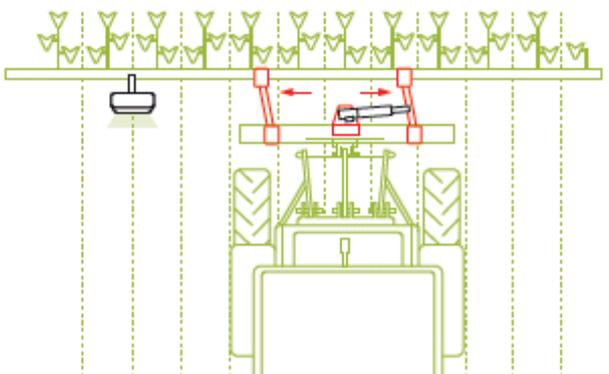
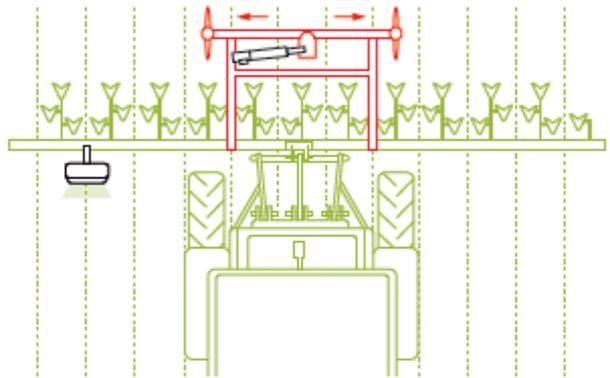
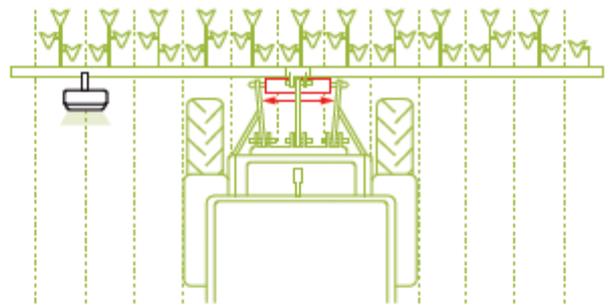


AGROCOM EYE-DRIVE

Automatic implement control by camera



Safety precautions

Please read and observe!

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Contents

Introduction	1
Overview.....	2
Sample report	2
Safety	3
General instructions	3
General instructions	3
To be observed in particular	3
Proper use	3
Pressure accumulator	4
Safety precautions	5
Identification of warning and danger signs.....	5
Applications	6
Ground speed:	6
Working in the dark:	6
Field structure (applications)	7
Rows of plants.....	7
Furrow.....	8
Ridges.....	9
Multiple row	10
Before putting into operation	11
General warnings.....	11
The control terminal	12
Overview of the control terminal.....	12
Front	12
The incremental encoder with push button function.....	13
The softkeys.....	14
Underside.....	14
Switching on the control terminal	14
How are the equipment settings made / how are the various ISO bus applications operated using the terminal?	15
How can I change between the menus or the various ISO bus applications?	16
The work menu	17
Change to the work menu as follows.....	17
Open the individual index cards of the work menu as follows.....	18
The "Automatic control system" index card	19
How is the automatic control system activated/deactivated?	22
How do I adjust the sensitivity of the steering?	23
How do I specify an offset?	24
How can I change between two offsets (dual offset)?.....	24
How do I switch the Xenon headlights on/off?	25
Overview of alarms	25

AGROCOM EYE-DRIVE

Contents

No signal from camera	25
Weak signal	25
Driven too slowly / Driven too quickly	25
Overview of error messages	26
Application - single rows of plants, multiple rows of plants and ridges.....	26
Application - multiple rows of plants	26
All applications.....	26
The "Set application" index card	27
How can I select an application or its corresponding parameters?	28
Overview of parameters for "Row of plants" application	29
Overview of parameters for "Ridges" application	29
Overview of parameters for "Furrow" application	30
Overview of parameters for "Multiple row" application.....	31
The "General settings" index card.....	32
How is the height of the camera determined?	33
Camera Position	34
How is the camera angle determined?.....	36
How is the "Xenon headlight on/off" option activated/deactivated?	37
How is the optional "Dual Offset" function activated/deactivated?.....	37
How is the sound switched on/off?.....	38
The "Service (advanced settings)" index card.....	39
Performing a calibration	39
How to open the calibration menu.....	39
Carrying out a 100 m calibration journey	40
The sensitivity of the control system.....	41
Calibration of steering angle sensor	41
Determining the max. swing width.....	43
Determining the steering speed and performing a steering cylinder test	44
Calibration of camera.....	45
Setting the steering speed	46
Checking the oil flow rate and/or determining the steering speed	46
Changing the flow rate.....	46
Increasing the flow rate:.....	47
Reducing the flow rate:	47
The "System information" index card	48
The service menu	48
Change to the service menu as follows	48
The settings of the service menu	49
Brightness/contrast.....	49
Time/date.....	50
Language, decimal point, time or date format, lengths, areas, volumes and/or unit of weight	51

Introduction

Congratulations – you are now the owner of an automatic AGROCOM EYE-DRIVE steering system. AGROCOM thanks you for choosing our product and placing your trust in our company. Your AGROCOM EYE-DRIVE system was carefully developed and has a rugged construction to ensure that your investment performs reliably over many years.

