User's guide

Job computer II
Field sprayer

ISOBUS

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Contents

1 Introduction

With the ISOBUS field sprayer job computer, your machine is equipped with state-of-the-art technology which we have developed in accordance with the latest ISO standard. Over 10 years experience in the development of CAN-bus components has had considerable influence here. You can connect your ISOBUS-compatible machine to any tractor equipped with an ISOBUS terminal. In future there will be a rapid increase in the number of agricultural machines, devices and tractors equipped with ISOBUS-compatible job computers and terminals. This means that today already you are one step ahead with the ISOBUS equipment on your field sprayer.

The ISO standard specifies the transmitting medium, connecting sockets and the data exchange for the ISOBUS. This works on the basis of a CAN bus, which is also used in the motorcar and commercial vehicle industry. The ISOBUS regulates the data exchange between the control terminal, the job computers in the tractor and the attached or trailed machines. The compatibility of the ISOBUS devices, according to the **ISO Standard 11783**, is examined by independent testing institutes. The equipment is only awarded the ISOBUS certificate once examination has been successfully completed.

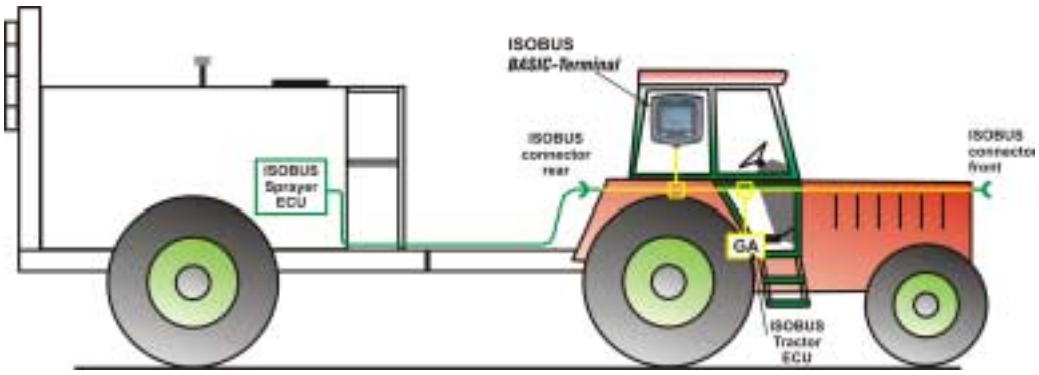


Diagram 1-1 Basic configuration of the ISOBUS according to ISO Standard 11783

Since the ISO standard allows for any combination of terminals, basic equipment, job computers etc., the description of all variations would extend beyond the scope of this guide. For this reason the examples in this guide have been limited to the *BASIC - Terminal*. When using another terminal, the distribution of the function keys as well as the data input can vary. For detailed information please refer to the user guide of the terminal in question.

This description covers the maximum range of functions enabled by the job computer. Depending on how the field sprayer is equipped, menus, soft keys etc. not required, will either not be displayed on the terminal or they will have no function.

2 Safety instructions

2.1 Disclaimer:

The field sprayer ISOBUS job computer is specified exclusively for agricultural use. The manufacturer takes no responsibility for any installation or application outwith this area.

The manufacturer does not accept liability for damage to persons or property resulting from unspecified use. In such cases all risks are the responsibility of the user.

Specified implementation also includes adhering to the operation and maintenance requirements stipulated by the manufacturer.

Relevant accident prevention regulations as well as other generally recognised safety, industrial health and road traffic rules are to be adhered to. In addition the manufacturer accepts no liability in cases where arbitrary modifications have been made to the device.

2.2 Safety measures

Warning!

Always pay attention to this symbol for references to important safety precautions.
It means attention! Become alert!
It is a question of your safety.

Read the user's guide before using the job computer for the first time.

Observe the following recommended precautions and safety instructions:

⚠ Do not remove any safety mechanisms or labels.

⚠ Before using the device, read and understand this guide. It is of equal importance that others operating this device also read und understand the manual.

⚠ During maintenance or when using a battery charger, switch off the power supply (pull out the ISOBUS plug).

⚠ Never service or repair the device while the job computer is switched on.

⚠ When welding on the equipment or on an attached machine, interrupt the power supply (pull out the ISOBUS plug).

⚠ Use clear water for testing. Only use chemicals once fully acquainted with the operation of all functions.

⚠ Keep children away from the equipment.

⚠ Do not expose the job computer and the sensors to the direct jet of a high pressure cleaner.

⚠ Do not open the job computer. Unauthorised opening leads to the loss of any warranty claims.

⚠ Operate the keys with your finger tips but avoid using fingernails.

⚠ Should any part of this guide remain incomprehensible after reading, contact the dealer or Mueller-Elektronik Service for further clarification before using the device.

⚠ Read carefully all safety instructions in the manual and the safety labels on the equipment. Safety labels must always be legible. Replace missing or damaged labels. Ensure that the current safety labels can be found on all new components. Your authorised dealer can supply you with spare labels.

⚠ Learn how to operate the machine and controls correctly. Nobody is to operate the machine without exact instructions.

⚠ Keep the machine and the spare parts in good condition. Unstipulated alterations can impair the function and/or safety and affect the life span of the machine.

3 Overview and initial operation

The field sprayer job computer is not sufficient in itself to operate the field sprayer. The sprayer can only be operated once the job computer has been connected via the ISOBUS socket to the terminal on the tractor. Diagram 3-1 illustrates the basic overview of the equipment on the ISOBUS tractor and ISOBUS field sprayer.

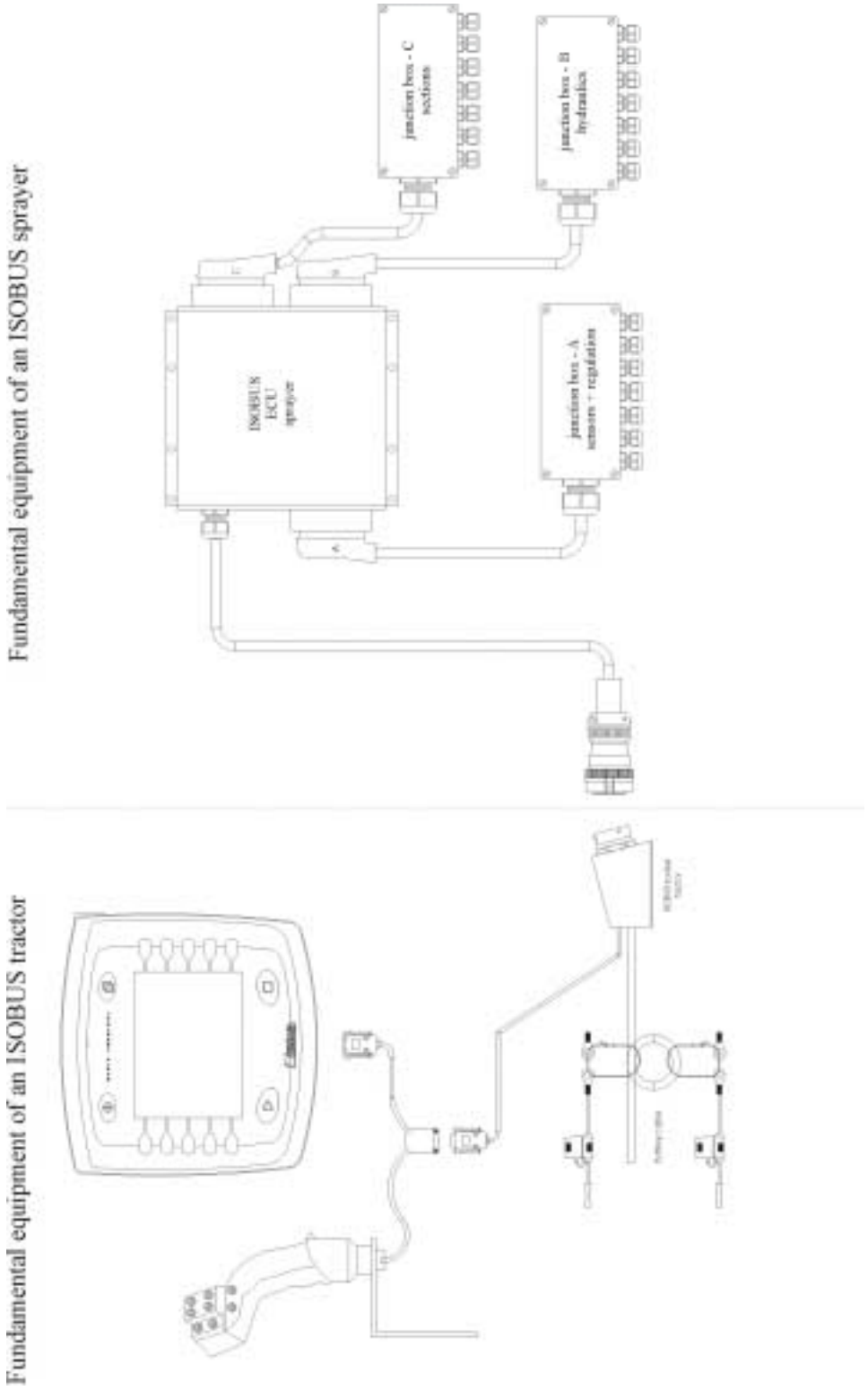


Diagram 3-1 ISOBUS system overview

The field sprayer job computer is the field sprayer's brain and distribution hub. It measures all signals, controls the actuators, displays information on the ISOBUS terminal and receives instructions from the operator via the terminal. All machine-specific data are stored in the job computer and remain stored even when the terminal is changed

The individual sensors and actuators are connected to the job computer by wiring harnesses and/or distribution boxes attached at the three plugs on the job computer.

The connection to the voltage supply and the ISOBUS terminal is made over the ISOBUS plug. Diagram 3-2 to Diagram 3-6 illustrates the socket and plug and their connection. Please always ensure that the dust shield caps are screwed on when the plug and socket are not in use. When plugged in, the dust shield caps must be interconnected to ensure that they are also protected from dust and humidity.

Diagram 3-2 ISOBUS socket closed

Diagram 3-3 ISOBUS socket open

Diagram 3-4 ISOBUS socket open

Diagram 3-5 ISOBUS plug closed

Diagram 3-6 ISOBUS connecting socket

4 Masks

Please refer to your ISOBUS terminal user's guide for the basic structure of the monitor and the function keys.

4.1 Mask structure

As soon as the job computer has been switched on and selected from the terminal, a working mask appears on the monitor. From here all of the job computer's functions can be navigated. Diagram 4-1 illustrates how the individual masks are connected

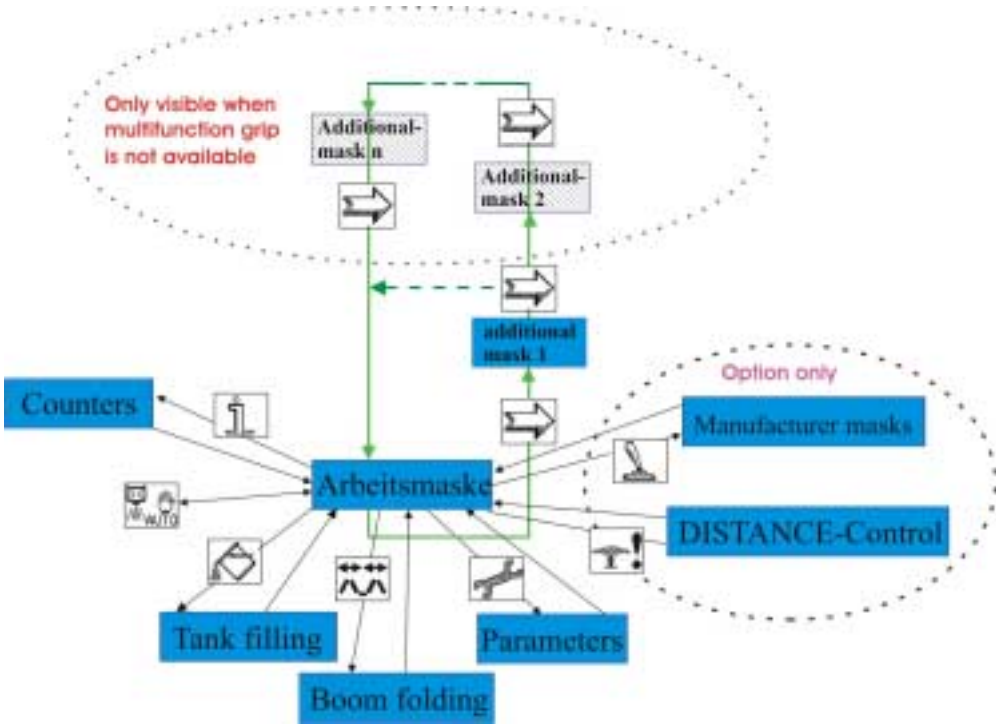
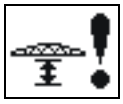
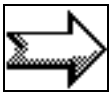
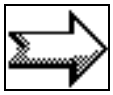
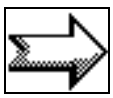


Diagram 4-1 Mask structure

As can be seen in Diagram 4-1, the masks counters, tank-filling, boom-folding, DISTANCE-Control, parameters and manufacturer-masks can be called up directly from the working mask. The soft keys  and  appear only if these options have been configured.

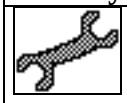
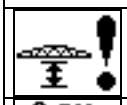
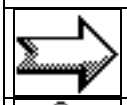
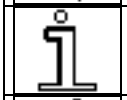
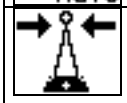
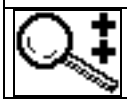
If the soft key  is pressed, the additional mask 1 appears. This has further functions.

To return to the working mask, press  again.

If no multifunction grip is connected (emergency operation), further additional masks appear which have its function. These can be accessed from the working mask by pressing the soft key  several times. The working mask is returned to after the last mask.

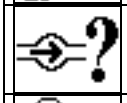
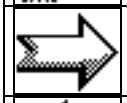
4.2 Soft keys in the working mask

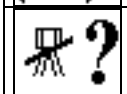
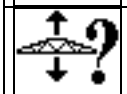
Tab. 4-1 Soft keys in the working mask

Soft key	Description
	Calls up the machine data mask (chap. 4.3 page 11). In the machine data masks all adjustable values can be seen and altered. From here further soft keys branch out to the individual calibration masks.
	Calls up the folding masks (chap.4.5 page 24). Depending on the function range of the boom the soft keys for folding are available here in either one or two masks.
	Calls up the special functions (chap.6 page 39). Soft keys for manufacturer-specific special functions are displayed here in either one or two masks.
	Calls up the DISTANCE-Control mask (chap.7 page 41).
	Switches the TRAIL-Control on and off (see chap. 8 page 47). This is not displayed when the machine is also equipped with DISTANCE-Control. In this case this function is only to be found on the multi-function grip.
	Switches on to the additional mask 1 (see Diagram 4-1) which has further soft keys for other functions.
	Calls up the counters mask (chap. 4.7 page 31). In the counters mask the daily and total counters are displayed.
	Calls up the tank-filling mask (chap.4.6 page 26). This mask combines all tank-relevant functions
	Switches from manual/automatic for the spraying function
	Middle position: This soft key belongs to the range of “TRAIL Control” functions. As long as the key is pressed, the steerage is in a middle position (chap.8.2.2 page 51)
 	Switches the working mask mode (see chap.4.4 page 19).

4.3 Machine data masks

Tab. 4-2 Soft keys in the machine data mask

Soft key	Description
	Stores the pump rpm as set value
	Calls up the mask for licence management (see chap. 11 page 66)
	Calls up the mask for flow meter calibration (see chap.4.3.1.1 page 14)
	Calls up the mask for Airtec settings (see chap. 9 page 52)
	Proceeds to the next machine data mask
	Returns to working mask

Soft key	Description
	Calls up the wheel sensor calibration mask (see chap.4.3.1.4 page 17)
	Calls up the boom section mask (see chap.4.3.1.5 page 18).
	Calls up the masks DISTANCE-Control (see chap. 6.2.1 page 41) or slope levelling (see chap.5.1)
	Calls up the mask for DISTANCE-Control semi-automatic height setting (see chap. 7.6 page 45)
	Calls up the TRAIL-Control calibration mask (see chap.8 page 47)

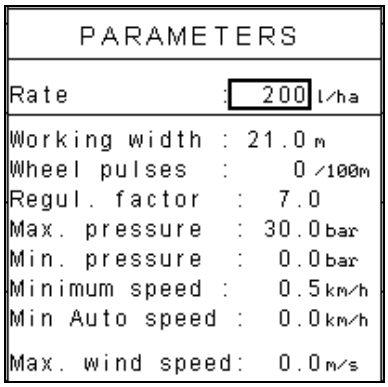


Diagram 4-2 Machine data page 1

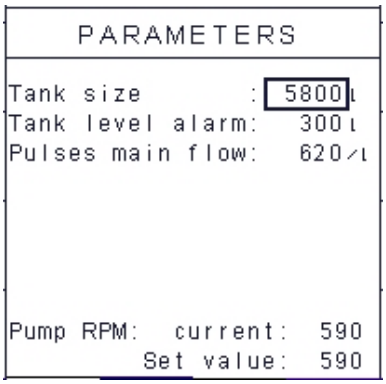


Diagram 4-3 Machine data page 2

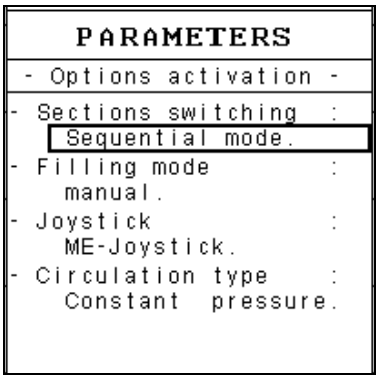


Diagram 4-4 Machine data page 3

Tab. 4-3 Machine data page 1

Parameter	Description
Set value	The pre-set value is sprayed, when the sprayer is working in automatic mode.
Working width	Set the working width on the field sprayer. ⚠ This value must be set exactly, as it affects the area measurement and the amount sprayed.
Imp. wheel sensor	If a speed sensor is connected (attached sprayer) the pulses / 100 m are set here. If the value is not known a calibration can be carried out (see chap.4.3.1.4 page 17). ⚠ This value must be set exactly, as it affects the area measurement and the amount sprayed.
Control constant	The regulating factor adapts to the speed of monitoring. Should, during travel at a constant speed, the spray rate jump around the pre-set value, the factor must be reduced. If the spray rate does not adapt quickly enough to a change in speed, the factor must be increased
Max. pressure	If a pressure sensor is installed, the maximum pressure is entered here. An alarm is set off if the pressure exceeds this value.
Min. pressure	If a pressure sensor is installed, the minimum pressure is entered here. An alarm is set off if the pressure falls below this value.
Min. operating speed	Set the minimum operating speed here. The boom section main switch on the field sprayer switches off automatically if the

Parameter	Description
	speed falls below this value. When this happens the icon  appears on the working mask.
Min. auto speed	"Min auto speed" determines the minimum speed for automatic fluid regulation. Regulation switches on to manual operation if the speed falls below this value. This function does not apply when the value is 0. This parameter is used typically in combination with "Min. operating speed" e.g. Min. operating speed=2 km/h" and "Min auto speed = 4 km/h". When the sprayer is switched on when not in motion, the job computer switches the icon  on to the display in order to show that spraying is not possible. Depending on the configuration of the nozzle type, the main valve remains closed and/or the by-pass open and/or the boom section valves closed. With a speed between 2 and 4 km/h the boom sections valves are opened, whilst regulation remains in manual operation and the icon  is displayed. Both parameters can be set separately. However it must be guaranteed that "Min. operating speed" >= "Min. auto speed", otherwise only "Min. operating speed" will be evaluated.
Max. wind speed	If a wind sensor is installed the maximum wind speed is entered here. An alarm is set off if the wind speed exceeds this value.

