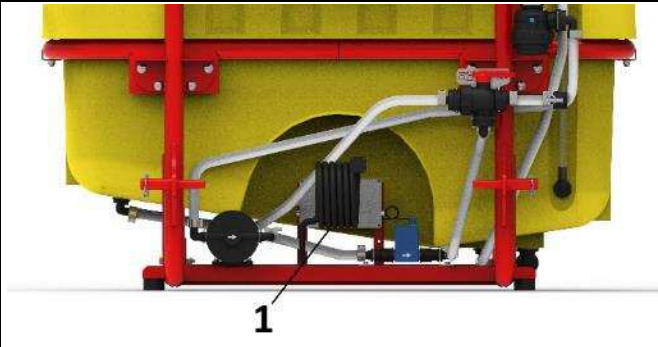
- None

Required components, tools and materials

For this work step, the following components, tools and materials are required:

- None

Overview

No.	Description	Illustration
1	Implement cable	

Procedure

To disconnect the Liquid Fertilizer from the power source:

Step	Description
1	Select one of the following options: a) Pull out the power supply plug from the control box b) Pull out the implement cable plug from the control box c) Switch off the control box

8.2 Emptying residual quantities

Purpose

Before cleaning or decommissioning, the liquid remaining in the tank must be removed.

Requirements

The following requirement must be fulfilled for this work step:

- None

Required components, tools and materials

For this work step, the following components, tools and materials are required:

- None

Procedure

To empty the fertilizer tank:

Step	Description	Explanation
1	Excess liquid fertilizer is diluted and spread on the field or pumped out and disposed of.	
2	The residual quantity is diluted when cleaning the Liquid Fertilizer and is spread on the field.	By turning two ball valves, fresh water can be pumped into the tank to dilute residual quantities.
3	The final diluted residual quantity is drained after cleaning and disposed of.	There is a drain tap at the bottom of the tank, which is opened by pulling. It can be turned by 90° to be locked.

8.3 Cleaning the Liquid Fertilizer

Purpose

The implement must be cleaned inside and out on a regular basis to ensure long-term proper functioning. If not cleaned properly, clumps can form inside the Liquid Fertilizer due to crystallisation.

Requirements

The following requirements must be fulfilled for this work step:

- The implement is disconnected from the power source, see *Disconnecting the Liquid Fertilizer from the power source* (page 29) for more information.

Required components, tools and materials

For this work step, the following components, tools and materials are required:

- Personal protective equipment
- Air compressor
- Water
- Moist cloth

Procedure

To clean the Liquid Fertilizer:

Step	Description
1	Empty the fertilizer tank, see <i>Emptying residual quantities</i> (page 29) for more information.
2	Clean the inside of the fertilizer tank with fresh water.
3	Clean the outside of the implement with a moist cloth.



CAUTION! RISK OF INJURY!

Due to toxic vapours in the fertilizer tank, climbing into the tank is forbidden.

- Do not climb into the tank!

8.4 Repairs and service

In case of failure or damage to the implement, please contact the manufacturer. More information on this can be found under *Service* on page 5.

9 Decommissioning, storage and disposal

In this section, you will learn how to decommission the Liquid Fertilizer, store it for longer periods of time, and dispose of it.

9.1 Decommissioning the Liquid Fertilizer implement

Purpose

It is important to take precautions for storage to ensure that the implement remains fully functional even if it is out of operation for longer periods of time.

Procedure

To prepare the Liquid Fertilizer for storage:

Step	Description
1	Completely remove all liquid fertilizer from the implement.
2	Rinse out the inside of the fertilizer tank with water, see <i>Cleaning the Liquid Fertilizer</i> on page 30 for more information.
3	Drain the remaining liquid from the tanks.
4	Clean the intake filter (see <i>Cleaning the suction filter when the tank is empty</i> , page 27).
5	Store the implement in a dry place to prevent the formation of germs inside the implement.
6	To prevent freezing in the winter, any liquids remaining e.g. in the pump, suction filter, etc. should be replaced with antifreeze. This can then be diluted and drained again after the winter.

9.2 Storage of the implement

The Liquid Fertilizer must be stored in a dry place protected from weather conditions to ensure that it remains functional, even if it is stored for a longer period of time.

9.3 Disposal

Disposal of the implement must be performed according to the local disposal regulations for machines.

10 Accessories

In this section, you will find a selection of possible accessories for your implement.

Cable extension 2 m (6-pin)

If the standard 6 m implement cable fitted is too short due of the length of the soil tillage implement and/or the implement structure, or if the cable cannot be routed practically, this 2 m extension cable can be ordered as an accessory.

Items included: 1 cable extension

Order number: 00410-2-148



Cable extension 5 m (6-pin)

If the standard 6 m implement cable fitted is too short due of the length of the soil tillage implement and/or the implement structure, or if the cable cannot be routed practically, this 5 m extension cable can be ordered as an accessory.