This manual will assist you in the operation and maintenance of your AGROCOM EYE-DRIVE steering system.

The system is supplied with the standard warranty for the relevant market that is agreed with the dealer under the terms of the contract. Non-compliance with the relevant operating and setting instructions in this User Manual will render the warranty null and void.



CAUTION: this is used to draw your attention to sections of the manual that are relevant to your personal safety or to the safety of the machine, or that contain specific operating instructions.

READ THESE INSTRUCTIONS CAREFULLY AND ALWAYS EXERCISE THE NECESSARY CAUTION.



DANGER!

YOU (THE DRIVER) ARE RESPONSIBLE FOR THE SAFE OPERATION OF THE MACHINE, EVEN IF IT IS BEING STEERED AUTOMATICALLY.

Failure to observe this instruction may result in death or severe injury.

- ALWAYS EXERCISE DUE CARE AND ATTENTION.

Introduction

Overview

Overview

The electronic/hydraulic EYE-DRIVE components were developed for use in conjunction with a large range of self-propelled agricultural machines. Specific installation kits and detailed instructions are available for installing the AGROCOM EYE-DRIVE on the relevant machine. In the interests of safety, this installation must only be carried out by an authorised workshop that specialises in agricultural machinery.

This manual deals only with operation of the automatic EYE-DRIVE steering system. Information on safety and the sample report required for operation is provided.

To ensure safe and reliable operation it is absolutely necessary to read the entire AGROCOM EYE-DRIVE User Manual carefully before starting off.

Sample report

Before starting off it is necessary to read the sample report issued by RWTÜV (Technical Control Board of North Rhine Westphalia in Germany).

The sample report demonstrates that the automatic AGROCOM EYE-DRIVE steering system has been approved for installation in the listed machines.

You must therefore check that your machine is listed in the certificate.

If this is not the case, the operating permit for the vehicle will be invalid and you should contact your specialist workshop immediately.

Further, the certificate sets out the arrangements governing use of the automatic steering system. Important: the system must always be switched off when travelling on public roads.

Safety

General instructions

General instructions

Read and observe the user manual and safety precautions before putting the machine into operation.

To ensure safe operation, the driver of the vehicle (= the operator of the automatic control system) must be familiar with all functions of the equipment. If the driver changes, the previous driver must instruct the new one.

To be observed in particular

The information provided in this user manual on applicable dangers must be read and observed by all personnel that use, maintain, repair or check this AGROCOM product.

Your attention is drawn in particular to the section entitled "Before putting into operation" on page 11.

The use of spare parts, accessories and ancillary equipment that are not genuine AGROCOM products and have not been tested or approved by AGROCOM may adversely affect the design characteristics or functionality of the AGROCOM machine and therefore also impair acute and/or passive driving safety and work safety (accident prevention).

AGROCOM will accept no liability whatsoever for losses incurred through the use of non-genuine AGROCOM parts, accessories and ancillary equipment.

Proper use

The front attachment and machine are made for standard agricultural applications (proper use).

Any use outside this scope of application is improper use and the manufacturer cannot be held liable for resulting losses; this is the sole responsibility of the user.

Proper use also includes compliance with the manufacturer's operating, maintenance and repair requirements.

Use, upkeep and maintenance of the front attachment and machine may only be carried out by persons with the appropriate level of expertise and knowledge of the associated dangers.

Applicable accident prevention regulations and other generally recognised safety, occupational health and statutory road traffic regulations must be complied with.

Safety

General instructions

The manufacturer cannot be held liable for losses incurred as a result of unauthorised modifications to the front attachment and machine.

Pressure accumulator

Exercise particular care when using hydraulic systems with pressure accumulators. Hydraulic systems with pressure accumulators are subject to high pressure.

Caution: pressurised oil escaping from a line may penetrate the skin. Seek medical advice immediately if injuries are sustained as a result of escaping pressurised oil. Serious blood poisoning may be the result if the wound is not promptly treated. Use a piece of wood or card therefore when searching for leaks, and never allow hands to come into direct contact with the pressure line.

Repair work on the hydraulic system may only be carried out by specialist workshops.

Safety precautions

Read and observe the user manual and safety precautions before putting the machine into operation.

Identification of warning and danger signs

We have identified the parts of this User Manual relevant to your safety and the safety of the front attachment or machine using the symbols below.

Inform other users about all safety precautions.



DANGER!

Type and source of danger

Failure to observe this instruction may result in death or severe injury.

- Measures for preventing danger



WARNING!

Type and source of danger

Failure to observe this instruction may result in injury

- Measures for preventing danger



Caution!

Type and source of danger

Failure to observe this instruction may result in material damage

- Measures for preventing danger

Applications

Safety precautions

Applications

Automatic control with the following applications:

1. Rows of plants
2. Furrow
3. Ridges
4. Multiple rows

is only possible if the following ground speeds and field structure characteristics are observed.

Ground speed:

Min. ground speed:	0.05 km/h
Max. ground speed	25 km/h

Working in the dark:

To allow work to be carried out in the dark, two Xenon headlights can be installed to illuminate the camera area.