Tab. 4-4 Machine data page 2

Parameter	Description
Tank size	Size of the tank for the spraying fluid.
Tank level alarm	An alarm is set off if the amount in the tank falls below this value.
Pulses main flow meter	The number of pulses per litre for the main flow meter can be set here. If the value is not known, a calibration can take place (see chap.4.3.1.1 page 14). ⚠ This value must be set exactly as it has a direct influence on the spray rate.
Pulses filling	Flow meter pulses per litre for filling.
Pulses reflux	Flow meter pulses per litre for reflux measurement. This point is only displayed when reflux measurement is installed.
Pump rpm	If a sensor for the measurement of the pump rpm is installed, the standard rpm is entered here. A warning is displayed if the value varies by a certain percentage (manufacturer-specific).

Tab. 4-5 Machine data page 3

Parameter	Description
Section switching	It can be differentiated between "sequential operation" and "nest treatment". The functions are described in chap.4.4.1.2 page 21. ⚠ After changing the setting, the job computer must be switched off and on again. Only then is the change effective.
Filling mode	Depending on the configuration, the following points can be selected: "manual", "Tank meter"; "TANK-Control". chap.4.6 page 26 describes the functions and handling.

Parameter	Description
	⚠ After changing the setting, the job computer must be switched off and on again. Only then the change is effective.
Joystick type	Switch to emergency operation if there is no multifunction grip. ”without joystick” = emergency operation; “ME-MFG ” = normal operation with multifunction grip. If ”without joystick” is set, all additional masks included in the multifunction grip soft keys, will be activated. (see Diagram 4-1 page 10). ⚠ After changing the setting, the job computer must be switched off and on again. Only then the change is effective.
Circulation type	The circulation type is determined here. There is a differentiation between “without balanced pressure” and “balanced pressure”. ⚠ After changing the setting, the job computer must be switched off and on again. Only then the change is effective.

4.3.1 Calibration masks

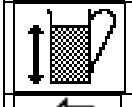
Calibration of individual components serves the purpose of balancing out manufacturing variations and changes which have occurred in the course of time due to wear and tear etc. The individual calibration steps must be carried out as accurately as possible. Only then can the best possible results be achieved. It is recommended that all functions be examined for accuracy and if necessary calibrated again at the beginning of each season. A new calibration should be carried out immediately if inaccuracies occur during the season.

The following chapter describes the procedure for the various calibrations.

4.3.1.1 Flow meter

Before initial operation, the machine’s flow meter must be calibrated. The number of pulses per litre can change during the life span of a flow meter. A repeat calibration at least once before the beginning of the spraying season is recommended. ⚠ **Important!** Only clear water is to be used for this purpose.

Tab. 4-6 Soft keys flow meter calibration

Soft key	Description
	Starts the main flow meter calibration using the tank method
	Starts the main flow meter calibration using the nozzle method
	Returns to the machine data mask

4.3.1.2 Tank method

1. Fill the tank with clear water.
2. Determine the total weight of the tractor and the field sprayer.
3. Switch on all boom sections.
4. Set manual control.
5. Start calibration process with the soft key.  The mask as illustrated in Diagram 4-6.

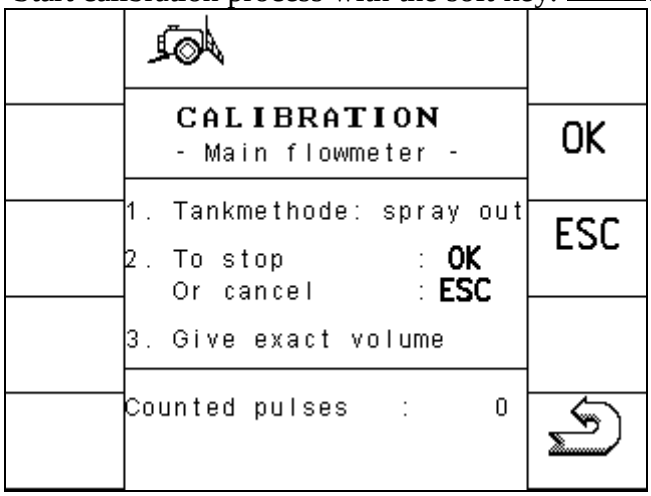


Diagram 4-5 Calibration tank method

6. Switch on spaying with the  key on the MFG and spray a few hundred litres. During this time the number of litres increases on the display.
7. Switch off the field sprayer by pressing the  key once more. Counting is discontinued.
8. Stop the calibration process by pressing OK.
9. Determine the amount sprayed and enter (see Diagram 4-6 Calibration tank method input).

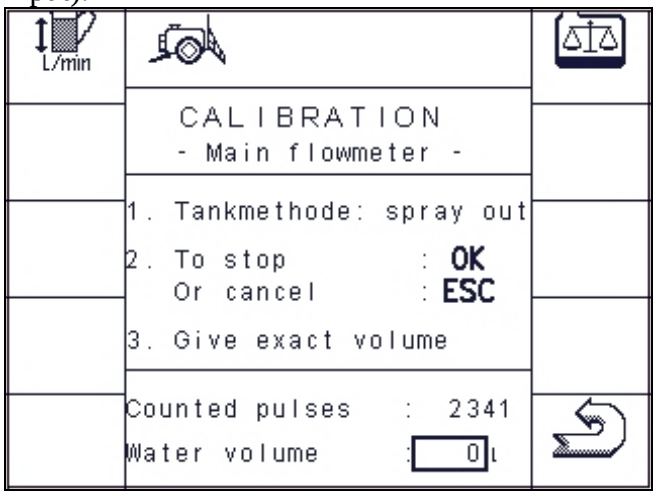


Diagram 4-6 Calibration tank method input

10. The new value (pulses per litre) is calculated and displayed in the machine data mask.

The calibration process can be interrupted at any time using the soft key ESC.

4.3.1.3 Nozzle method

Using the nozzle method the value pulses/litre is measured with the nozzle flow meter. An approximate pulse number (pulses/l) must be entered, before a calibration on the flow meter with the nozzle method is possible.

Attention! The tank method is more time-consuming, but more accurate than the nozzle method.
Do not change the current flow during the calibration!

To ensure accurate calibration, the working width (chap. 4.2 page 10) and the nozzles per boom section (chap 4.3.1.5. page 16) must be checked before the calibration process begins.

Procedure:

1. Fill the tank with clear water.
2. Switch on all sections.
3. Set manual control.
4. Start calibration process by pressing  .

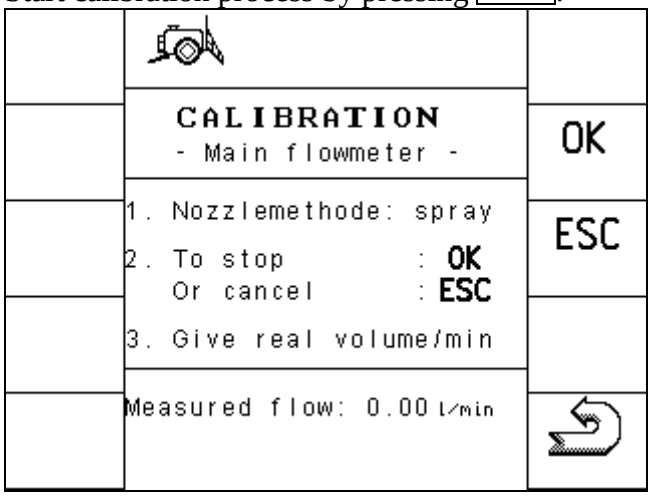


Diagram 4-7 Nozzle method

5. Switch on spraying with the  key on the MFG.
6. Use a measuring jug to determine the current nozzle flow per minute. It is advisable to establish the average flow from several nozzles.
7. The current measured value is displayed in the calibration mask after “measured flow”. (see Diagram 4-7).
8. Stop the calibration process by pressing  .
9. Switch off the MFG by pressing the  key.
10. Enter the determined value per nozzle in l/min (see Diagram 4-8).

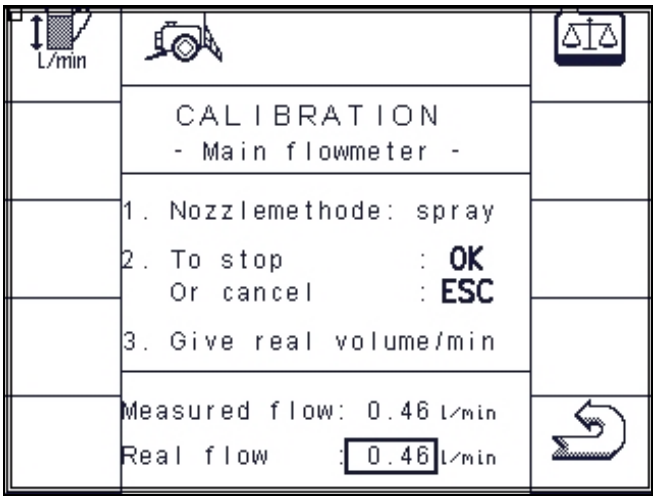


Diagram 4-8 Nozzle method input

4.3.1.4 Wheel sensor

The calibration mask can be selected in the machine data mask. Some preparation is necessary before the calibration process can begin.

Attention! The calibration must be carried out accurately. The speed, the area measurement and the amount sprayed are all affected by it.

1. Measure and mark a distance of 100 m on the field (tank half full).
2. Drive the tractor to the marked line.
3. To start the calibration process, press the key. The key disappears. The OK and ESC keys appear.
4. Drive a hundred meters and stop. During the journey the current pulses measured are displayed.
5. To confirm the pulses measured, press the OK key at the end. The new value is now displayed in the machine data mask. The calibration process can be interrupted by pressing the ESC key instead of OK. The old values remain unchanged.

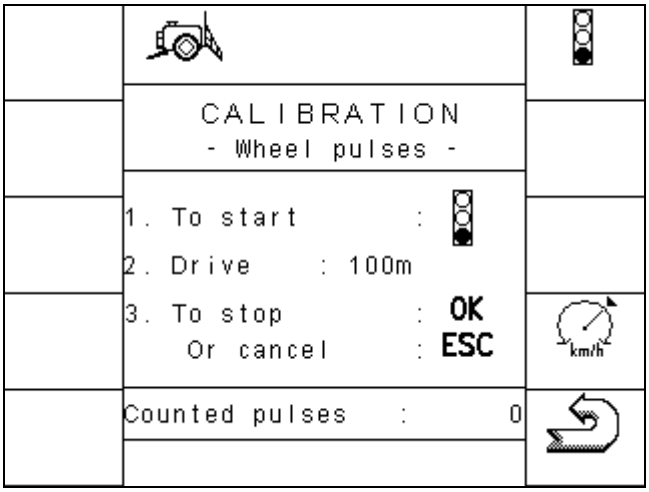
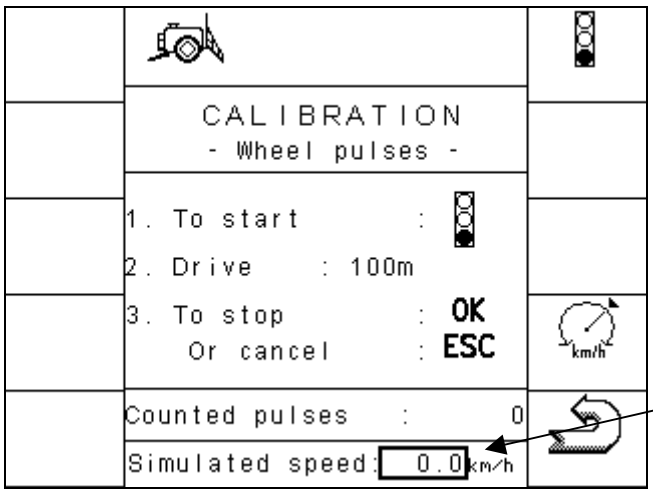


Diagram 4-9 Calibration of wheel sensor

4.3.1.4.1 Simulated speed

Press the soft key  to start simulation. An input field is displayed. Enter the speed to be simulated here.



The value is pre-set to 0 km/h. The user can enter any value up to 25.5 km/h. Simulation can be ended again by pressing the soft key once more. When the job computer is restarted simulation is always deactivated. The last value to be set can however be called up again by pressing  .

Important:
For reasons of safety the TRAIL-Control function cannot operate with simulated speed. TRAIL-Control remains in manual operation mode.

4.3.1.5 Boom sections

The number of nozzles per boom section can be changed in this mask by selecting the corresponding input field and entering the value.
In addition it is possible to switch the boom sections on and off permanently.

Select the required boom sections with  and  . The boom sections selected can be recognised by the highlighted nozzle symbol. By pressing the  key, the symbol alternates between the nozzle  and the scored out nozzle  .

The boom section is permanently switched off when the symbol  appears behind a boom section. In this case switching on in the field sprayer working mask is not possible.

4.4 Working masks

2 different working masks can be displayed in which all values and conditions required during operation are displayed.

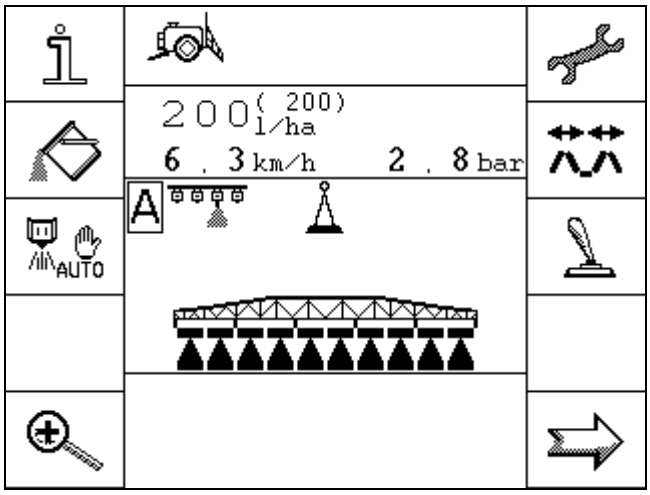


Diagram 4-10 Working mask 1

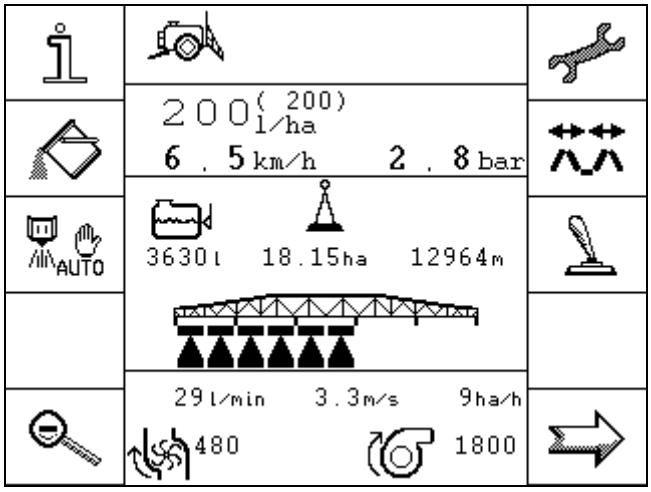


Diagram 4-11 Working mask 2

Diagram 4-10 and Diagram 4-11 illustrate the 2 working masks. These can be switched using the soft keys  and  .

Comparing the 2 masks shows that only specific areas change. We differentiate here between permanent and selective display areas.

In the permanent areas the spraying data and status of the boom sections are displayed. Switching does not affect these. In the selective areas the display changes. Symbols which indicate the current status of aggregates, controllers etc. are displayed in the working mask 1. Working mask 2 displays information concerning level, rpm etc.

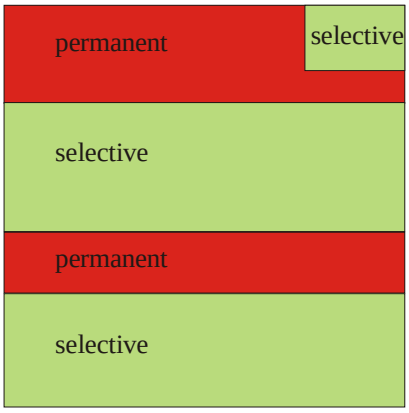


Diagram 4-12 Basic structure of the working mask

4.4.1 Working mask 1

The symbols displayed in this mask are described together with the corresponding functions. For this reason the permanent areas only are explained here.

4.4.1.1 Spraying data

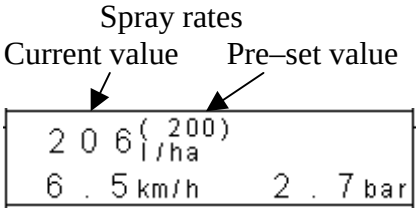


Diagram 4-13 Spraying data in the working mask

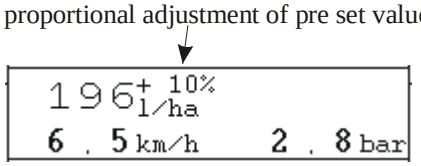


Diagram 4-14 Adjusted pre-set rate

Pre-set value: Spray rate in l/ha entered by operator.
Current value: Current spray rate in l/ha.
Speed: Sprayer's current speed in km/h. If there is no speed determination on the sprayer, the speed of the tractor has to be used.
Spray pressure: Current pressure of the spraying fluid in bar.

In automatic mode the pre-set rate can be adjusted in steps of 10%. After adjustment the percentage is displayed for about 2 seconds.

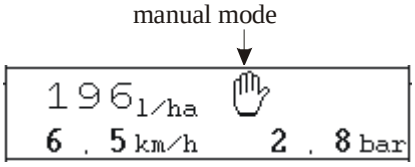


Diagram 4-15 Manual spraying mode

The symbol appears in the display, when the sprayer is switched to manual mode. Using the MFG keys (see chap.12.1 page 69) the spray pressure can be manually adjusted.

Diagram 4-16 Minimum working speed

If the symbol appears in the display, this means that a pre-set rate of 0 l/ha has been set or that the working speed has fallen below the minimum (see Tab. 4-3 Page 12). Even if the main sprayer switch is on, the sprayer can only be switched on when all conditions have been fulfilled again.