Items included: 1 cable extension

Order number: 00410-2-149



11 Appendix

11.1 My idea

The **LF 600** has been extensively developed and tested. It took a long time from the initial idea to serial production. It required lots of commitment from the entire development team.

Nonetheless, the most valuable experience is gained in practice.

Our motto: **"Inspired by farmers & realized by professionals."**

This is how customer proximity of the development department creates a leading edge for you and APV.

Tell us about the positive and negative experiences you have had with the implement.

Share your suggestions for improvement and your ideas with us:

meineidee@apv.at

Take pictures or make hand-drawn sketches! We are open and grateful for any information, no matter in what form. Your information goes directly to the leading developers at APV.

I would like to thank you in advance for your involvement and wish you lots of fun with your APV product!

Sincerely yours,

Your Head of Development & Technology

11.2 Connection diagram LF #02

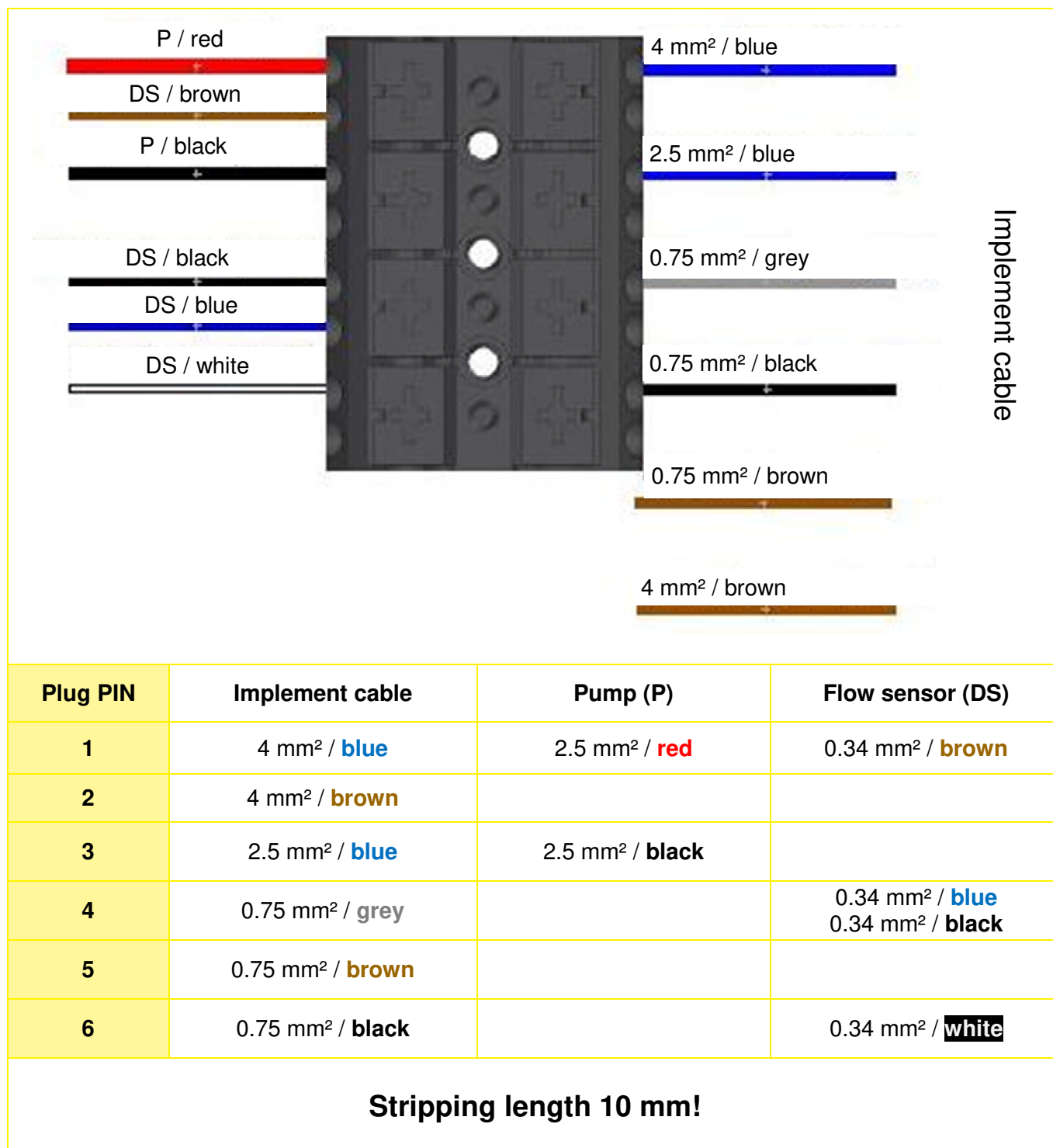


Figure 12

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Qualität für Profis

- seit 1997 -



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