Field structure (applications)

Rows of plants



Important:

Rows of plants, specifications:

Colour: coloured

Min. row spacing (r): 15 cm

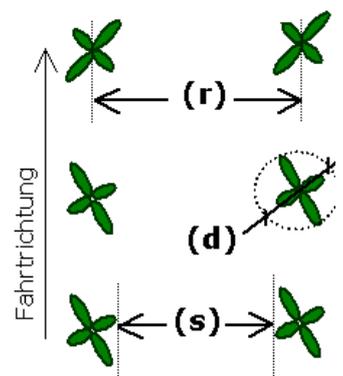
Max. row spacing (r) none

Min. diameter of plant (d): 3 cm

Max. diameter of plant (d): 75 cm

Min. earth surface (s): 5-10 cm

Max. earth surface (s) none

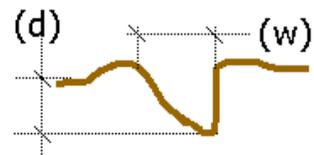
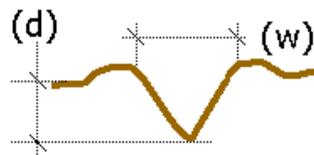


i

Applications

Safety precautions

Furrow



Important:

Furrowing specifications:

Min. furrow width (w): 10 cm

Min. furrow depth (d): 10 cm

i

The furrow depth is **always** measured from the deepest point in the furrow to the lowest point on the left and right of the furrow.

Ridges



Important:

Ridge specifications:

Min. ridge height (h):	10 cm
Max. ridge height (h):	none
Min. ridge width (w):	2 cm
Max. ridge width (w):	none

i

The height of the ridge is **always** measured from the tip of the ridge to the highest point on the left and right of the ridge.

Applications

Safety precautions

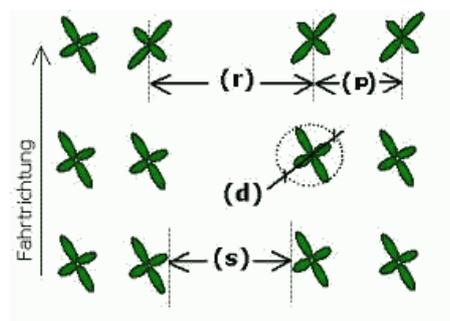
Multiple row



Important:

Rows of plants, specifications:

Colour: green



Min. row spacing (r):	15 cm
Max. row spacing (r):	75 cm
Min. diameter of plant (d):	3 cm
Max. diameter of plant (d):	75 cm
Min. row spacing in multiple row (p):	3 cm
Max. row spacing in multiple row (p):	25 cm
Min. earth surface (s):	5-10 cm
Max. earth surface (s):	none

i

Before putting into operation

General warnings



DANGER!

As a basic rule, only carry out repairs, maintenance and cleaning works and eliminate malfunctions when the machine is shut down.

Failure to observe this instruction may result in death or severe injury.

- Diesel engine OFF.
- Operate parking brake.
- Remove ignition key.
- Remove key for battery isolating switch.
- Secure machine with wheel chocks.
- Make sure that the machine cannot be brought into operation by third parties.



DANGER!

Operating the machine with the automatic control system.

Failure to observe this instruction may result in death or severe injury.

- Do not use the automatic control system for driving on roads.
- Only use the automatic control system for its intended purpose.
- No persons may be within a 50 m radius when the automatic control system is switched on.
- Always check the terrain for obstacles, even when the automatic control system is switched on.
The camera cannot detect trees, gullies, ditches and other obstructions that may be in the field. Stay watchful and alert to prevent injury to persons or damage to property. Deactivate the control system and steer the vehicle round obstructions manually.
- Only allow work on the automatic control system to be performed by authorised service centres.

The control terminal

Overview of the control terminal

The control terminal



CAUTION!

The control terminal is not watertight.
 Failure to observe this instruction may result in material damage

- Clean the unit using lukewarm water only and wipe dry with a soft cloth.



CAUTION!

Welding work.
 Failure to observe this instruction may result in material damage

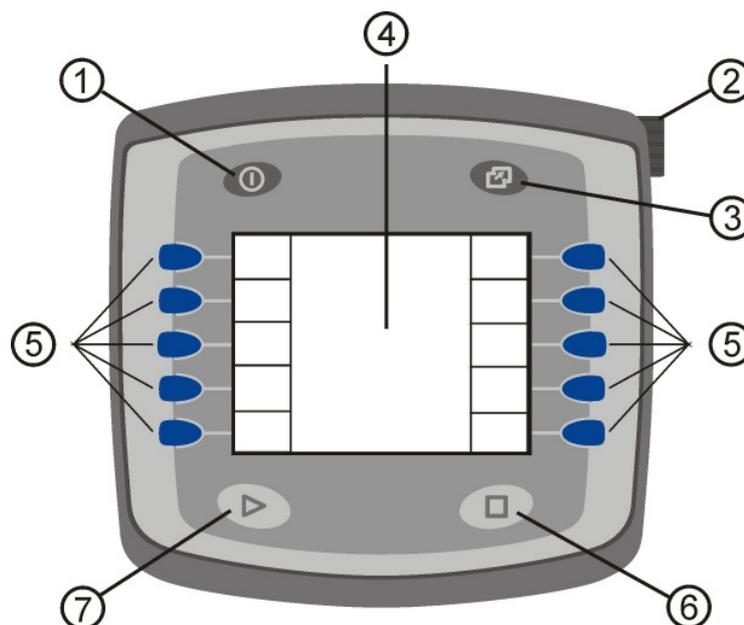
- Before performing welding work on the tractor or on an attached machine, the power supply to the control terminal, camera and steering module must be disconnected.