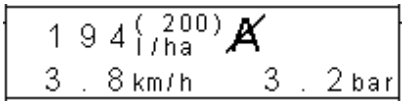


Diagram 4-17 Minimum auto speed

If the symbol appears in the display, this means that the current speed is lower than “Min. auto speed” and higher than “Min. operating speed.” (see Tab. 4-3 page 12)

4.4.1.2 Boom sections

The boom sections are illustrated by bars and triangular symbols underneath the boom. The bars correspond to pre-selected boom sections. The triangles symbolise spraying cones representing switched-on boom sections.

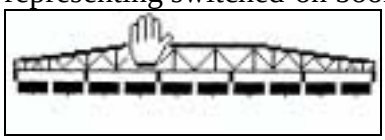


Diagram 4-18 Boom sections; main switch off; all sections are pre-selected

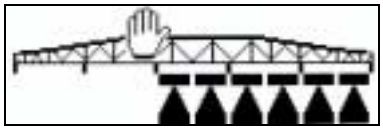


Diagram 4-19 Boom sections; main switch on; sections 3, 4 and 5 are in spraying mode

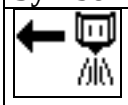
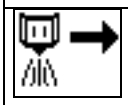
There are 2 variations for the switching of boom sections. Differentiation is between “sequential operation” and “nest treatment”. Switching between these 2 modes of operation is described in Tab. 4-5 page 13.

4.4.1.2.1 Sequential operation

The working mode “sequential operation” is conceived for normal spraying operations. It is also suitable for spraying wedge-shaped areas and strips which are narrower than the working width of the sprayer.

Individual boom sections can be switched using the 4 MFG keys (see chap.12.1 page 69). Individual boom sections can also be switched permanently in the boom section mask (chap. 4.3.1.5 page 18).

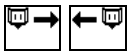
Tab. 4-7 Boom section soft keys

Symbol	Description
 	If a boom section is already switched on, further boom sections from right to left will be switched on when the  key is pressed. If no boom sections are switched on (active), then only the boom section on the outside left will be switched on when the  key is pressed. By pressing the  key, all active boom sections from left to right are switched off.
 	If a boom section is already switched on, further boom sections from left to right will be switched on when the  key is pressed. If no boom sections are switched on (active), then only the boom section on the outside right will be switched on when the  key is pressed. By pressing the  key, all active boom sections from right to left are switched off.

If the last boom section is switched off using the boom section key while the main boom section switch is on, then this will be automatically switched off. A pre-selection can now be carried out using the boom section keys. Switching on must be done at the main switch. If no boom sections have been pre-selected, all boom sections are switched on by the main switch.

4.4.1.2.2 Nest treatment

The working mode nest treatment is conceived for the specific treatment of small patches of weeds. It is possible to switch on and off one or more boom sections in the middle of an area being processed.

Operation is also carried out using the 4 MFG keys  (see chap.12.1 page 69)
In this working mode a cursor is displayed between the boom and the boom sections. The cursor can be moved from left to right using the  keys. The  keys are used for switching the boom sections. Both have the same function.

Independent of the position of the main switch, the cursor can be moved on any boom section and the status of the boom section adjusted.

Boom section 4 is pre-selected. Boom section 2 can be pre-selected using the keys  or 

Diagram 4-20 Nest treatment, main switch off

Boom sections 3 and 4 switched on, boom section 1 can be switched on using the keys  or 

Diagram 4-21 Nest treatment, Main switch on

Characteristics:
When the main switch is switched off, all switched on boom sections are also switched off. If no boom sections have been pre-selected, all boom sections are switched on by the main switch.

Diagram 4-22 illustrates the allocation of the symbols for the nest treatment on the MFG, displayed on the additional mask 2.

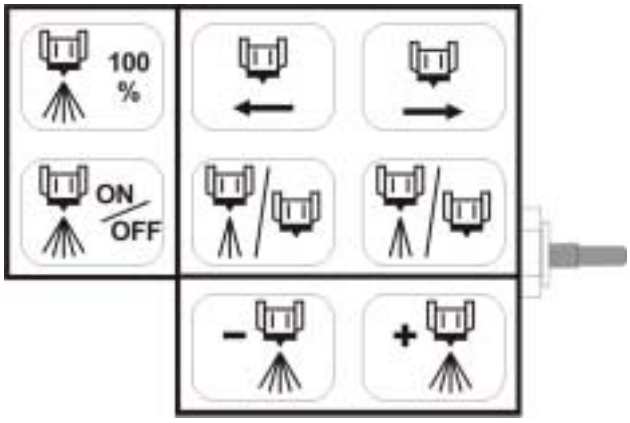


Diagram 4-22 MFG allocation for nest treatment

4.4.2 Working mask 2

The symbols displayed in this mask are described together with the corresponding functions. For this reason the selective areas only are explained here, as only these are affected when the working mask 2 is switched to.

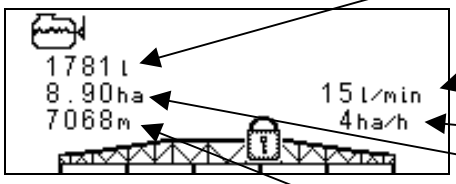


Diagram 4-23 Working mask info

Current tank content: Depending on how the sprayer is equipped, the theoretical or measured tank content is displayed here.
Flow rate per minute: Flow rate through the main flow meter
Area performance
Area to be operated: With the current tank content and the momentary spray rate the area displayed here can still be operated.
Distance to be operated: Under present conditions this distance can still be covered

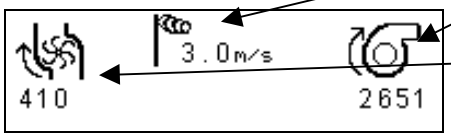


Diagram 4-24 Working mask info

Wind speed: *1) Current wind speed measured
Fan rpm: *1) Current fan rpm measured
Pump rpm: *1) Curent pump rpm mesured

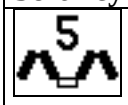
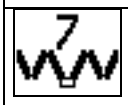
*1) These values are only displayed when the corresponding sensors have been installed.

4.5 Folding masks

All keys needed for folding the boom can be found in the folding masks. Depending on the type of boom, a varying number of keys are available. This means that you will not find all keys described here on the terminal. Not all variations are described here.

Tab. 4-8 Soft keys Folding masks

Soft key	Description
	Unfolds right and left simultaneously
	Folds in right and left simultaneously
	Unfolds left
	Unfolds right
	Folds in left
	Folds in right
	Pre-selects inner boom section; if the boom section is activated, this is highlighted dark on the mask. When deactivated there is only a transparent frame.

Soft key	Description
	Pre-selects middle boom sections; if the boom section is activated, this is highlighted dark on the mask. When deactivated there is only a transparent frame.
	Pre-selects outer boom sections; if the boom section is activated, this is highlighted dark on the mask. When deactivated there is only a transparent frame.
	Folds in inside left
	Unfolds inside left
	Folds in inside right
	Unfolds inside right
	Folds in outside left and right simultaneously
	Unfolds outside left and right simultaneously

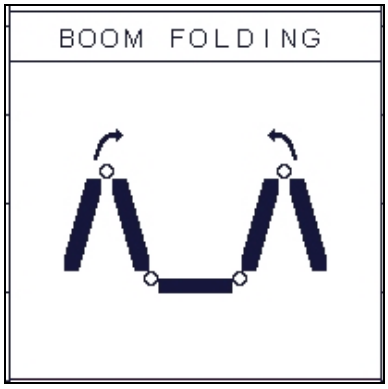


Diagram 4-25 Example 1 Folding mask

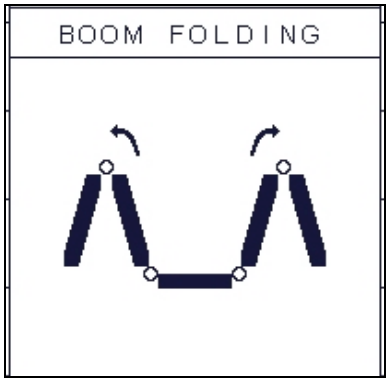


Diagram 4-26 Example 2 Folding mask

With all versions of folding masks additional keys for boom correction are displayed as long as there is room for these keys:

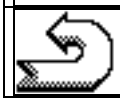
- If there is only one row of soft keys (soft keys facing each other), the soft keys for raising  and lowering  the boom are displayed.
- If there is a further row not in use, these soft keys will be included for slope correction:  and  .

The function of these keys is described in Tab. 4-16 page 34.

4.6 Tank mask

4.6.1 Manual

Tab. 4-9 Soft keys manual filling

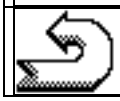
Soft key	Description
	Tank full; the tank content is set to the value of the tank size (see Diagram 4-3 page 12)
	Tank empty; the tank content is set to 0.
	Return to working mask

The manual filling mode allows only the tank content to be set at “full” or “empty” or the manual input of a value.

4.6.2 TANKMETER

With the TANKMETER the quantity filled can be measured in the tank.

Tab. 4-10 Soft keys TANKMETER

Soft key	Description
	Tank full; the tank content is set to the value of the tank size (see Diagram 4-3 page 12)
	Tank empty; the tank content is set to 0.
	Deletes the value filling
	Returns to working mask

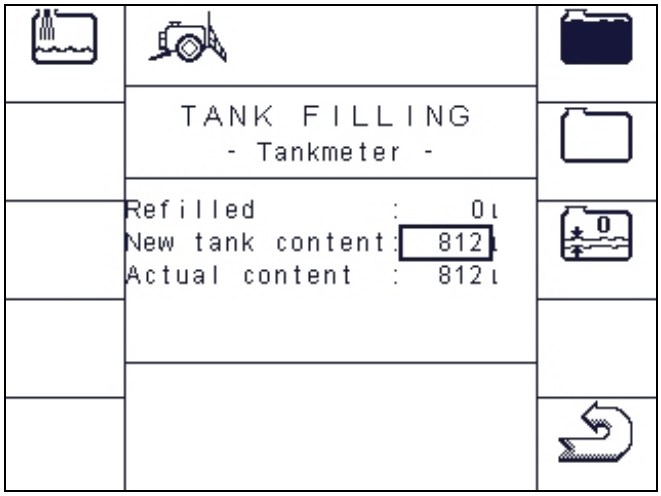


Diagram 4-27 Filling mask TANKMETER

Diagram 4-27illustrates the filling mask, when the sprayer is equipped with a Tankmeter. The parameters are explained in Tab. 4-11.

Tab. 4-11 TANKMETER parameter

Parameter	Description
Filling	The litres measured on the TANKMETER are displayed here. These are added to the current tank content. This value is set to "0" using the soft key.
Tank content new	This is an input field. If a new value is entered for the tank content, the current tank content is changed to this value
Tank content current.	Current tank content

4.6.3 TANK-Control

TANK-Control is a measurement system, which continually measures and displays the current tank content. With this system the filling process can be automatically terminated when the sprayer is equipped with a ball valve for switching off filling or with a filling pump with a cut-off function.

Tab. 4-12 Soft keys TANK-Control

Soft key	Description
	Switches to the current filling limit. The symbols and on the lower part of the display show the current status.
MAX	Sets filling to the maximum value (value of the tank size see Diagram 4-3 page 12).
	Switches filling pump on and off (only available when the sprayer is equipped with a filling pump).
	Returns to working mask.

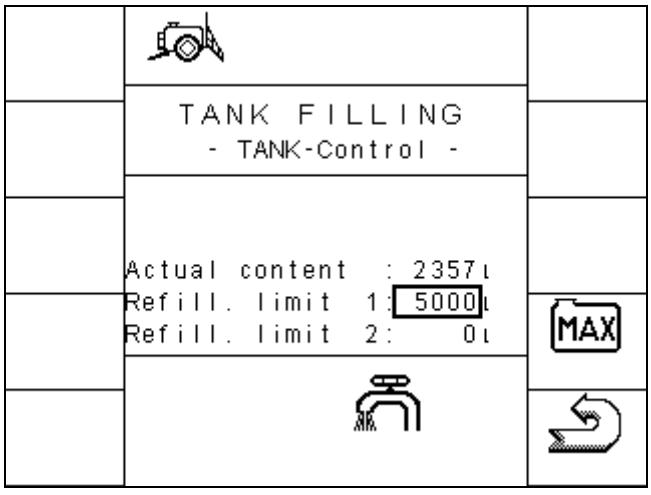


Diagram 4-28 Filling mask TANK-Control

The automatic filling process can be carried out in 2 different ways. For this purpose differentiation is made between filling with one and with two limits.

4.6.3.1 Filling with one filling limit:

Filling with one filling limit is carried out as follows:

Enter the required value for filling limit 1 in the filling mask. The value for filling limit 2 must be set to 0 for this process; otherwise filling with 2 filling limits will be activated. Subsequently open the ball valve using the filling key which can be found in the vicinity of the filling duct. The symbol appears. Filling is now switched on. As soon as the pre-set level is reached, the ball valve closes automatically. The filling process is then completed.

If the tank has to be filled to the top, the maximum level can be set as filling limit using the MAX key. Care must be taken to ensure that the input for filling limit 1 is active. Otherwise filling limit 2 will be altered and this would result in automatic switching to filling with 2 filling limits (see chap. 4.6.3.2).

The filling process can then be started by pressing the filling key once again. As soon as the filling level is reached, the filling process is switched off again.

The filling key can be used to terminate the filling process at any time.

4.6.3.2 Filling with 2 filling limits:

In order to activate 2-stage filling simply enter the values for both filling limits, whereby the second value must be higher than the first:

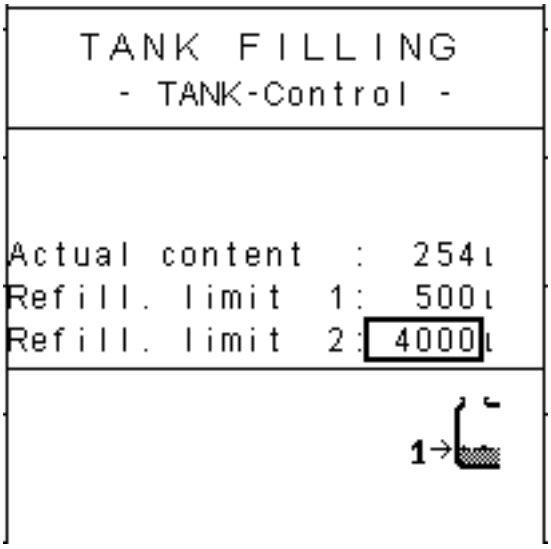
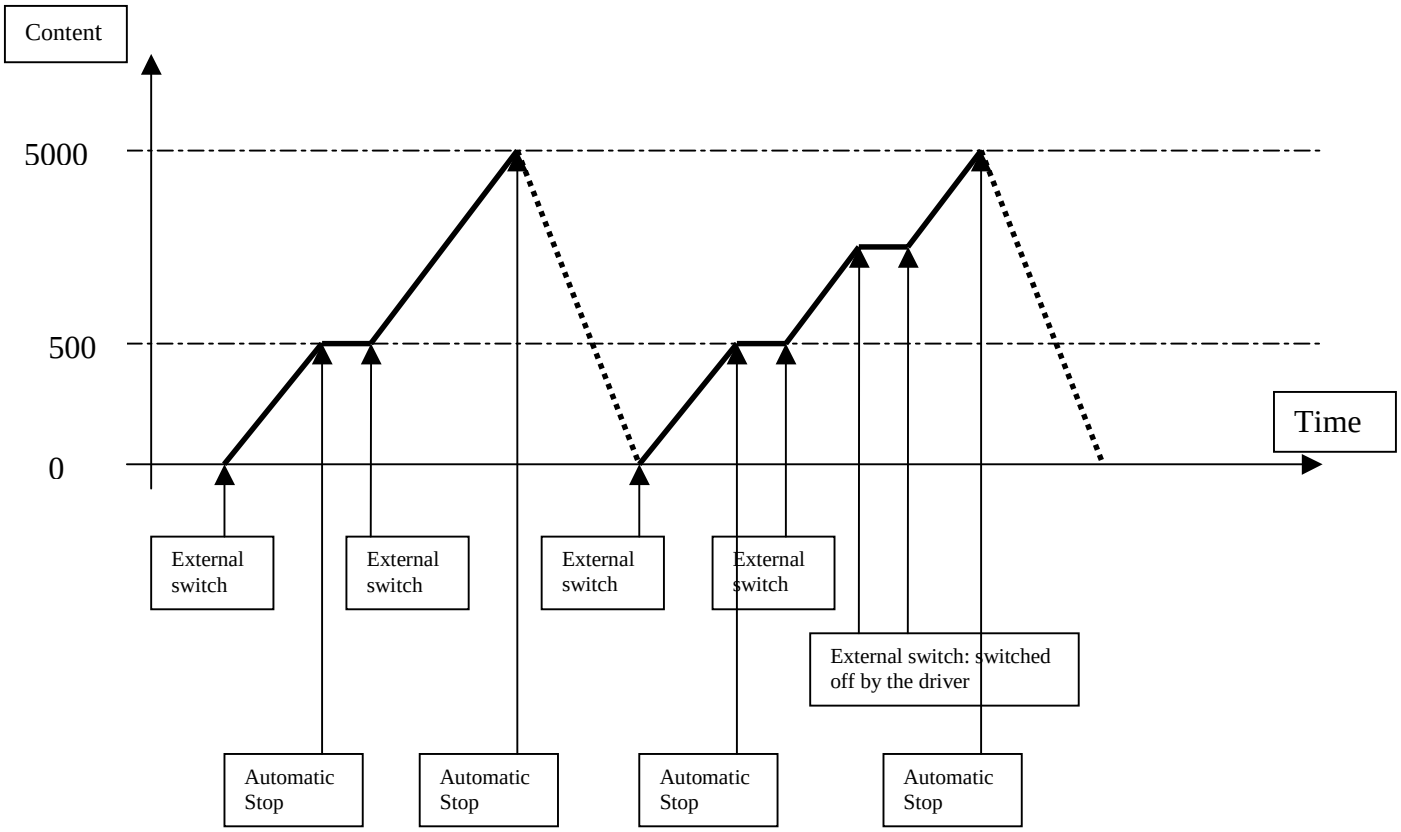


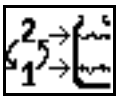
Diagram 4-29 Filling with 2 filling limits

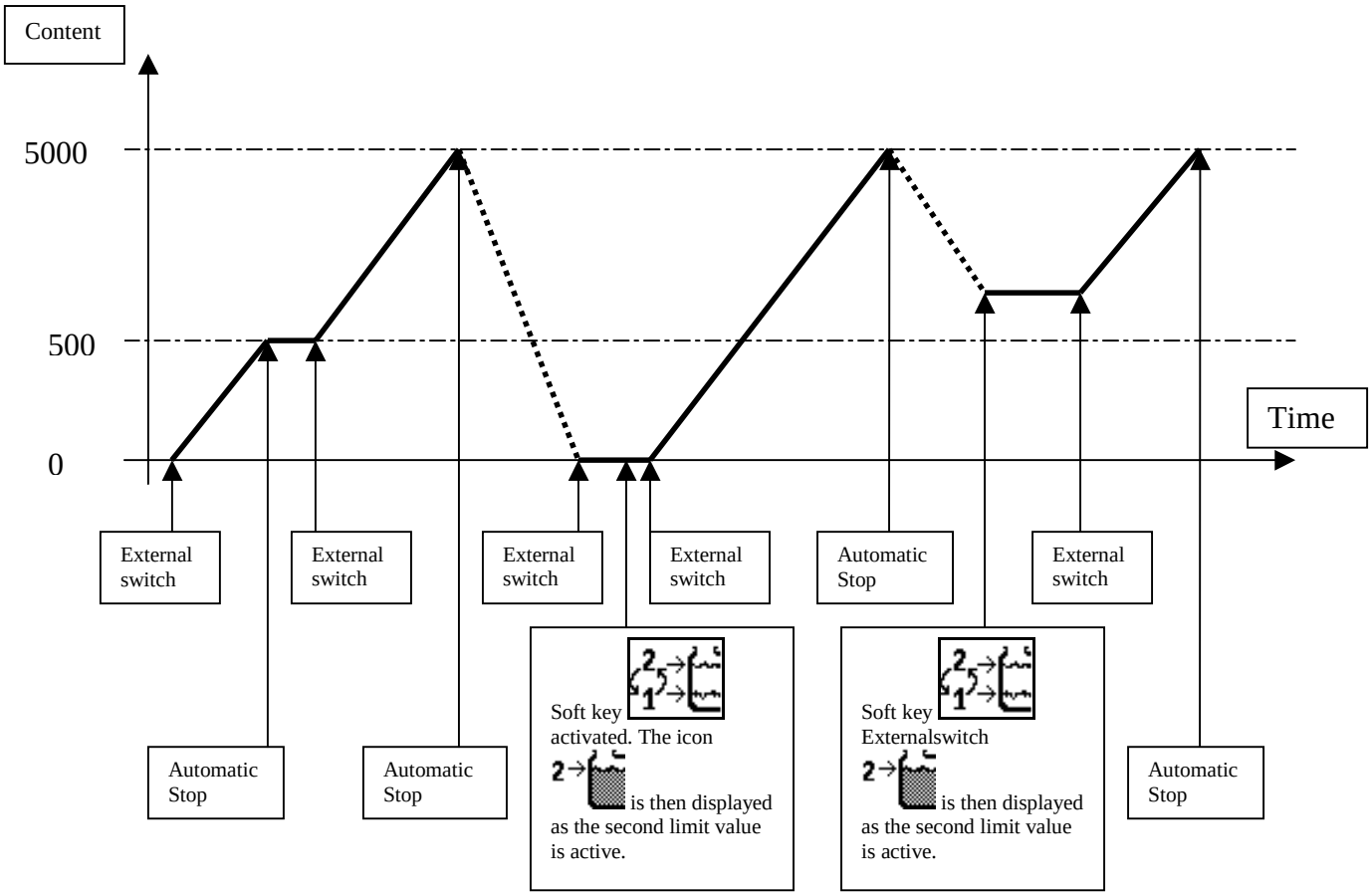
As 2 definite values have been entered, 2-stage filling will be activated. Icons 1 or 2 appear to display the information relating to the monitoring of the filling limits.
This filling process first of all allows automatic filling up to filling limit 1. When this limit has been reached and the filling process automatically switched off, filling limit 2 will be activated as the next limit value. The second filling process can now be activated likewise using the external filling switch and will be automatically switched off once the second filling limit has been reached. After the second level has been reached, the first limit value will be activated once more as the next filling limit and the corresponding icon is displayed.

The following diagram illustrates how the filling function operates:



As the diagram illustrates, the filling process can be interrupted using the external switch without altering the sequence of the 2-stage filling.

The soft key  provides the user with a further filling alternative:
- the first and lower limit can be put out of action without having to re-enter the limit values. In the following example, direct filling of 5000 litres was carried out using the soft key, without having to initiate a filling stop at 500 litres.
- Water can be added at any time.



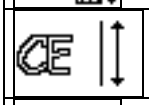
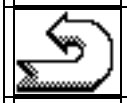
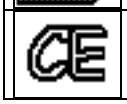
4.6.3.3 Filling pump

If the machine is equipped with a filling pump, the soft key  can be found in the TANK-Control mask. This is used to switch the filling pump on and off. When the filling pump is switched on the symbol  appears in the working mask 1 and in the TANK-Control mask. When automatic filling is activated, the filling pump switches off automatically as soon as the active filling limit is reached.

4.7 Results

This mask displays all counters. There are two kinds of counters – daily counters and total counters. The daily counters can be reset by the operator at any time. The total counters cannot be reset.

Tab. 4-13 Soft keys for the results mask

Soft key	Description
	Deletes quantity
	Deletes area
	Deletes distance
	Deletes work time
	Returns to working mask
	Deletes all counters

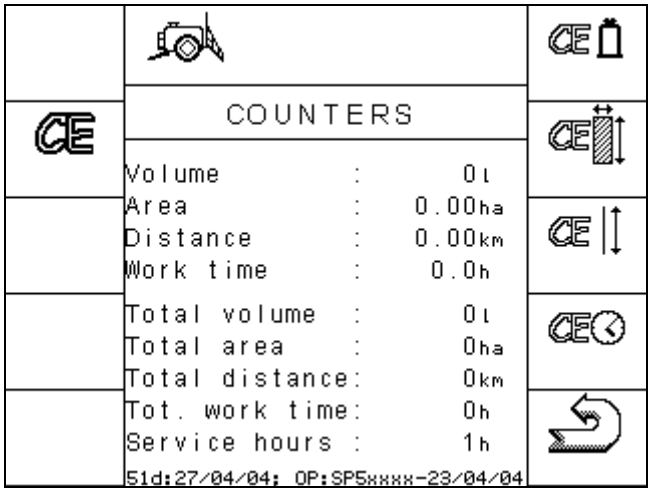


Diagram 4-30 Counters mask

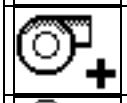
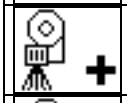
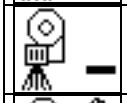
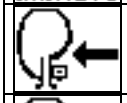
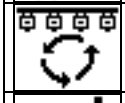
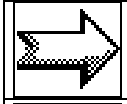
4.7.1 Software version number

In addition to the counters in the results mask (Diagram 4-30), the software version number with the corresponding date and the date of the user interface are displayed. In the example in Diagram 4-30 the software version is 5.1d, dated 27.04.04. The date of the user interface is 23.04.04.

4.8 Additional masks

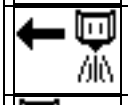
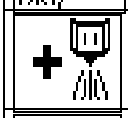
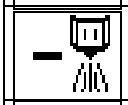
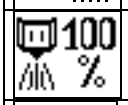
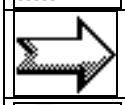
Depending on how the field sprayer is equipped, additional masks are required, making soft keys available for all functions. Only the soft keys for functions supported by the field sprayer are displayed in each mask. Some of the masks are only displayed when in the 3rd machine data mask for “Joystick type”, “without joystick” is selected (see diagram Diagram 4-4 page 12). This makes emergency operation possible without multifunction grip.

Tab. 4-14 Soft keys for additional masks 1

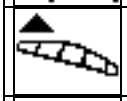
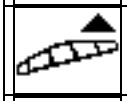
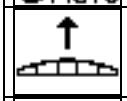
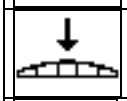
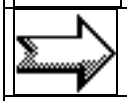
Soft key	Description
	Switches on/off foam marker on the left
	Switches on/off foam marker on the right
	Calls up the multiple nozzle mask. The function of the multiple nozzles is described in detail in chap.10 page 54.
	Switches off foam marker
	DISTANCE-Control switches manual/automatic
	Reduces ventilator rpm
	Increases ventilator rpm
	Increases Airtec air pressure
	Reduces Airtec air pressure
	Airtecs switch manual/automatic
	Increases air angle
	Reduces air angle
	Multiples nozzle mask
	Increases agitator performance
	Reduces agitator performance
	Next mask
	Changes to working mask 2

Soft key	Description
	Changes to working mask 1

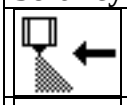
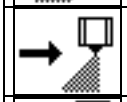
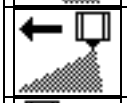
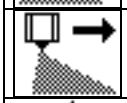
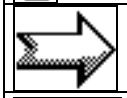
Tab. 4-15 Additional mask 2

Soft key	Description
	Switches boom section on/off
	“Sequential mode”: switches on boom sections to the right
	“Sequential mode”: switches off boom sections from the right
	“Sequential mode”: switches on boom sections to the left
	“Sequential mode”: switches off boom sections from the left
	“Nest treatment” mode: Cursor to the left
	“Nest treatment” mode: Cursor to the right
	“Nest treatment” mode: switches boom section underneath the cursor on/off
	Increases spray rate in steps of 10% (Auto) or increases spraying pressure (manual)
	Reduces spray rate in steps of 10% (Auto) or reduces spraying pressure (manual)
	Resets proportional change in the spray rate
	Next mask
	Changes to working mask 2
	Changes to working mask 1

Tab. 4-16 Soft keys for the additional mask 3

Soft key	Description
	Switches TRAIL-Control manual/automatic
	TRAIL-Control machine to the left
	TRAIL-Control machine to the right
	Raises bar on the left
	Raises bar on the right
	Switches on semi-automatic slope regulation
	Switches DISTANCE-Control manual/automatic
	Raises bar
	Lowers bar
	Next mask
	Changes to working mask 2
	Changes to working mask 1

Tab. 4-17 Soft keys for additional mask 4

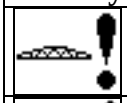
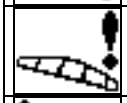
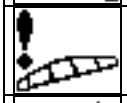
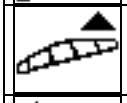
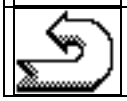
Soft key	Description
	Fence line nozzle left on/off
	Fence line nozzle right on/off
	Long-distance nozzle left on/off
	Long-distance nozzle right on/off
	Independent right-hand boom lift
	Independent left-hand boom lift
	Independent right-hand boom lower
	Independent left-hand boom lower
	Simultaneous boom lower
	Simultaneous boom lift
	Reduces foam pressure
	Increases foam pressure
	Next mask
	Changes to working mask 2
	Changes to working mask 1

5 Functions

5.1 Slope levelling

The function “slope levelling” helps the driver when he is working on a slope. The boom can be adjusted on the slope into the middle position or to a pre-set inclination to the right or left simply by pressing a key. The current setting is displayed in the working mask by the boom when this function is activated.

Tab. 5-1 Soft keys Slope levelling

Soft key	Description
	Calibrates the middle position
	Calibrates the end stop on the right
	Calibrates the end stop on the left
	Raises the right hand side
	Raises the left hand side
	Returns to the working mask

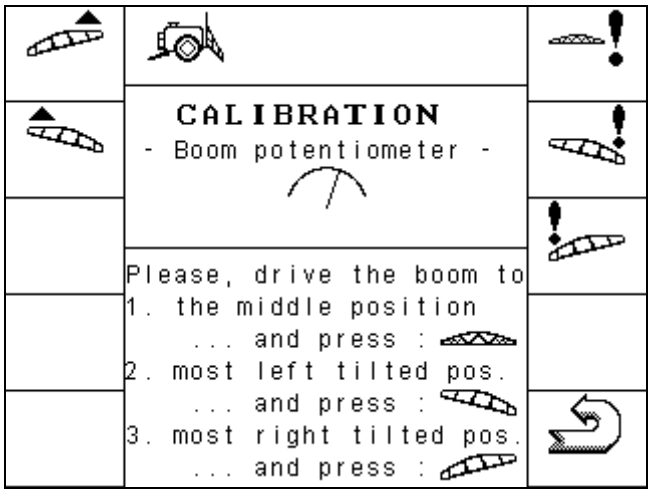


Diagram 5-1 Calibration slope levelling

Tab. 5-2 Symbol slope levelling

Symbol	Definition
	Activates slope levelling
	Adjustment in process
	Adjustment ended

Calibration:

1. Set the sprayer on even ground.
2. Place the boom in a horizontal position and then press the  key.
3. Lower the boom as far as possible to the right and then press the  key.
4. Lower the boom as far as possible to the left and then press the  key.

Operation:

On the slope set the required inclination once using the keys on the multifunction grip (MFG). When now the  key on the MFG is pressed, the boom is set in a horizontal position. The symbol  displays the direction of movement and that adjustment is in process. The symbol disappears as soon as the middle position is reached. By pressing  again the other side of the boom is lowered. The symbol  appears once more. The symbol changes to  once the required position has been established. Pressing the key once again leads to a further horizontal position etc. The function is terminated when one of the keys for slope adjustment is pressed.

5.2 Foam marking

Variation 1:

When the sprayer is equipped with a foam marker the corresponding soft keys can be found in the additional mask 1.

Tab. 5-3 Soft keys for the foam marker

Soft key	Description
	Switches the foam marker on the left on/off
	Switches the foam marker on the right on/off

The active foam marker is displayed on the side in question beside the boom ()

There are two variations for switching foam marking.

With this variation there are only the  keys. The foam marker required can be switched on and off using the corresponding key.

Variation 2:

Tab. 5-4 Soft keys for foam marking

Soft key	Description
	Change to the foam marker on the left
	Change to the foam marker on the right
	Switch off foam marker

The active foam marker is displayed on the side in question beside the boom ()

The keys   and  are displayed. When foam marking is switched off, the  or  keys are used to switch on the corresponding foam marker. Switching to the other side takes place using the key for the opposite side etc. Only a change from right to left can take place. Foam marking is switched off by pressing the  key.

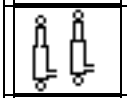
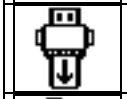
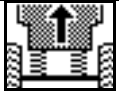
5.3 Manual pressure adjustment

The spraying mode automatic/manual can be switched using the  key. In manual mode, the symbol  is displayed beside the current spray rate. The spraying pressure can be adjusted using the  and  keys on the terminal or the keys  and  on the MFG (see chapter 4.4.1.1 page 20).

6 Special functions

6.1 Masks

Tab. 6-1 Soft keys manufacturer-specific

Soft key	Description
	MSR direct feed product 1
	MSR direct feed product 2
	Lighting
	Inside cleaning of tank
	Fresh water tank
	Releases double cylinder
	Rinses nozzle ring tube
	Raises filling funnel
	Lowers filling funnel
	Rinses filter
	Rinses compressed air
	Agitator on/off
	Switches tyre pressure
	Next mask
	Changes to working mask 2
	Changes to working mask 1
	Raise external suspension function This function can only operate when automatic is switched off. When the key is pressed, the symbol  is displayed on the lower part of the working mask.
	Lower external suspension function This function can only operate when automatic is switched off. When the key is

Soft key	Description
	pressed, the symbol  is displayed on the lower part of the working mask.
	External suspension function Switching manual/automatic. When automatic is active the symbol  is displayed on the lower part of the working mask. No symbol is displayed whilst in manual operating mode.

6.2 Functions

6.2.1 Nozzle ring tube rinsing

When the sprayer is equipped with nozzle ring tube rinsing the soft key  can be found in the manufacturer-specific mask.

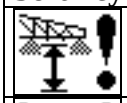
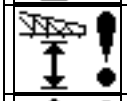
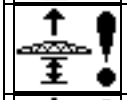
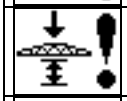
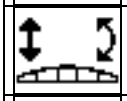
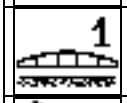
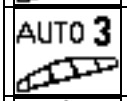
The nozzle ring tube rinsing is switched on when the  key is pressed. When the function is active the corresponding symbol appears in the manufacturer-specific area of the working mask. The function is switched off and the symbol disappears when the boom section main switch () is switched on. The nozzle ring tube rinsing restarts when the main switch is switched off. Pressing the  key once more switches the function off completely. If direct injection is switched on, the nozzle ring tube rinsing cannot be activated.

7 DISTANCE-Control

DISTANCE-Control automatically maintains the pre-set distance from the boom to the target surface. Two ultrasonic sensors installed near the ends of the boom constantly measure the current distance to the ground or plant surface. Further sensors provide information about deflection and inclination of the boom frame. By means of these values the job computer determines the current status and the necessary reaction to height and inclination deviations.

The current status of the DISTANCE-Control (manual / automatic) is shown in the working mask on the boom. In manual mode the symbol appears on the boom and disappears in automatic mode. The AUTO key on the MFG or with emergency operation the soft key AUTO in the additional mask 1 is used for switching

Tab. 7-1 Soft keys DISTANCE-Control calibration

Soft key	Description
	Sets the working height when DISTANCE-Control is in manual mode.
	Sets the excavation height when DISTANCE-Control is in manual mode.
	Increases the working or raised height when DISTANCE-Control is in automatic mode.
	Reduces the working or raised height when DISTANCE-Control is in automatic mode
	Sets the control type
	Starts the 1st calibration process
	Starts the 2nd calibration process
	Starts the 3rd calibration process
	Returns to the working mask

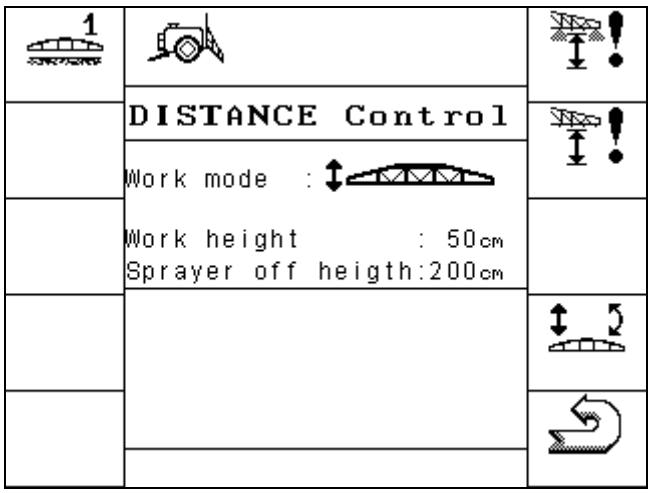


Diagram 7-1 DISTANCE-Control mask

Some information has to be entered before DISTANCE-Control can be used. Subsequently a calibration has to be carried out.

7.1 Setting the working height:

The working height is determined by DISTANCE-Control when the boom section main switch is on. In order to program this height the following steps have to be carried out:

1. Switch DISTANCE-Control to manual mode using the key on the MFG.
2. Set the boom to the required working height.
3. Press to store this information.

The working height is now stored and will be set automatically by DISTANCE-Control when it is in automatic mode and the boom section main switch is on.

The working height can also be set during operation. For this purpose the boom section switch must be on and the following steps carried out:

1. Call up DISTANCE-Control mask using the soft key in the working mask.
2. With the soft keys and set to the required height. Ready!

7.2 Setting the raised height:

The raised height is determined by DISTANCE-Control when the boom section main switch is off. In order to program this height the following steps have to be carried out:

1. Switch the DISTANCE-Control to manual mode using the key on the MFG.
2. Set the boom to the required working height.
3. Press to store this information.

The raised height is now stored and will be set automatically by DISTANCE-Control when it is in automatic mode and the boom section main switch is off.

If DISTANCE-Control is in automatic mode (boom section main switch off) the raised height can be set as follows:

1. Call up DISTANCE-Control mask using the soft key  in the working mask.
2. With the soft keys  and  set to the required height. Ready!