Overview of the control terminal

Note

The control terminal does not require regular servicing. In order to be able to operate the terminal properly, it is important for the driver to be familiar with the functions of all keys and symbols on the terminal.

Front



1	On/off key Switching the control terminal on and off.
---	--

The control terminal

Overview of the control terminal

2	Incremental encoder with push button function The adjustable input fields can be selected by turning the incremental encoder. The value in the corresponding field selected can be modified by pressing the incremental encoder (and then turning it). The modified value can be saved by pressing the incremental encoder again.
3	Selection key, menu To change between the control menu for automatic control system (working menu) and the settings menu for the Communicator (Service menu) or to change between various ISO bus applications.
4	Display The necessary control displays and/or input options and/or corresponding display areas for the softkeys are shown in the display.
5	Softkeys Various functions can be executed using the softkeys depending on the display area assigned to the function.
6	Key (not assigned)
7	Key (not assigned)

The incremental encoder with push button function

The incremental encoder (2) can be used for the following

- by turning the knob:
 - the input fields in the relevant menu can be selected and corresponding values specified.

Note

A frame appears round the field when it is selected.

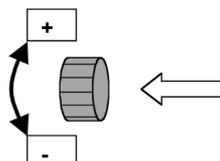
- the set values can be adjusted (once the corresponding settings input field has been selected by pressing the button).

- by pressing the knob:
 - the corresponding input field can be selected in order to make adjustments (to adjust a set value).

Note

A thicker frame appears around the field selected for adjustment.

- a new set value can be saved and the input field exited (once the corresponding value has been set by turning the knob).



The control terminal

Switching on the control terminal

The softkeys

A corresponding quadrangular area on the left or right-hand margin of the display is assigned to each softkey (5). Corresponding (program) functions are displayed in these areas of the screen depending on the menu selected. To operate this type of program function you have to press the corresponding softkey.

Underside

A serial interface (C) and two CAN bus interfaces (A and B) are built into the underside of the control terminal.

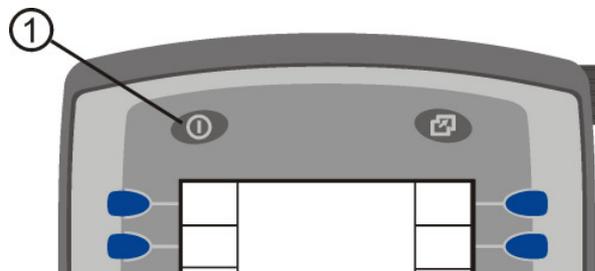
Connect the corresponding plug from the wiring harness to **CAN bus interface B**.

Switching on the control terminal

Important note!

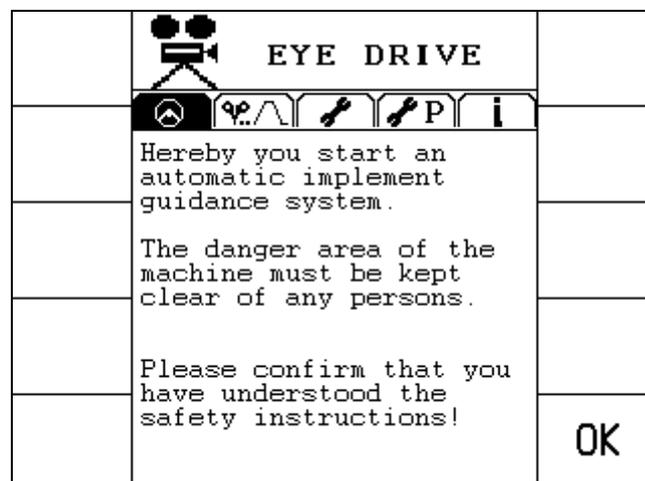
The control terminal must be switched off when the tractor engine is started.

1. Press the on/off key (1) to switch the terminal on.

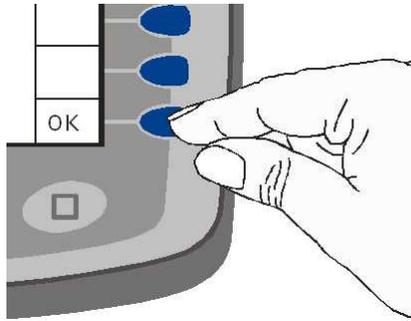


Note

The following important message is initially displayed when the control terminal is switched on:



Press "OK" to confirm that you have read the safety precautions in the manual using the corresponding softkey, see illustration below:



The control terminal then establishes a connection with the camera. This procedure may take several seconds. Once the connection has been established, the work menu opens automatically. The attachment control system can be controlled via this menu, see also chapter entitled "The work menu" on page 17.

Important note!

Never switch the control terminal off when work is in progress as this deactivates **all** control functions.

How are the equipment settings made / how are the various ISO bus applications operated using the terminal?

Corresponding adapted menus are available for making the equipment settings (language, brightness, contrast, etc.) and for operating the individual ISO bus applications using the terminal. The next chapter explains how to switch between the individual menus.

You can find a description of the individual menus in the chapter entitled "The work menu" on page 17 and in the chapter entitled "The service menu" on page 48.

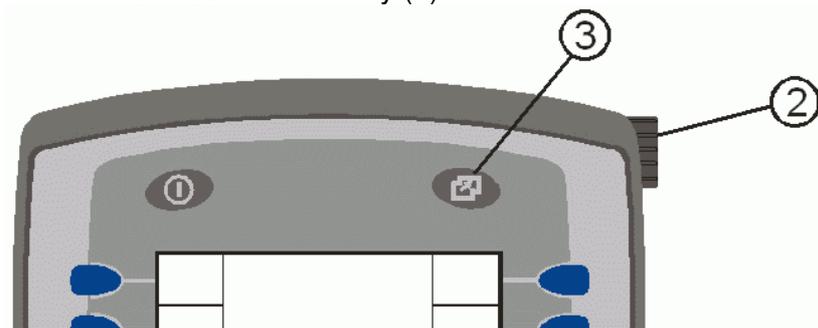
The control terminal

Switching on the control terminal

How can I change between the menus or the various ISO bus applications?

Proceed as follows to switch between the work menu and the **Service** menu and/or to change between various other ISO bus applications:

1. Press the **menu** selection key (3).

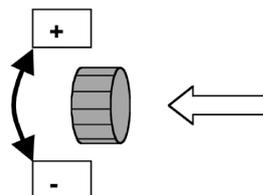


All available menus or ISO bus applications are then displayed.

2. Select the required menu or ISO bus application by turning the incremental encoder (2) in a clockwise or anticlockwise direction.

The thick frame indicates which menu is currently selected.

3. Press the incremental encoder (2).



The selected menu now appears in the display.

Note

Change to the work menu as follows

The work menu

The automatic attachment control system is controlled and set via the work menu.

The menu also includes important displays, such as the camera signal quality display on the **automatic control system** index card. To maintain a clear overview and provide a suitable structure, the menu is split up into 5 index cards.

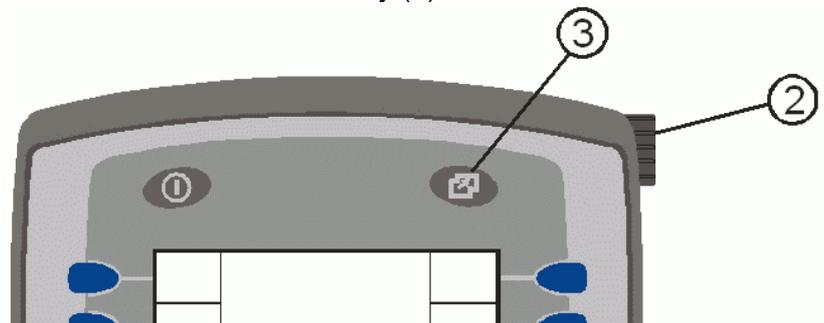
Note

The tab of the index card that is currently open is coloured black.



Change to the work menu as follows

1. Press the **menu** selection key (3).

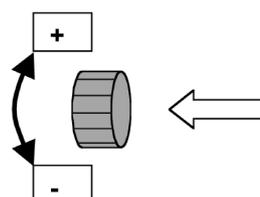


All available menus or ISO bus applications are then displayed.

2. Turn the incremental encoder (2) in a clockwise/anticlockwise direction until a frame appears around the work menu, the **CUL_xxx** work menu is shown below as an example:



3. Press the incremental encoder (2).



The work menu

Open the individual index cards of the work menu as follows

Open the individual index cards of the work menu as follows

To maintain a clear overview and provide a suitable structure, the work menu is split up into 5 index cards as follows.

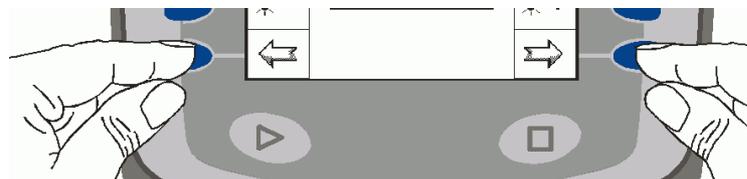
- The **Automatic control system** index card, see also chapter entitled "The "Automatic control system" index card" on page 19.
- The **Set application** index card, see also chapter entitled "The "Set application" index card" on page 27.
- The **General settings** index card, see also chapter entitled "The "General settings" index card" on page 32.
- The **Service (advanced settings)** index card, see also chapter entitled "The "Service (advanced settings)" index card" on page 39.
- The **System information** index card, see also chapter entitled "The "System information" index card" on page 48.