7.3 Selection of the control type

DISTANCE-Control operates normally with a combination of height and inclination control. The type of control in the DISTANCE-Control mask can be changed using the soft key  . Differentiation is made between height control (), inclination control () and a combination of both. Specific applications can be selected by repeatedly pressing the  key in the corresponding mode.

7.4 Calibration

Specific data for each boom type is determined once. These are stored as master data in the job computer and cannot be altered by the user. The user however is responsible for optimisation by carrying out calibration. All parameters which can vary due to production or can change during the life span of the machine are recorded here.

Important:

1. **The calibration must be carried out for each sprayer with DISTANCE-Control!**
2. **Calibration should be repeated at least once a year at the beginning of the season.**
3. **The sprayer must be positioned horizontally on ground which is even and has no slope. There should be no hollows under the ultrasonic sensors. The ground surface should not be too smooth (e.g. asphalt or concrete) otherwise the ultrasonic signals can get lost.**
4. **All mobile parts of the boom suspension must be free of paint and sufficiently lubricated.**
5. **The correct working width must be entered in the machine data.**

Correct functioning of DISTANCE-Control after the calibration process is only possible if all these points are adhered to. Regular maintenance of all mobile parts is absolutely essential to ensure long-lasting and correct functioning. Changes to the manoeuvrability of the boom suspension can cause grave impairment to control performance, which even a repeat calibration may not be able to rectify.

The calibration process is carried out in three consecutive stages. The individual stages are clearly separated but should be carried out successively during one process. The machine must be stationary during this process. If problems or operating errors occur, calibration will be automatically terminated and the original parameters restored. The process can be interrupted manually at any time by pressing the ESC soft key.

During calibration:
The functions of the multifunction grip remain active; boom adjustment to the defaults can therefore be carried out either via the multifunction grip.

Procedure:

1. Press the  soft key. The calibration process begins and the following text appears:

Horizontal calibration
Place boom in a horizontal position at a height of 2m
And press: OK

2. Now place the boom in a horizontal position at a height of 2m. In this position the boom must be able to tilt freely to the ground. If this is not the case select a lower height. To help with setting, the height of the boom on the left and right are displayed in the menu Depending on the position the following text appears:

Boom is now horizontal
or
Boom is not horizontal

3. When the boom is horizontal the setting is stored using the OK key. Now and again wind can cause the boom to move 2-3 cm back and forth so that the display “Boom is now horizontal” wavers on the monitor. In this case press the OK key several times until the input is accepted.

4. As soon as the first setting is completed the soft key  disappears and this key appears  .

5. To start the second calibration step press the Soft key  . This text appears :

Manual Calibration

Tilt the boom to the left for 5 seconds

6. Now press down the left side by hand (⚠ **Attention! <u>not</u>** via the slope adjustment) until the ultrasonic sensor is about 40 cm above the ground. As soon as the deflection is sufficient the following text appears:

Move back the boom to the horizontal position
and
Boom is now horizontal
or
Boom is not horizontal

7. Hold the boom in the deflected position for about 5 seconds and then let go. The boom should now move itself back into the horizontal position. If the display does not switch to "Move back the boom to the horizontal position" press down the boom once more, this time further than the first time.

   ⚠ The ground must not be touched.

8. Once the boom is horizontal this step can be concluded by pressing [OK]. The  key disappears and the  key appears.
9. Press  to start step 3. The following text appears:

Automatic calibration: please wait...

10. Now an automatic process is started. The boom will be raised first on the left and then on the right and subsequently returned to the horizontal position, during which it must not touch the ground. If, after this, the horizontal position is not set correctly this does <u>not</u> mean that the calibration has failed.
11. Observe the movement of the boom. If something is not correct, the process can be terminated by pressing [ESC] key. All three steps must then be carried out once again.
12. If this step has also been concluded successfully, the following text appears:

Calibration completed. Please press ok.

If the new calibration values are to taken over the [OK] key has to be pressed once more. With the [ESC] key the new calibration values can be rejected.

Once the calibration has been fully completed, DISTANCE-Control is ready for use and can be switched to automatic mode by pressing the  key in the additional mask 1.

7.5 Safety functions:

Under specific safety-relevant conditions DISTANCE-Control is switched to manual mode.

- Maximum speed of 15 km/h is exceeded
- Error messages involving DISTANCE-Control
- Activation of another function involving DISTANCE-Control (folding etc.)
- Signal from other sensors e.g. locking, lift mast sensor etc.
- Start of calibration
- Short term loss of sensors

7.6 Semi-automatic height adjustment

The semi-automatic height adjustment is an alternative to DISTANCE-Control.
The function here is limited to lifting and lowering the boom at the headland automatically when the boom section main switch is on or off.

7.6.1 Basic setting

1. Set manual operation mode using the key in the auxiliary mask 2 or on the MFG. The symbol appears on the working mask.
2. Adjust the boom to the correct height while driving through the field (speed >0.5 km/h) with the main boom section switch switched on.
3. Switch off the boom section switch at the headland and stop. The boom rises automatically to the currently programmed excavation height. Now set the required excavation height.
4. Now store the excavation height in the DISTANCE Control menu using the key.
   ⚠ Attention: The deviation from the working height, not the absolute excavation height will be stored. If the working height is altered, the excavation height will alter accordingly.

7.6.2 Operating procedure

Set the boom to the correct working height before the first journey in the field. For this purpose the semi-automatic height adjustment should be in **manual operation** mode, which is generally the case after switch-on. Switch on the main boom section switch and drive onto the field. Now activate the automatic mode using the key in the auxiliary mask 2 or on the MFG. The hand symbol representing the boom on the working mask disappears. Automatic mode is now active.

⚠ **Important!** If automatic mode is activated before the main boom section switch is switched on, the boom will be lowered to the pre-set deviation in height at switch-on.

If the main boom section switch is switched off at the headland whilst in automatic mode, the boom will be raised by the pre-set deviation in height. It will be lowered to the correct height as soon as the main boom section is switched on again.

While driving through the field in active automatic mode, the boom can be adjusted to the required height. The absolute excavation height adjusts accordingly, as raising takes place at the same rate.

⚠ **Attention:** If the boom height is adjusted manually at the headland when the main switch is off, the semi-automatic height adjustment goes into manual operation mode.

8 TRAIL-Control

The function TRAIL- Control ensures that an attached field sprayer automatically stays in the trail of the tractor The current position of the complete system is recorded via a sensor (Gyroscope) on the tractor and a sensor (Potentiometer) at the pivot of the machine's steering. The job computer uses this data to calculate the required reaction to the hydraulics so that the sprayer can follow in the trail of the tractor. An inclination sensor (optional) provides information on the slope of the ground. With this information automatic slope regulation can be carried out.

Operation of the TRAIL -Control function is integrated in the job computer.
The following chapter describes the controls, their operation and calibration.

8.1 Initial operation

Before TRAIL Control can be used, the sensor (Gyroscope; Diagram 8-1) must be mounted to the tractor.

Diagram 8-1 Gyroscope

Diagram 8-2 Gyroscope bracket

Diagram 8-3 Gyroscope with bracket

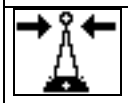
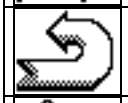
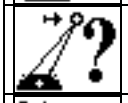
Diagram 8-2 illustrates the mounting bracket for the gyroscope. This must be mounted **perpendicularly** and **vibration-free** on to the rear of the tractor. The gyroscope is then placed in the bracket and secured with a wing screw (see Diagram 8-3)

⚠ The label “TOP-OBEN” must point upwards.

Attention! It is essential to make sure that the gyroscope is mounted perpendicularly and vibration-free to the rear of the tractor. Otherwise TRAIL Control will not function correctly

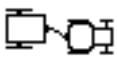
A second bracket is mounted on the sprayer. This is to take the gyroscope when the sprayer is disconnected from the tractor.

Tab. 8-1 TRAIL Control Soft keys

Soft key	Description
	Soft key in the working mask and the key on the MFG for switching TRAIL Control on and off. The  key on the MFG has to be switched on before TRAIL Control can be used. When the function is switched on the soft key for manual/automatic mode is displayed in the working mask.
	Middle position: As long as the soft key (working mode “manual”) is pressed, steering is driven in the middle position. When the soft key is released prematurely, the hydraulics switch off.
	Manual/automatic: these soft key switches back and forth between the working modes “manual” and “automatic.
	Switches crab steering on/off. This soft key switches back and forth between the working modes “normal” and “crab steering”. The current status is displayed in the TRAIL Control mask by the symbol  .
	Sprayer to the right. As long as this soft key is pressed, the sprayer shifts to the right.
	Sprayer to the left. As long as this soft key is pressed, the sprayer shifts to the left.
	Returns to the working mask
	Calibrates the middle position: see chap.8.1.2 page 50
	Calibrates the maximum position on the left: see chap.8.1.2 page 50
	Calibrates the maximum position on the right: see chap.8.1.2 page 50
	Hydraulics calibration: see chap.8.1.2 page 50
	Confirmation key: This key is used to end the individual TRAIL Control calibration stages (see chap.8.1.2 page 50).

Tab. 8-2 TRAIL Control symbols

Symbol	Description
	TRAIL Control is switched on in “manual” mode
	TRAIL Control is switched on in “automatic mode “
	Crab steering to the right
	Crab steering to the left
	Boom folded in. TRAIL Control can not be switched on as long as this symbol appears. Operation can only be carried out with the boom folded out.

Symbol	Description
	TRAIL Control is locked. This symbol appears when the steering drawbar is locked mechanically. TRAIL Control cannot be switched on.
	Axle locked. This symbol appears when the steering axle is locked mechanically. TRAIL Control cannot be switched on.
	Normal steering
	Crab steering is activated

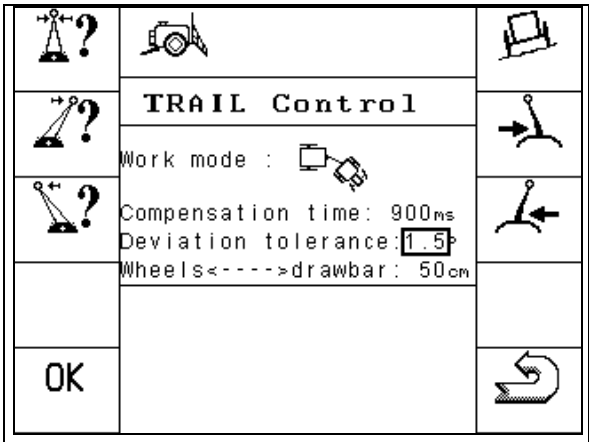


Diagram 8-4 TRAIL Control cal. mask b/w

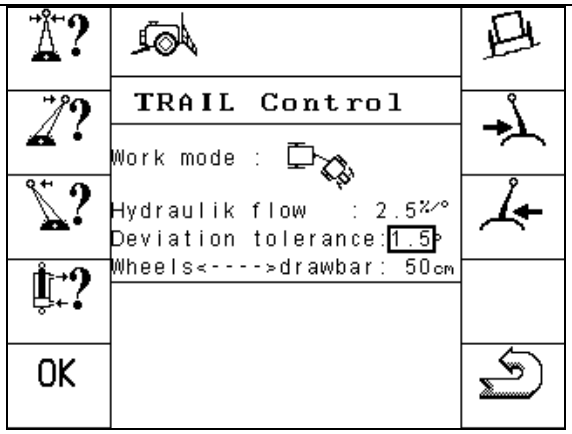


Diagram 8-5 TRAIL Control cal. mask prop.

8.1.1 Input of sprayer-specific data:

Some parameters have to be set before a calibration of the system can be carried out.

Compensation time:
This value is only displayed on models equipped with hydraulic valve S/W (see Diagram 8-4). The normal value is in the range of 700 ms – 1000 ms. The lower the value, the sooner the sprayer takes curves and vice versa.

Hydraulic speed:
This value is only displayed on models equipped with a proportional valve (see Diagram 8-5). The hydraulic speed is a factor which can be set with the steering speed of the sprayer. The higher the value, the quicker changes are levelled out. Standard values are in the range from 1.5 %/° and 3 %/°.

Deviation tolerance:
The deviation tolerance affects the reaction of TRAIL Control around the middle position. The lower the tolerance, the more sensitive is the reaction of the controller to small changes. Normally this value lies between 1° and 3°.

Drawbar <---> wheel:
The distance between the rear axle of the tractor and the towing point is entered here. This is normally somewhere in the region of 45 cm and 90 cm.

⚠ If the tractor is changed, the parameters must be adapted to meet the new conditions.

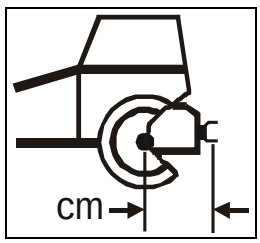


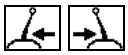
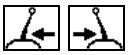
Diagram 8-6 Length of tractor

8.1.2 Calibration:

1. Middle position

- Set the sprayer on a flat underground straight behind the tractor using the  keys on the MFG or the soft keys  .
- Call up calibration of the middle position with the soft key. At the bottom of the monitor the display appears “Ready for calibration of the middle position”.
- Press the  soft key within 3 seconds. The calibration process can now be started. The message “Middle position is running” appears. After a few seconds this message disappears again. Calibration for the middle position is now completed.

2. End stops

- Press the  keys on the MFG or the soft keys  to drive the sprayer to the maximum position on the left.
- Press the  soft key to activate calibration. The message “Maximum position on the left ready” appears.
- Press the  soft key within 3 seconds. The message “Maximum position on the left is running” appears. The message disappears when the new position has been stored.
- Press the  keys on the MFG or the Soft keys  to drive the sprayer to the maximum position on the right.
- Press the  soft key to activate calibration. The message “Maximum position on the right ready” appears
- Press the  soft key within 3 seconds. The message “Maximum position on the right is running” appears. The message disappears when the new position has been stored.

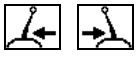
3. Proportional valve ( only with machines with proportional valve)

Attention: The sprayer is moved automatically during this calibration process. No-one is to be within reach of the control area of the machine!

- Press the  soft key to activate calibration. The message “Hydraulic calibration ready” appears“.
- Press the  soft key within 3 seconds. The message “Hydraulic calibration is running” appears. This process lasts about 20 seconds. The process is ended when the message disappears. To interrupt the process press  key again.

8.2 Operation:

8.2.1 Automatic / Manual

When the TRAIL Control function is switched on the “manual” mode is active, signalised by the symbol  in the working mask. In this mode steering reacts to operation with the keys  and  . As long as one of these keys is held down, an adjustment in the corresponding direction takes place.

If the  key is pressed the mode is switched to "automatic", signalised by the symbol

 . The sprayer is now steered automatically. In this mode the keys  and  have no function.

Press the  key several times to switch between manual and automatic mode.

Important! TRAIL Control switches off automatically as soon as the maximum speed of 15 km/h is exceeded and can only be switched on again when the speed falls below the maximum.

8.2.2 Middle position

The middle position of the steering is started using the  soft key. This soft key functions only in “manual” mode.

8.2.3 Crab steering

As well as automatic, crab steering can be activated by pressing the  key. The symbol  appears in the TRAIL Control mask. Now the keys  and  are activated. This means that the sprayer can be adjusted against the slope.

If the machine is also equipped with an inclination sensor, TRAIL Control controls the measured inclination against the slope. The intensity can be set during the journey using the  and  keys. Depending on the current position of the steering in “crab steering” mode, either the symbol  or  is displayed in the working mask.

By pressing the  key again crab steering is switched off. The symbol  disappears from the TRAIL Control mask.

8.2.4 Locking

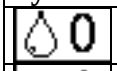
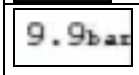
 shows if the steering is locked mechanically. If the symbol is not displayed then the steering is not locked.

9 Airtec

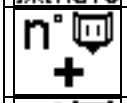
Airtec is a system designed for use with field sprayers to control the drop size. The sprayer must be equipped with special Airtec nozzles from the firm Cleanacres and a compressor for air support in order to be able to carry out this function. The pre-selected drop size is kept constant by controlling the air pressure of the Airtec nozzles in relation to the current flow rate. At present 9 different drop sizes can be selected.

Important! To enable optimal operation at the beginning of the field, the speed at the end of the field when the sprayer is switched off and the speed at the beginning of the field when the sprayer is switched on should be the same and if possible correspond to normal spraying speed.

Tab. 9-1 Airtec Symbols

Symbol	Description
	Drop size 0 means that Airtec is switched off
	Drop size 1 - drop size 9
	Manual working mode
	In info mode the Airtec air pressure is displayed instead of the drop size or the symbol  .

Tab. 9-2 Airtec Soft keys

Soft key	Description
	Calls up the Airtec mask
	Switches manual/automatic
	Upward nozzle selection
	Downward nozzle selection
	Increases drop size
	Reduces drop size
	Returns to working mask

9.1 Nozzle number input

Call up the AIRTEC mask (see Diagram 9-1) in the machine data mask by pressing the  soft key. The number of the nozzle to be used can be set using the soft keys  and  .

Attention! The selection of the wrong nozzle number results in the wrong drop size, which can lead to plant damage.

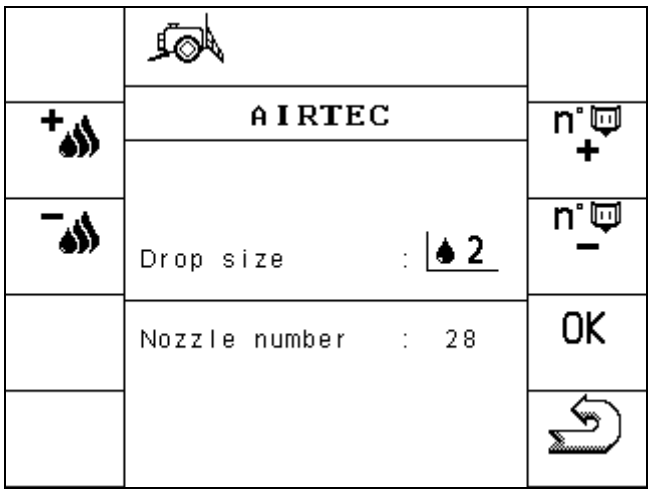


Diagram 9-1 Airtec Mask

9.2 Altering the drop size:

Call up the AIRTEC mask (see Diagram 9-1) in the machine data mask by pressing the soft key. The drop size can be altered using the soft keys and . The current setting is displayed with the 0 and 1 - 9.

9.3 Automatic mode:

The drop size can be adjusted in automatic mode using the soft keys and . The current setting is displayed in the Airtec mask and in the working mask with the symbols 1 - 9. Working mask 2 displays the air pressure instead of the drop size.

9.4 Manual mode:

In manual mode the air pressure is set directly when the soft keys and are pressed.

For reasons of safety air pressure lower than the minimum air pressure or higher than the maximum air pressure cannot be set. The values for minimum and maximum air pressure are manufacturer dependent and are specified in the configuration.

9.5 Switching Airtec on/off

The Airtec system is switched off when the drop size "0" is entered. This is displayed by the symbol 0.

Attention! The system can only be switched off if there are no Airtec nozzles in use. Otherwise there is a danger of spraying liquid entering the air pressure system and damaging it.

10 Multiple nozzles

To switch nozzles automatically a nozzle fitting for 2 or 4 nozzles is used instead of the standard nozzle fitting. Depending on the manufacturer a specific number of nozzles in relation to the current set value can be automatically switched in such a way that an optimal spraying scheme results. For this purpose the nozzles can either be switched on individually or in combination. The advantage of this system is the larger working area (l/ha). Switching can be done automatically (Vario) or manually (Select).

With the new Software Version 5.1d (May 2004) it is necessary to enter a licence code (see chap. 11 page 66). Without the code only the Select mode with 2 nozzles and the cleaning mode can be operated. When the correct code is entered the entire scope of the Select and Vario modes with 4 nozzles can be operated.

Calling up of the multiple nozzle mask and the soft keys for adjusting the droplet size can be found in the auxiliary mask 1 (see Diagram 10-1).

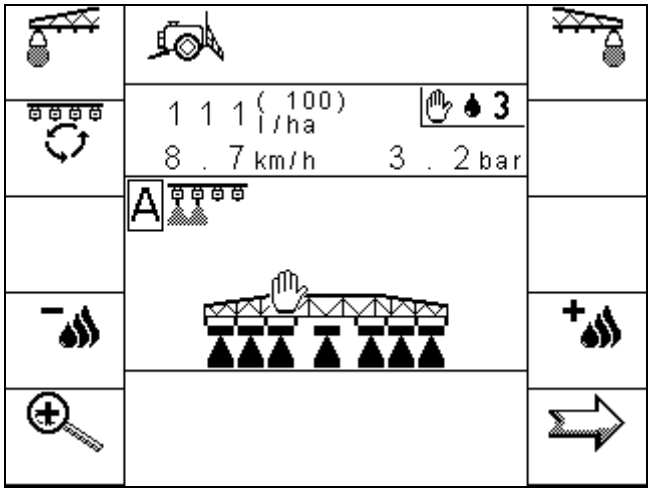


Diagram 10-1 Auxiliary mask 1

Tab. 10-1 Soft keys for multiple nozzles in the auxiliary mask 1

Soft key	Description
	Calls up the multiple nozzle mask (see chap. 10.1 page 55)
	Droplet size adjustment (see chap. 10.4 page 58) Increase droplets
	Droplet size adjustment (see chap. 10.4 page 58) Decrease droplets

10.1 The multiple nozzle mask

Press the soft key  in the auxiliary mask 1 to display the multiple nozzle mask (see Diagram 10-2).

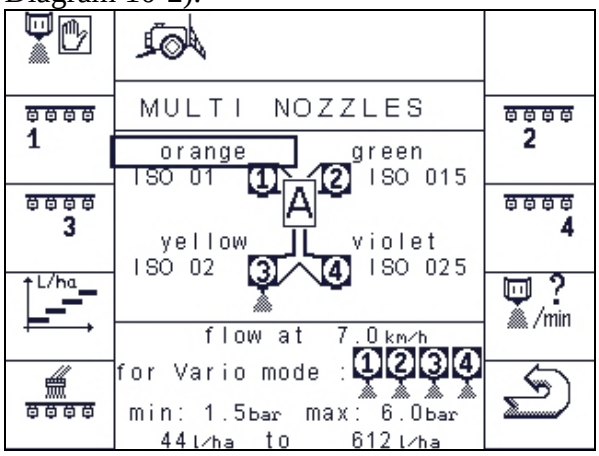
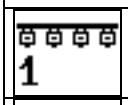
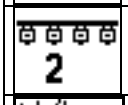
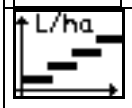
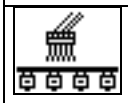
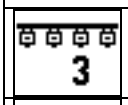


Diagram 10-2 Multiple nozzle masks

Tab. 10-2: Soft keys for the multiple nozzle mask

Soft key	Description
	Calls up the nozzle deactivation mask In this mask individual nozzles can be eliminated from operation in Vario mode (see chap. 10.5.4.2 page 62).
	Switches nozzle 1 on/off (Select mode see chap. 10.3 page 57)
	Switches nozzle 2 on/off (Select mode see chap. 10.3 page 57)
	Switch to display the comparison in performance of the nozzles used. Press the soft key  to switch to the performance area on the lower part of the data mask (see chap. 10.5.5 page 63). Press the key again to return to the normal display.
	Switches nozzle cleaning on/off. All nozzles are opened when this key is pressed. The symbol  is displayed in the working mask in front of the nozzles. Once cleaning is completed, automatic or Select mode can be switched on again by pressing the soft key  again.
	This Soft key is only displayed when the Select mode is active. Press  to switch to the Vario mode. The soft key disappears once more (see Select mode chap. 10.3 page 57)
	Switches nozzle 3 on/off manually (Select mode see chap. 10.3 page 57)
	Switches nozzle 4 on/off manually (Select mode see chap. 10.3 page 57)
	Calls up the nozzle data mask.
	Returns to working mask

10.2 Vario mode

Attention!
When operating in Vario mode it is absolutely essential that all parameters are entered correctly, are coordinated with each other and with the machine. For exact input instructions refer to chap. 10.5 page 58.

In Vario mode the selection of the correct nozzle combination is carried out according to the current flow per nozzle. Another combination is automatically selected as soon as there is a change in speed or the quantity sprayed.

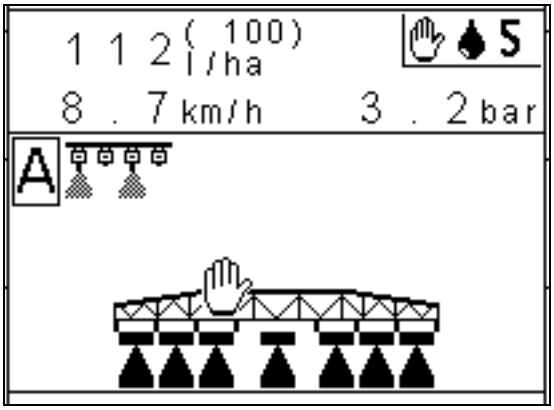


Diagram 10-3 Illustration of multiple nozzles in the working mask

The current status is displayed on the left of the centre area of the working mask. The symbol A shows that the Vario mode (automatic) is active. A spraying cone under a nozzle illustrates that the nozzle is switched on.

If the Vario mode is inactive, the multiple nozzle mask can be switched on using the soft key .

10.3 Select mode

Attention!
When operating in Select mode it is absolutely essential that all parameters are entered correctly, are coordinated with each other and with the machine. For exact input instructions refer to chap. 10.5 page 58.

In Select mode the required nozzle combination is set manually. This remains active until it is altered manually or it is switched over to Vario mode.

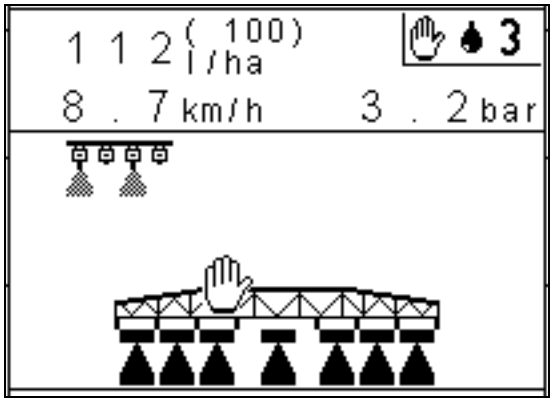


Diagram 10-4 Working mask in Select mode

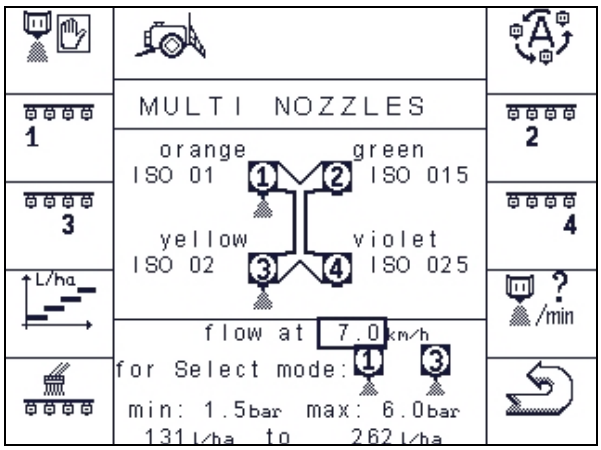


Diagram 10-5 Multiple nozzles mask in Select mode

Select mode can be recognised in the working mask by the fact that only the selected nozzles without the symbol [A] are displayed. Similarly the symbol [A] does not appear in the illustration of the nozzle fittings in the multiple nozzle mask. The soft key [A] is provided. The required nozzles can be switched on and off using the soft keys [1], [2], [3] and [4] Switched-on nozzles can be recognised by the spraying cone below the nozzle. If all nozzles are switched off, the system switches over to Vario mode. Vario mode can also be activated by pressing the soft key [A]. The soft key [A] disappears from the multiple nozzle mask as soon as the Vario mode is activated.

The working area of the current nozzle combination is displayed in the lower part of the multiple nozzle mask. For an exact description of the data displayed refer to chap. 10.5.2 page 60.

10.4 Setting the droplet size manually

Control in Vario mode takes place using the selected pressure area. The software tries to keep the system constantly within a close pressure range to be found in the middle of the pressure range defined for the nozzles. If this pressure range were to be shifted to a range with higher or lower pressure, it would theoretically be possible to attain control of a specific droplet size. The system is steered intentionally into the lower pressure range for larger drops and into the higher pressure range for smaller drops.

Depending on the configuration supplied by the field sprayer manufacturer, the job computer operates either without droplet size adjustment or with manual adjustment. In this case the number of adjustable droplet sizes lies within the range of 4-9. The standard value is 5 droplet sizes.

If the setting of droplet sizes is activated, the current droplet size is displayed in the working mask, as is the case with the Airtec function. (see Diagram 10-6).

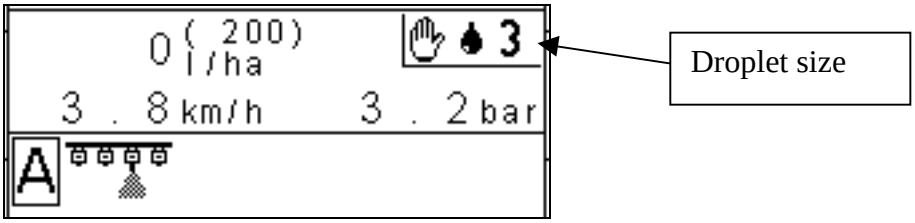


Diagram 10-6 Display of droplet sizes

Note:

The icon beside the droplet size means that droplet size control is being carried out manually. Automatic control is at present not yet available.

2 additional soft keys and appear in the auxiliary mask 1 to allow gradual adjustment of the droplet size within the number of droplet sizes configured. The adjustment can only be carried out in Vario mode.

10.5 Input parameters

All parameters in connection with multiple nozzle functionality can be entered over the multiple nozzle mask.

Important!

For the operation of multiple nozzles it is absolutely essential that all parameters are entered correctly, are coordinated with each other and with the machine (type of nozzle, permitted pressure range of the nozzles, position of the individual nozzles on the multiple fitting). The parameters are required for calculation and execution in particular for the Vario mode. Wrongly–entered values can lead to the nozzles not being properly combined and the required quantities and results of the spraying liquid applied not being adhered to.

10.5.1 Selection of nozzles

The number of nozzles to be controlled depends on the fitting system used (usually tandem or quatro fitting systems. With a tandem fitting multiple nozzle 1 and multiple nozzle 2 are configured. With a quarto fitting multiple nozzle 3 and multiple nozzle 4 are configured in addition.

The multiple nozzles are displayed differently in the corresponding operating masks depending on the configuration.

Tandem fitting:

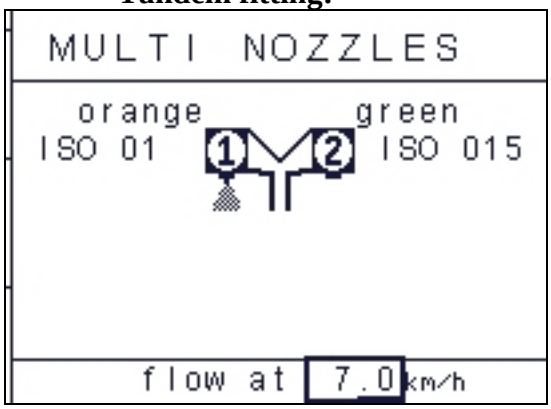


Diagram 10-7 Operating mask tandem fitting

Quatro fitting:

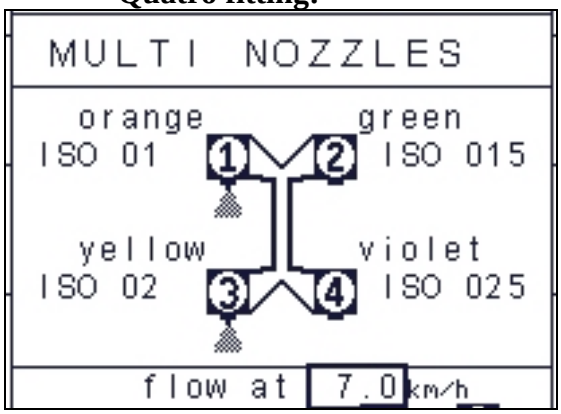


Diagram 10-8 Operating mask tandem fitting

Independent of the nozzle fitting the type of nozzle currently used can be entered for each nozzle. An input list makes this possible whereby the colour of the current nozzle is selected. In addition corresponding ISO name for each nozzle appears on the working mask.

The selection list for the nozzles contains the 14 standard types of nozzles specified in ISO 10625 and 4 user-specific, freely specified types of nozzles. It is possible to select “no nozzle” in order to deactivate a nozzle on the fitting system.

Tab. 10-3 Nozzle table

Nozzle colour ISO 10625	ISO descriptor	Performance in l/min at 3 bar
Violet	0050	0.2
Light pink	0075	0.3
Orange	01	0.4
Green	015	0.6
Yellow	02	0.8
Purple	025	1.0
Blue	03	1.2
Wine red	035	1.4
Red	04	1.6
Brown	05	2.0
Grey	06	2.4
White	08	3.2
Light blue	10	4.0
Light green	15	6.0

Nozzle A	-	Specific
Nozzle B	-	Specific
Nozzle C	-	Specific
Nozzle D	-	Specific
No nozzle		

10.5.2 Operating conditions input

The multiple nozzle mask always displays the current value of the operating conditions currently set on the lower part of the mask.

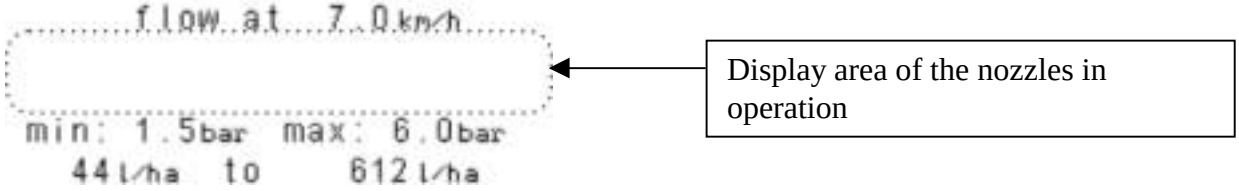


Diagram 10-9 Working conditions

This area has 3 user-specific parameters:
Working speed
Minimum pressure value
Maximum pressure value

The pressure range determined by the pressure values should always be within the specifications laid down by the nozzle manufacturer.

The structure of the display area for the nozzles in operation can vary depending on the operating mode of the multiple nozzles.
In Vario mode the area is shown as follows:

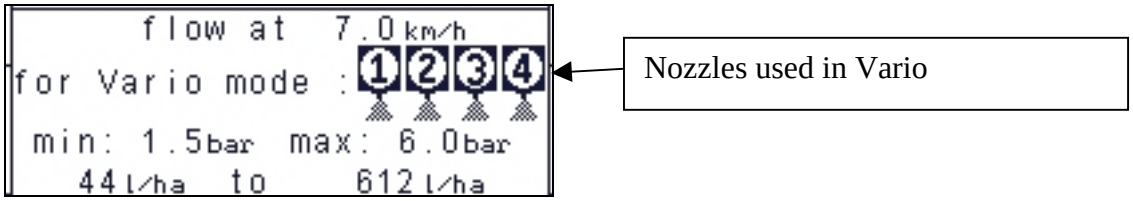


Diagram 10-10 Working conditions Vario mode

The area for the spraying quantity is determined by the individual nozzles and their possible combinations (from the smallest individual nozzle up to the combination of all nozzles). The nozzle icons 1-4 show which nozzles are assigned to the Vario mode. Only the first 2 are provided with a tandem fitting. With a quadruple fitting one or more nozzles can be reserved solely for Select mode (see chap. 10.5.4.2 page 62).

In Select mode the area is displayed as follows:

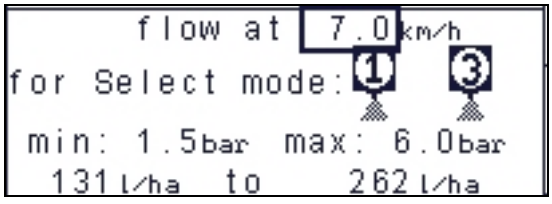


Diagram 10-11 Working conditions Select mode

The spraying quantity is defined here by the manually selected nozzles. In the example Diagram 10-11 nozzles 1 and 3 are activated simultaneously. This means that the spray rate is the sum of the values of both nozzles.

Refer to chap.10.5.3 page 61 for a further example for this display area.

10.5.3 Working conditions with user-specific nozzles

By pressing the soft key  a mask is displayed which provides exact information about the specific data of a nozzle. By means of a selection list all 18 types of nozzles can be selected and displayed.