Note

The tab of the index card that is currently open is coloured black. The example below shows the **Automatic control system** index card when open:



To open an index card, press (several times if necessary) one of the softkeys shown in the following illustration:



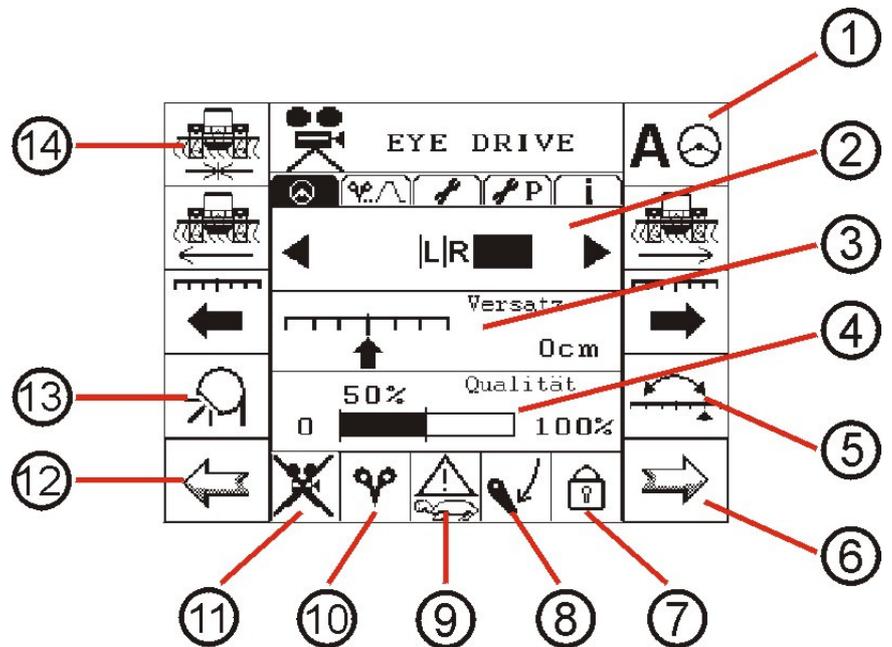
The functions on the individual index cards are displayed either:

- as symbols in the left or right-hand margin
These functions are executed by pressing the corresponding softkey.
- or as a symbol in the centre and/or at the bottom edge of the display.
These functions can be selected and executed by turning then pressing the incremental encoder.

The work menu

The "Automatic control system" index card

The "Automatic control system" index card



<p>1</p>	<p>Activate or deactivate the automatic control system for the attachment. Note that the automatic control system can only be activated under the following circumstances:</p> <ul style="list-style-type: none"> • if you are travelling within a specific speed range (> 0.05 km/h and < 25 km/h) • if the attachment is in the working position, see Item 8 • if no alarm is displayed, see Item 9 • if a connection with the camera exists, see Item 11 • and if the quality of the camera signal is above the threshold value, see Item 4. <p>If an alarm is output when the automatic control system is in operation or if the connection to the camera is interrupted, the automatic control system is cut off as follows:</p> <ul style="list-style-type: none"> • Travelling too fast: immediate cut-off • Travelling too slowly: immediate cut-off • If there is no connection with the camera the system is cut off immediately • If the camera signal is below the threshold value, the system is cut off after travelling several metres <p>The attachment remains in the current position after the automatic control system is cut off.</p>
-----------------	--

The work menu

The "Automatic control system" index card

<p>2</p>	<p>Lateral offset of the attachment. After calibrating the attachment, the left or right-hand lateral offset of the attachment will be represented symbolically in the form of a bar. The larger the bar, the larger the offset. If the attachment reaches its maximum left or right-hand offset (and, therefore, can no longer be automatically adjusted (moved) in this direction), a message appears instructing you to steer accordingly.</p> <p>Attachment in working position (see Item 8): the bar shows the current offset as set by the automatic control system. To keep within the control range, corrective steering adjustments should be made (always in the direction the bar is pointing) in the event of prolonged or large lateral offsets.</p> <ul style="list-style-type: none"> • Bar facing right – steer right • Bar facing left – steer left <p>Attachment not in working position: manual lateral offsetting of the attachment.</p> <p>The sensitivity of the control system can be set on the index card "Service (Extended Settings)" within the calibration menu.</p>
<p>3</p>	<p>Right/left offset The offset of the attachment can be adjusted left or right in cm increments using the two softkeys.</p>
<p>4</p>	<p>Signal quality of camera with threshold value. If the signal quality falls below the specified threshold value (if there are missing/defective sections in a row of plants, for example), the attachment remains in the current position until:</p> <ul style="list-style-type: none"> • the signal quality required for the automatic control system is restored, e.g. at the end of the missing/defective section or <p>Possible reasons for poor signal quality are:</p> <ul style="list-style-type: none"> • Insufficient visibility of field structure • Incorrect camera angle or height • Wrong application • Field data are out-of-spec.
<p>5</p>	<p>Dual Offset (optional) - changeover between two offsets, e.g. a left-hand offset and a right-hand offset; see also chapter "How can I change between two offsets (dual offset)?" on page 24.</p> <p>This function is only available if it is activated on the index card General Settings, see also chapter "The "General settings" index card" on page 32.</p>
<p>6</p>	<p>Next index card</p>

The work menu

The "Automatic control system" index card

7	<p>This field serves as an additional display for the status of the automatic control system. If the lock symbol:</p> <ul style="list-style-type: none"> • is displayed, the automatic control system is deactivated • is not displayed, the automatic control system is activated.
8	Position of the attachment.
9	<p>The reasons why the automatic control system cannot be activated or was deactivated are displayed here (alarms). The following alarms are relevant in this case:</p> <ul style="list-style-type: none"> • Driven too fast: if the tractor is moving at a speed greater than 25 km/h • Driven too slowly: if the tractor is moving at a speed less than 0.05 km/h
10	<p>The symbol of the application currently selected. The individual applications can be selected on the Set application index card, see also chapter entitled "The "Set application" index card" on page 27.</p>
11	<p>No connection with camera. Possible reasons for this are:</p> <ul style="list-style-type: none"> • Camera is not connected. • No power supply; check the 12 V power source at the control terminal and at the camera. • Break in cable; check the connection cable. • The camera software has shut down. Restart the camera. <p>This field will be empty if a connection with the camera exists.</p>
12	Previous index card
13	<p>Xenon headlight on/off (optional, for driving in the dark), for more information refer to chapter entitled "How do I switch the Xenon headlights on/off?" on page 25. This function is only available if it is activated on the General settings index card, see also chapter entitled "The "General settings" index card" on page 32.</p>
14	Attachment in centre position.

The work menu

The "Automatic control system" index card

How is the automatic control system activated/deactivated?



DANGER!

Operating the machine with the automatic control system. Failure to observe this instruction may result in death or severe injury.

- Do not use the automatic control system for driving on roads.
- Only use the automatic control system for its intended purpose.
- No persons may be within a 50 m radius when the automatic control system is switched on.
- Always check the terrain for obstacles, even when the automatic control system is switched on.
- Only allow work on the automatic control system to be performed by authorised service centres.



DANGER!

Persons are inside the steering range / danger zone of the machine. Failure to observe this instruction may result in death or severe injury.

- Before making adjustments and also when this work is in progress, make sure that no persons are present in the steering range / danger zone.

Note

The automatic control system can be activated/deactivated via the **Automatic control system** index card in the work menu, also see chapter entitled "Open the individual index cards of the work menu as follows" on page 18.

Note

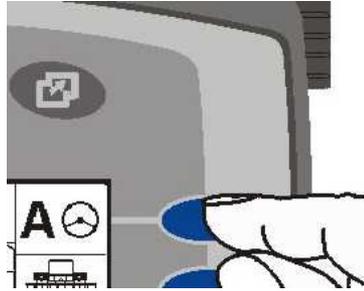
Make sure that all settings relevant to the required application and camera have been made prior to activation of the automatic control system.

To activate the automatic control system:

1. Depending on the set application, drive the vehicle manually over the centre of the chosen row of plants, ridge etc.
2. Press the softkey while driving to activate/deactivate the automatic guidance system:

The work menu

The "Automatic control system" index card



Note

If the automatic control system is activated, a STOP symbol appears in the relevant section of the display instead of "A" and the steering wheel symbol.

To deactivate the automatic control system:

1. Press the softkey to activate/deactivate the automatic guidance system, see above illustration.

If one of the alarms listed below is output when the automatic control system is in operation or if the connection to the camera is interrupted, the automatic guidance system is cut-off as follows:

Driven too fast:	cut-off occurs immediately
Driven too slowly:	cut-off occurs immediately
No connection with camera	cut-off occurs immediately
<p>If the signal quality falls below the specified threshold value (if there are missing/defective sections in a row of plants, for example), the attachment remains in the current position until:</p> <ul style="list-style-type: none"> • the signal quality required for the automatic control system is restored, e.g. at the end of the missing/defective section 	

How do I adjust the sensitivity of the steering?

The sensitivity of the steering can be set in the work menu on the index card "Service (Extended Settings)", see also chapter "The "Service (advanced settings)" index card on page 39.

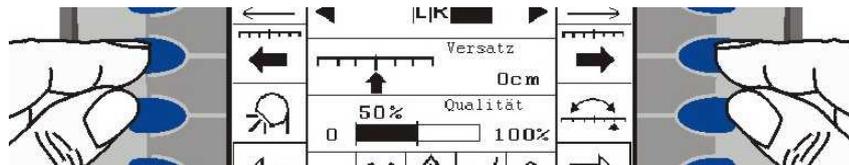
The work menu

The "Automatic control system" index card

How do I specify an offset?

Note

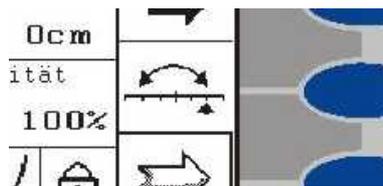
The offset can be set via the **Automatic control system** index card in the work menu, also see chapter entitled "Open the individual index cards of the work menu as follows" on page 18. To adjust the offset (in cm), press (several times if required) one of the softkeys shown in the following illustration (depending on whether a left or right offset is required):



How can I change between two offsets (dual offset)?

If the user is turning on the headland, it is sometimes advantageous in view of gradients or wind to be able to change between two offsets.

To change offsets via the **Automatic control unit** index card, this option must be activated beforehand in the **General settings** index card, see chapter entitled "How is the optional "Dual Offset" function activated/deactivated?" on page 37. Following activation, the "Dual Offset" function is available on the bottom right of the **Automatic control unit** index card, see illustration below:



If you wish to specify an additional offset, press the "Dual Offset" softkey and modify the offset as described in the previous chapter. To change between the two offsets, press the corresponding softkey once again.

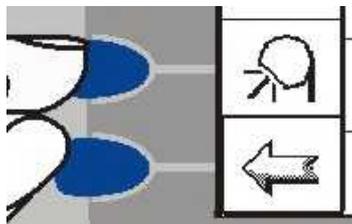
Note

The last two offsets specified are recorded by the system.