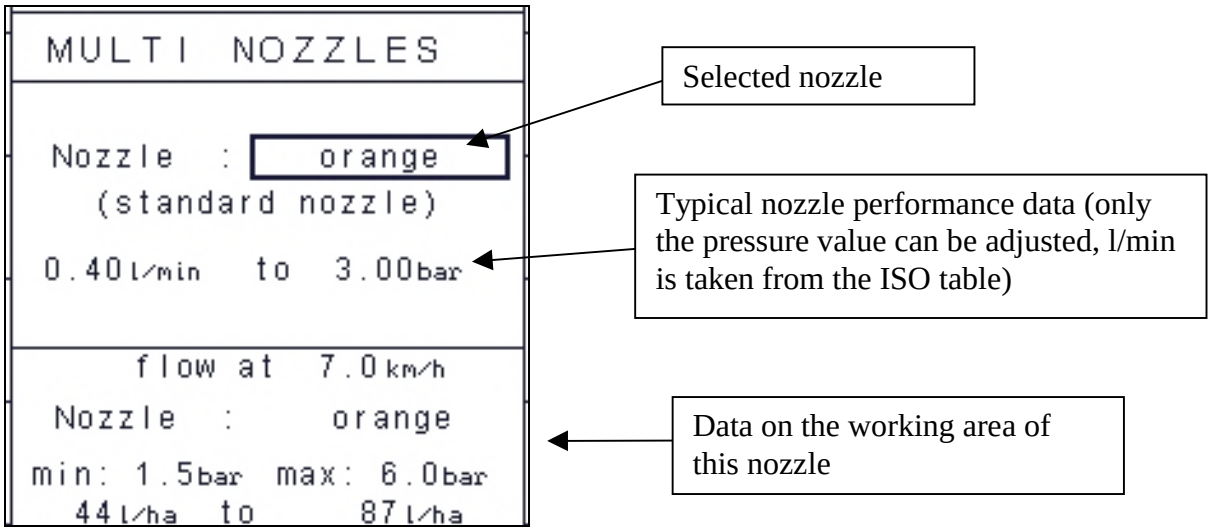


Diagram 10-12 Nozzle performance data

In example in Diagram 10-12 the nozzle performance is shown to be 3 bar. The pressure value can be changed at any time. The working area of the nozzle relating to a working speed which can be entered and a freely definable pressure range is displayed on the lower part of the mask. This range reflects the nozzle data as generally found in nozzle and spraying tables.

If you select a non-ISO nozzle (nozzle A to D) you will have to define the typical operating point of this nozzle. For this purpose enter the values for both pressure and l/min. The definition of this operating point is sufficient to calculate the entire working area of the proprietary nozzle. The calculated data is displayed in the data mask:

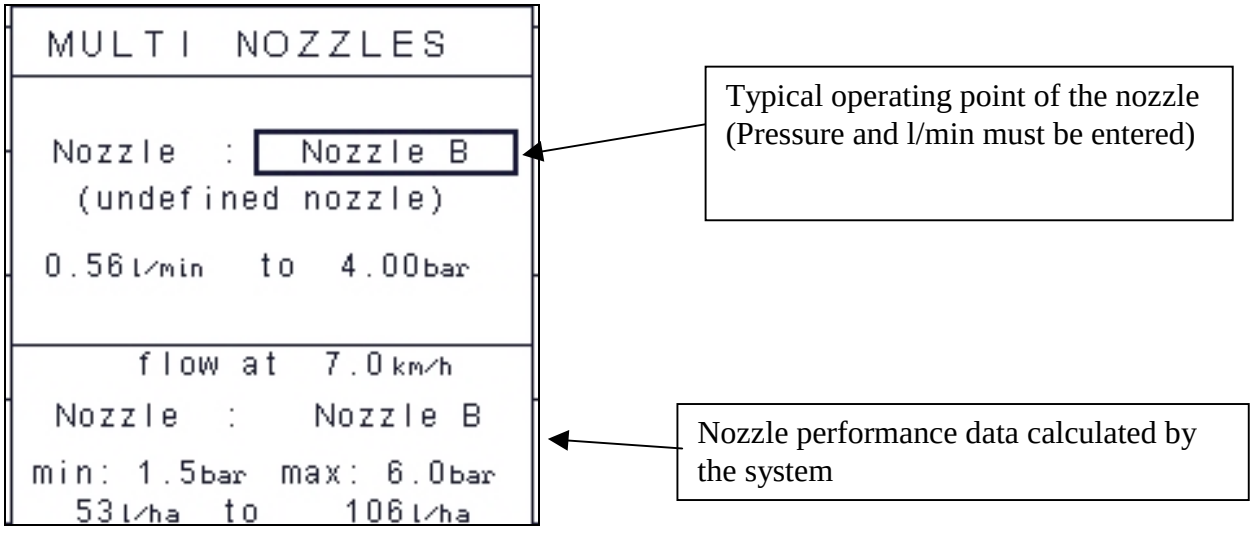


Diagram 10-13 performance data of user defined nozzle

10.5.4 Deactivating a nozzle

There are two possibilities for nozzle deactivation.

10.5.4.1 Global deactivation

You can decide that an installed nozzle is to be never used, neither in the Vario nor in the SELECT mode. For this purpose select "no nozzle" from the nozzle selection list for the corresponding nozzle. The configured output for this nozzle is now switched to inactive mode and the corresponding soft key is deleted from the soft key mask. This function can be used e.g. in order to work with a nozzle fitting which is not fully equipped. However, at least 2 nozzles always have to remain active. This means that global deactivation can only be used with a quatro fitting.

10.5.4.2 Vario mode elimination

It is possible to eliminate nozzles from the Vario mode. These eliminated nozzles can only be activated in Select or cleaning mode. The following soft key mask is displayed when the soft key  is pressed:

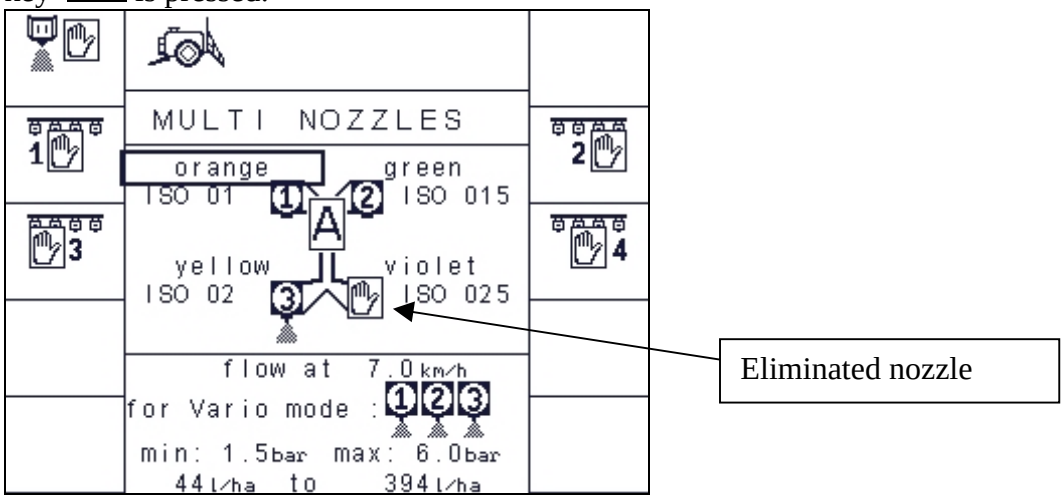


Diagram 10-14 Vario mode elimination

Press the soft key for the nozzle which is to be eliminated from the Vario mode. The eliminated nozzle is characterised by the icon  .

Using the same procedure elimination can be reversed. The elimination process can only be used with quatro fittings as at least 2 nozzles are always required for the Vario mode. If an attempt is made to eliminate one of the last two available nozzles, the system reacts with an alarm and the elimination process is blocked.

Diagram 10-15 Alarm Multiple nozzle elimination

The typical application for Vario elimination is when liquid fertilizer is to be sprayed. In this case only one nozzle for liquid fertilizer is used in Select mode. The other three nozzles can be used for normal spraying procedure in Vario mode.

10.5.5 Performance comparison

Press the soft key 

in order to receive an overview of the performance of the nozzles used. On the lower part of the data mask a diagram appears showing the performance range of the individual nozzles.

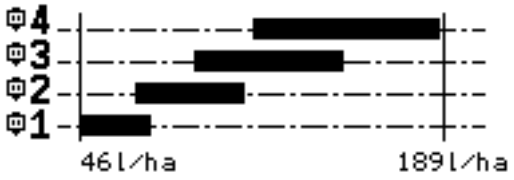


Diagram 10-16 Performance comparison

A filled-in rectangle is displayed for each nozzle in the diagram (for tandem fittings only 2 rectangles for nozzle 1 and 2 are displayed). The lowest rate of the smallest nozzle and the highest rate of the largest nozzle form the minimum and maximum value on the diagram scale (taken from the set pressure range).

If a nozzle has been deactivated nothing is indicated for the nozzle concerned.

If a nozzle has been eliminated from the Vario mode the performance range of this nozzle is represented by an empty rectangle. In the following diagram nozzle 4 is operating in Select mode:

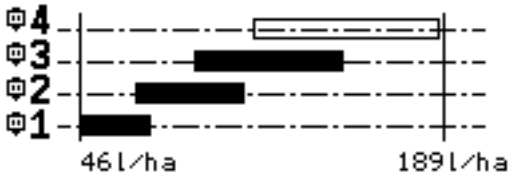
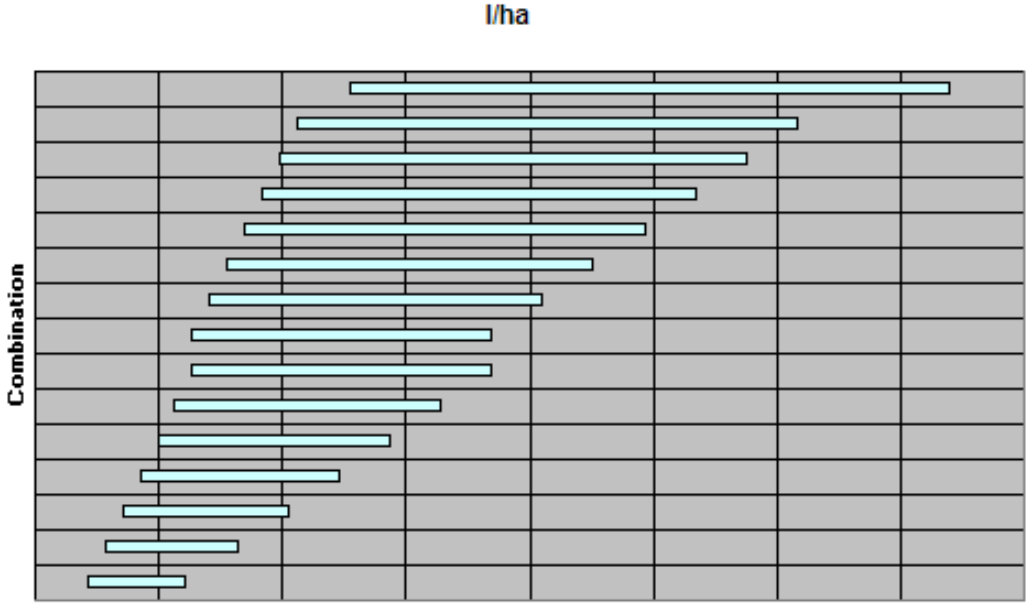


Diagram 10-17 Performance comparison with nozzle 4 in Select Mode

10.5.6 Overlapping conditions

The pre-set pressure range is used to determine overlapping due to nozzle combinations. Complete overlapping occurs when it is possible to work from the lowest to the highest performance rate within the pre-set pressure range without interruption. Here is an example of how the nozzle combination could be displayed in such a case



Overlapping conditions are always examined when parameters are altered. The following factors can influence overlapping: type of nozzle, elimination of a nozzle, working point parameters with specific nozzles, pressure range.

An alarm goes off as soon as the overlapping conditions are no longer fulfilled.

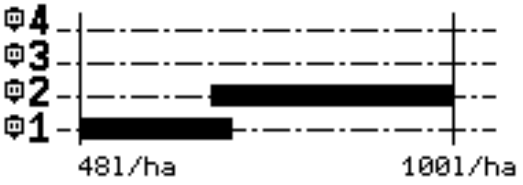
In order to get a better understanding for the reason behind the alarm, refer to the diagram illustrating the performance range of the nozzles and press the  key.

Important!
The diagram alone is not sufficient to determine the fulfillment rate of overlapping conditions for all nozzle combinations. Only the alarm can supply explicit information on possible gaps in the spray rate.

It can occur that the diagram illustrating the performance range of the nozzles indicates gaps but the overlapping conditions are fulfilled nevertheless due to a combination of nozzles.

Gaps in the performance range of the nozzles, however compensated by the combination of 2 nozzles (here nozzle 1and nozzle 2)

On the other hand the performance range diagram may not display gaps, however combining nozzles over the whole range is not entirely possible. This occurs in particular in connection with tandem fittings.



In the example above the overlapping conditions seem to have been adhered to. However with a closer look problems can be detected:
Nozzle 1 sprays approx. 48 l/ha with minimum pressure
Nozzle 2 sprays approx. 65 l/ha with minimum pressure
The only possible combination of the nozzles sprays 110 l/ha with minimum pressure and this value is higher than nozzle 2's maximum.

11 Licences

Note:
The current version does not require licences for the DISTANCE-Control and TRAIL-Control functions. The software releases the functions automatically.

Licence management can be called up when at least one of the following options has been configured:

- TRAIL-Control in automatic mode (automatic centre alignment is not affected by this)
- DISTANCE-Control in automatic mode (automatic alignment and slope levelling are not affected by this)
- Airtec in automatic mode
- Multiple nozzle Select mode with more than 2 nozzles and for Vario mode

- If for a configured option no licence is activated, the option will only be supported with reduced functionality:

- TRAIL-Control: only in manual mode
- DISTANCE-Control: only in manual mode
- Airtec: only in manual mode with 2 nozzles
- Multiple nozzles: only in manual mode

11.1 Activating software subject to licence

Call up licence management using the soft key in the third machine data mask.

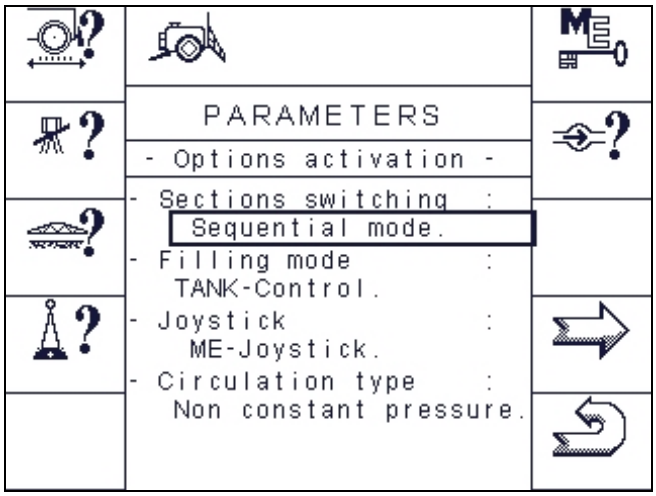


Diagram 11-1 Machine data mask 3 with licence management soft key

The data mask is structured as illustrated in Diagram 11-2:

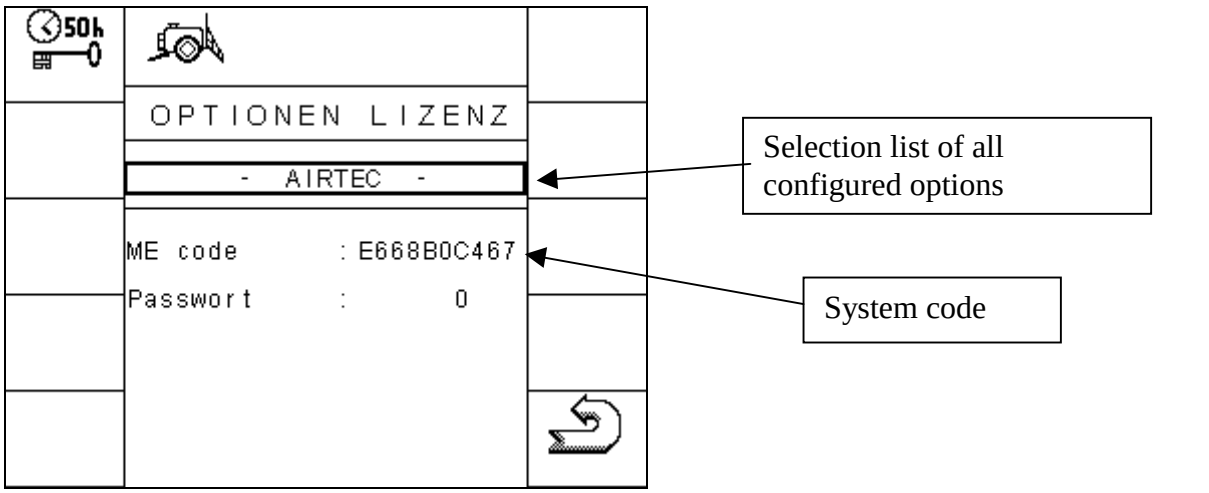


Diagram 11-2 Licence mask with system code

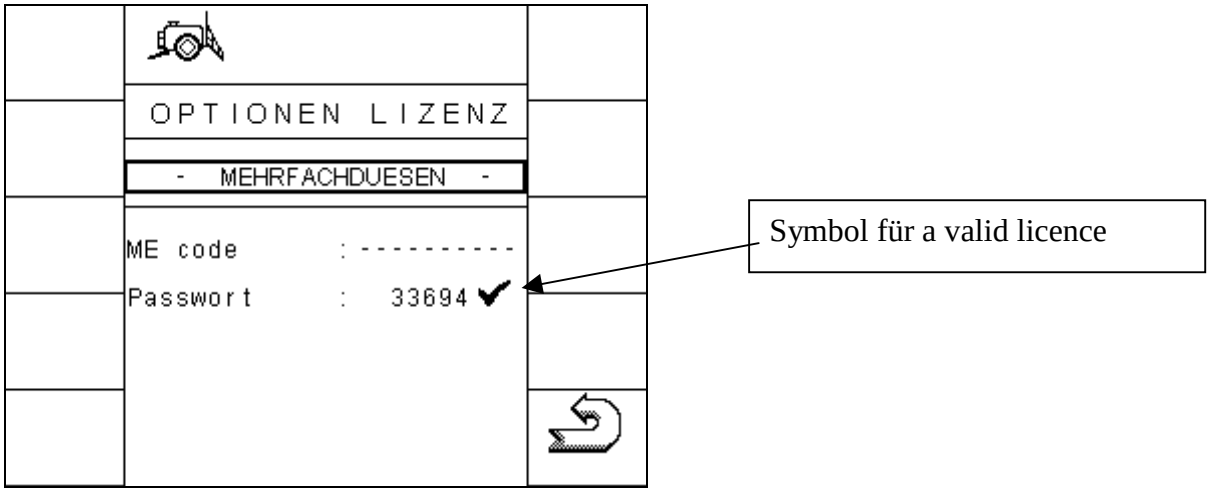


Diagram 11-3 Licence mask with valid licence

The selection list contains all options subject to a licence and which are currently configured. Select the required option here. The current status of the selected option will then be displayed in the licence mask (see Diagram 11-3). If the option has not been activated, the system code (ME code) will be displayed as a 10-character long string. You must communicate this code to a Muller-Elektronik service representative, who will then give you a 5-digit activation code which you then enter in place of the password. If the value is correct, an alarm appears as illustrated in Diagram 11-4.

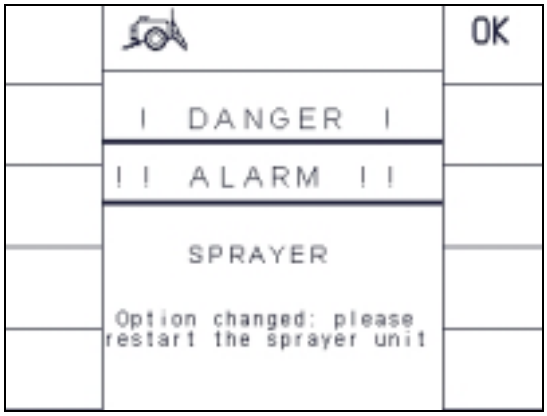


Diagram 11-4 Activating alarm

A system reboot always has to be carried out before an option can be activated. After the reboot a tick mark after the password indicates that the input was valid. The system code is no longer displayed.

11.2 Temporary Licence

To avoid waiting periods due to activation procedure, each configured option can be activated temporarily. This is a licence which can be activated once only for each individual option for a period of 50 operating hours. This temporary licence can also be used for configuration, testing or maintenance of the machine.

A temporary licence can be activated

- when no licence has been activated
- when free operation time is still available for this option.

If the conditions are fulfilled, the temporary licence can be activated and deactivated using the soft key 

in the licence mask. When the temporary licence is activated the symbol 

and a progress bar are displayed. The bar displays the time already used up for this option. In diagram 11-5 there is approx. 20 hours operating time still available for the Airtec option.

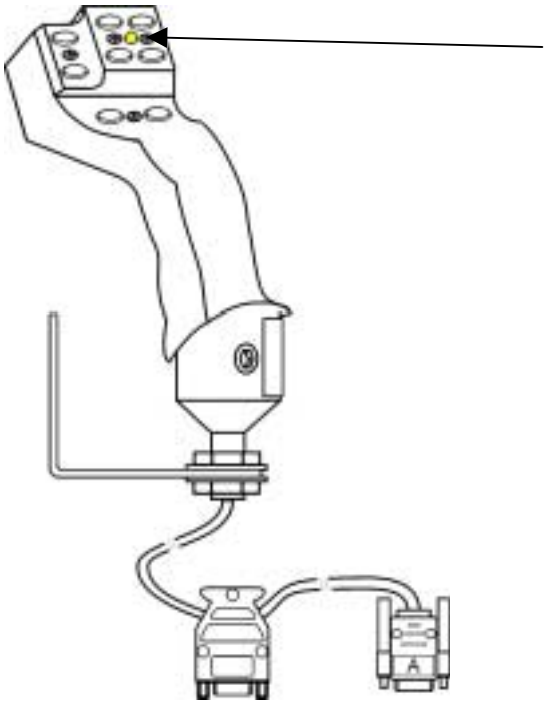
Diagram 11-5 Licence mask with 50 h licence

Once the temporary 50-hour licence has been used up and if in the mean time no change-over to an unlimited licence has taken place, a permanent alarm appears with the demand to reboot the job computer. After reboot the function requiring a licence is no longer available and can only be activated by entering a permanent licence.

12 External extensions

12.1 Multifunction grip (MFG)

The multifunction grip can also be connected to the terminal and is absolutely essential for operating the field sprayer. It combines the most important functions required while working with the field sprayer, at the same time allowing them to be carried out easily, quickly and without eye contact. With the MFG the number of masks is reduced, making handling easier.



The new version of the multifunction grip has been included in delivery since May 2004. It is equipped with a LED status between the top four keys and displays the current status of the switch on the back of the multifunction grip.

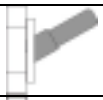
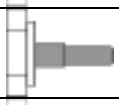
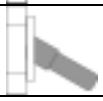
Switch position	Colour status LED
	Red
	Yellow
	Green

Diagram 12-1 Multifunction grip

On the rear side of the grip there is a switch which can be switched up and down from the middle position. With this each key has 3 different assignments.

For functions carried out using the switch, please observe the following:

- First press the switch and hold.
- Subsequently press the corresponding key.

To end the function release, first the key and then the switch.

The MFG assignment is illustrated in Diagram 12-2. This assignment can be found on a adhesive label delivered with the sprayer. Stick this label in the tractor cabin where it is visible.

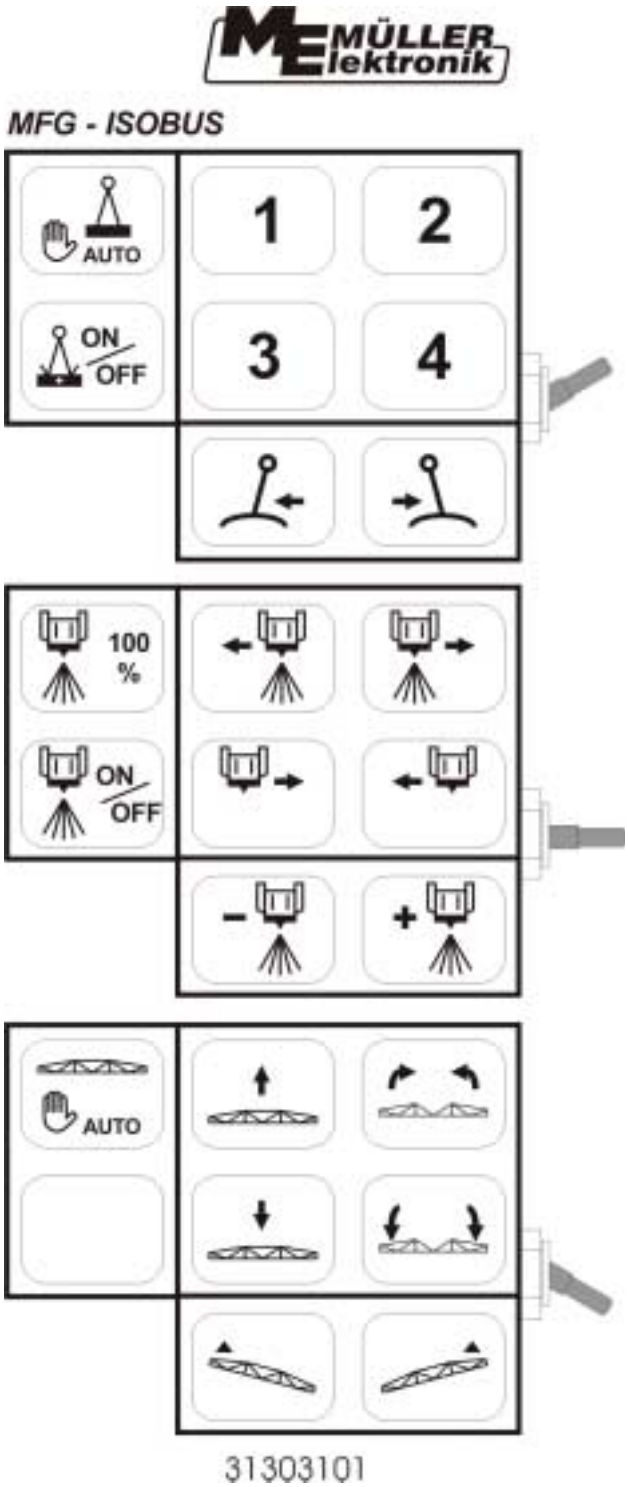


Diagram 12-2 Assignment multifunction grip

12.2 S-Box

12.2.1 Introduction

The ISOBUS S-box is a boom section switch box with mechanical switches for the control of boom sections and the main switch on an ISOBUS field sprayer. The switch box can be operated together with an ISOBUS multifunction grip (MFG) or on its own for controlling the boom sections on the sprayer. Versions with 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 and 13 boom sections are available.

Important!
The S-box is designed for operation only with ISOBUS sprayer job computers from Müller-Elektronik GmbH & Co KG.
The software version must be 5.2xx or higher.

12.2.2 Assembly and wiring

The S-box can be mounted to the multifunction grip if both are to be operated together. The S-box is connected electrically between the multifunction grip and the basic equipment. Diagram 12-3 illustrates the assembly and wiring of the terminal, the multifunction grip and the basic equipment.

If the multifunction grip is not to be used, the S-box is connected between the terminal and the basic equipment as illustrated in Diagram 12-4.

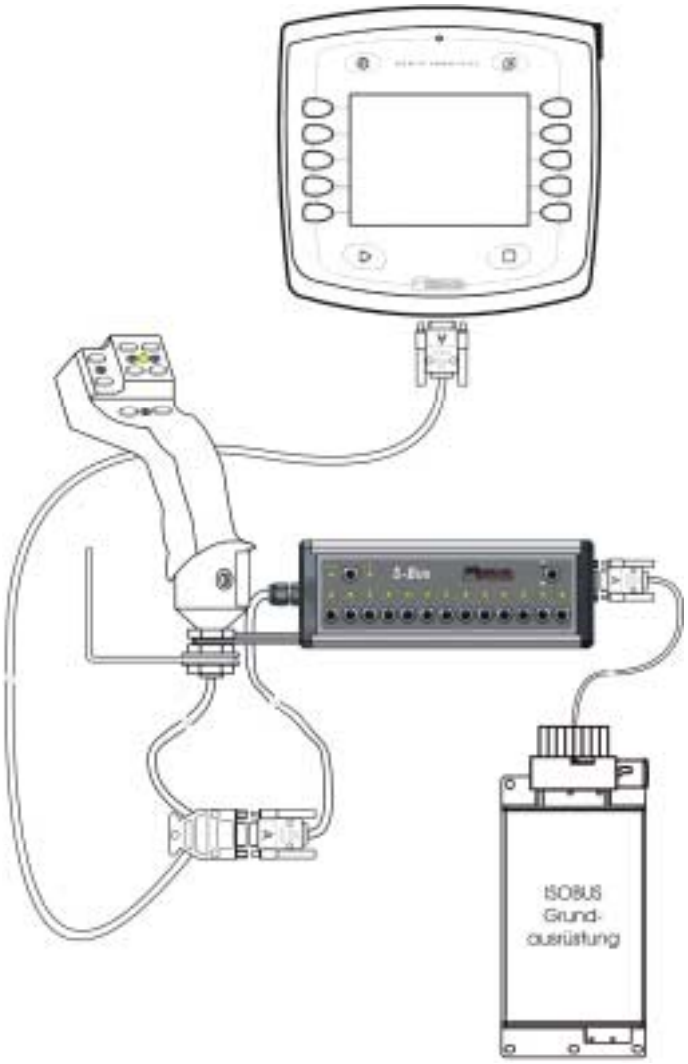


Diagram 12-3 Wiring with MFG

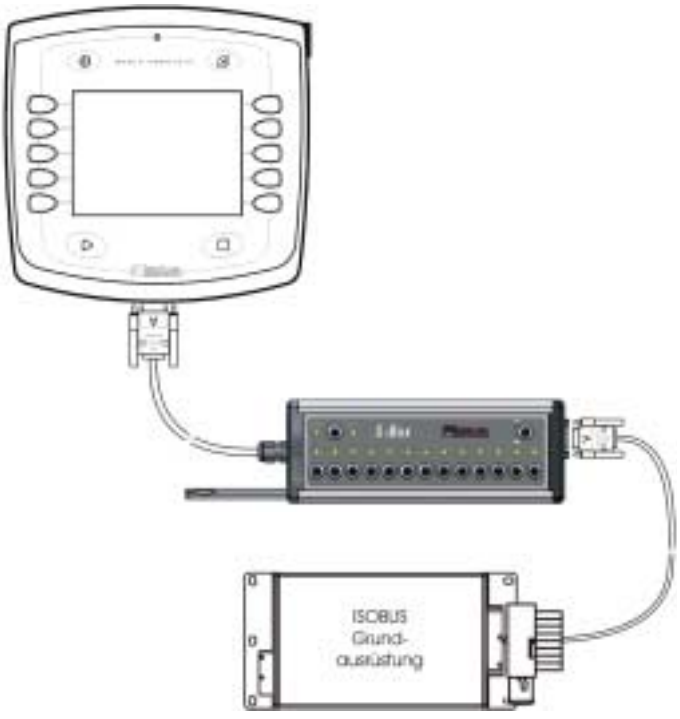


Diagram 12-4 Wiring without MFG

12.2.3 Operating elements

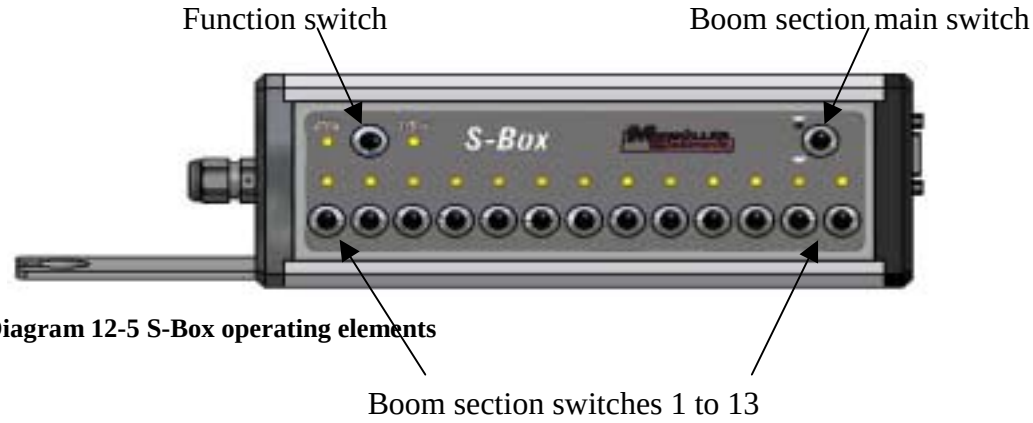


Diagram 12-5 S-Box operating elements

The S-box is activated by means of the function switch  . The S-Box has no function in the position MFG. Depending on the mode selected, the boom sections can be operated using the MFG (see parameter "boom section switching" in the 3rd machine data mask on the sprayer).

The S-box is active when the function switch  is switched to S-box. This is displayed in the working mask on the sprayer with the symbol  . In this position the sprayer evaluates the pre-set switch settings on the S-box for the boom sections and the boom section main switch  . The boom section switches convey the current status of the boom sections. When a boom section switch is switched to "on" the boom section is either active or pre-selected depending on the position of the main boom section switch  .

The main boom section switch  functions as a sprayer on/off signal transmitter. When switched to "on" all boom sections which are switched on are activated. When switched off all switched-on boom sections move into pre-selected mode.

13 Appendix

13.1 Technical data (Job computer II)

Tab. 13-1 Technical data

Connections:	- Cable screw for the connecting cable to the ISOBUS plug - 2 x 42-pin plugs (plug A & B. mating connector lockable and with single wire seals for the connection of actoric/sensoric technology)
Power supply:	10 .. 16 V DC (incl. load-dump protection up to 80V)
Current consumption (IN):	400mA (at 14.4V without power output. without supply to external sensors)
Quiescent current (OUT):	70µA
Ambient temperature:	-20 .. +70 ºC (acc. to IEC68-2-14-Nb. IEC68-2-30 and IEC68-2-14Na)
Casing:	Anodised aluminium continuous casting casing, painted aluminium cover with EPDM seal. stainless steel screws
Safety class:	IP66K (dust proof and protection against jet water with increased pressure in acc. with DIN40050 part 9: 1993)
Environmental testing:	vibration and impact test in accordance with IEC68-2
Measurements:	250 mm x 232 mm x 77 mm (LxBxH, without plug)
Weight:	5.0 kg (with 6.5m connecting cable)

13.2 Machine data

Please enter the machine data set for your field sprayer.

Parameter description	**Set value**
Working width	
Pulses wheel sensor	
Regulating factor	
Max. pressure	
Min. pressure	
Min. working speed	
Min auto speed	
Max. wind speed	
Size of tank	
Tank level alarm	
Pulses main flow.	
Pulses filling	
Pulses reflux	
Section switching	
Filling mode	
Joystick model	
Circulation model	

13.3 Technical data S-Box

Tab. 13-2 Technical data S-Box

Connections:	- 1x 9pol. sub-D plug (for the connection to the terminal or to the MFG) - 1x 9pol. sub-D socket (for the connection to the basic equipment)
Power supply:	10.5 V – 16 V
Current consumption:	Max. 0.5 A
Temperature range:	-20 °C – 50 °C
Casing:	Aluminium continuous casing with plastic end caps
Safety class:	IP 42
Measurements:	214mm x 40mm x 18 mm (LxHxB)

13.4 Glossary

Tab. 13-3 Glossary

Term	Definition
Bus	Bus means that different devices (terminal. job computer etc.) are generally connected to one another by a network. Only data packets (messages) which can be accessed by all participants are sent here. Each message is labelled in such a way that each BUS participant can recognise if it is intended for him. In this case he evaluates it.
CAN-Bus	Principally a network existing of two cables. CAN means "Controller Area Network" and was developed by Bosch for use in industrial plants and the motorcar industry. This form of data bus is particularly suited to use in industrial plants as it has little susceptibility to faults.
ISO 11783	International standard, which specifies the connections and data exchange for tractors as well as attached and trailed agricultural machines. This standard has been developed further from the European LBS standard (DIN 9684.2-5) and forms the basis for an internationally co-ordinated system for agricultural engineering.
ISOBUS	ISOBUS is the name for the international interface for tractors and attached implements. **ISOBUS** is composed of **ISO** and **BUS**. **ISO**, because the transmitting medium, the plug and socket connection and the data exchange are specified in the ISO standard 11783. **BUS,** because the transmitting medium is a data bus (CAN-Bus).
ISOBUS tractor	A tractor is an ISOBUS tractor when it is equipped with a terminal and the basic ISOBUS configuration. This means that ISOBUS-compatible machines can be connected and accessed.
Function keys	Function keys are keys on the terminal set up beside the monitor. The current key function (soft key) is displayed on the terminal.
Mask	Masks are where the Various job computer functions are depicted on the terminal monitor. Within the mask information from the job computer and the assignment of the function keys are displayed.
Terminal	The terminal is the output and operating unit in the tractor cabin. It makes the connection between the driver and the machine. The data of the connected machines are displayed on the terminal. By means of function keys, all functions can be carried out.
Basic equipment	The basic equipment constitutes the link between the terminal and the tractor. By means of the basic equipment the voltage supply and the ISOBUS are attached to the terminal. Depending upon the type of tractor and its equipment, the basic equipment also consists of the battery cable and the ISOBUS socket.
Soft key	The soft key is the current function of a function key. It is displayed on the monitor beside the function key.
Configuration	The configuration is a table of parameters, which communicates the range of machine functions to the job computer.
Job computer	The job computer is the brain of the machine, being responsible for all functions. All control functions (e.g. spray rate, TRAIL Control, DISTANCE-Control etc.) are carried out here and controlled. Sensor values are measured and sent for display to the terminal. Commands (raise/lower boom. folding etc.) which are entered on the terminal by the operator are converted here to switching signals

Term	Definition
	and so controlled, e.g. hydraulic valves. The ISOBUS cable connects the job computer to the tractor. The cables on the sensors and actuators are connected (if necessary by means of a cable harness or distributor) to the job computer.
Cursor	The cursor indicates the current position in a data input or selection menu. It marks the value which is being altered.
Resources	Resources are graphic objects made accessible by the job computer. Their purpose is to display the functions, input, output etc. on the terminal. The first time the terminal is connected to a new job computer, the resources are loaded and stored there. Due to storing, a reboot is not necessary. The resources remain stored on the terminal until they are deleted by the user.

13.5 Abbreviations

Tab. 13-4 Abbreviations

Abbreviation	Definition
MFG	Multifunction grip

13.6 List of diagrams

13.7 List of tables