The "Automatic control system" index card

How do I switch the Xenon headlights on/off?

To allow work to be carried out in the dark, two Xenon headlights can be installed to illuminate the camera area. To be able to switch these headlights on/off via the **Automatic control unit** index card, this option must be activated in the **General settings** index card, see chapter entitled "How is the "Xenon headlight on/off" option activated/deactivated?" on page 37. Following activation, the "Xenon headlights on/off" function is available in the **Automatic control unit** index card:



To switch the Xenon headlights on/off, press the corresponding softkey.

Overview of alarms

No signal from camera

No connection with camera. Possible reasons for this are:

- The camera is not connected.
- No power supply; check the 12 V power source at the control terminal and at the camera.
- Break in cable; check the connection cable.
- The camera software has shut down. Restart the camera.

Weak signal

If the quality of the camera signal falls below the specified threshold value (if there are missing/defective sections in a row of plants, for example), the attachment remains in the current position until:

- the signal quality required for the automatic control system is restored, e.g. at the end of the missing/defective section.

Possible reasons for poor signal quality are:

- Insufficient visibility of field structure
- Incorrect camera angle or height
- Wrong application
- Field data are out-of-spec.

Driven too slowly / Driven too quickly

If the tractor is travelling at a speed which is less than 0.05 km/h or faster than 25 km/h. When the automatic control system is cut off, a lock symbol appears in the **Automatic control unit** index card at the bottom on the right.

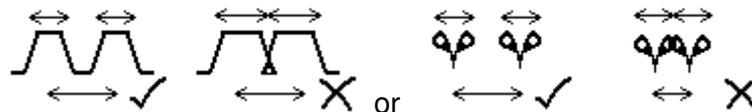
The work menu

The "Automatic control system" index card

Overview of error messages

Application - single rows of plants, multiple rows of plants and ridges

The combination of lens width and distance between objects is invalid.



Application - multiple rows of plants

If there are more than 4 rows in each bed, the number of rows between the tyres must be equal to the number of rows. If there are 2-4 rows per bed, then there must be double as many rows between the tyres.

All applications

- Left-hand limit position reached. Please steer left:



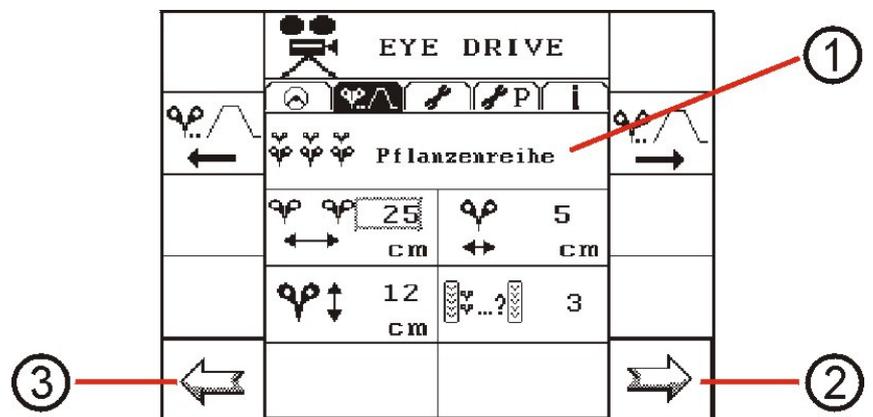
- Right-hand limit position reached. Please steer right:



The "Set application" index card

The applications can be selected in the **Set application** index card. The following applications are available:

1. Row of plants
2. Ridges
3. Furrow
4. Multiple row



1	Selection of application
2	Next index card
3	Previous index card

The work menu

The "Set application" index card

How can I select an application or its corresponding parameters?



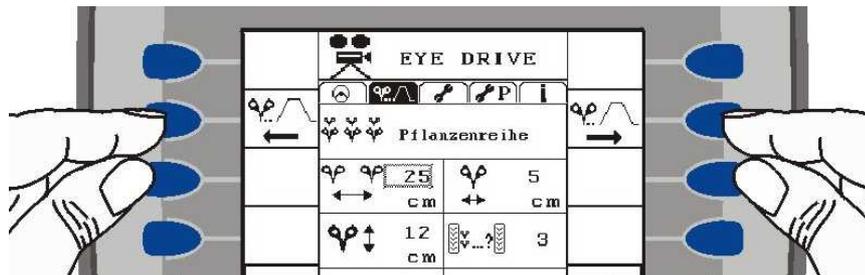
Danger!

All adjustments (change application, modify sensitivity, adjust lighting, etc.) may only be carried out with the machine at a standstill.

Failure to observe this instruction may result in death or severe injury.

- Before making adjustments and also when this work is in progress, make sure that no persons are present in the steering range / danger zone.

To select an application, press one of the softkeys shown below (several times if necessary) until the name of the application is displayed:



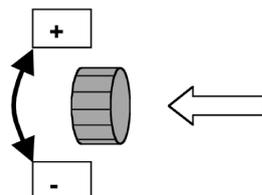
Once the required application has been selected, the appropriate settings can be specified below.

Note

An overview of the various parameters is provided in the following chapters.

When making the relevant parameter settings follow the procedure below:

1. Turn the incremental encoder (clockwise or anticlockwise) until a frame appears round the required value then press the knob.



Note

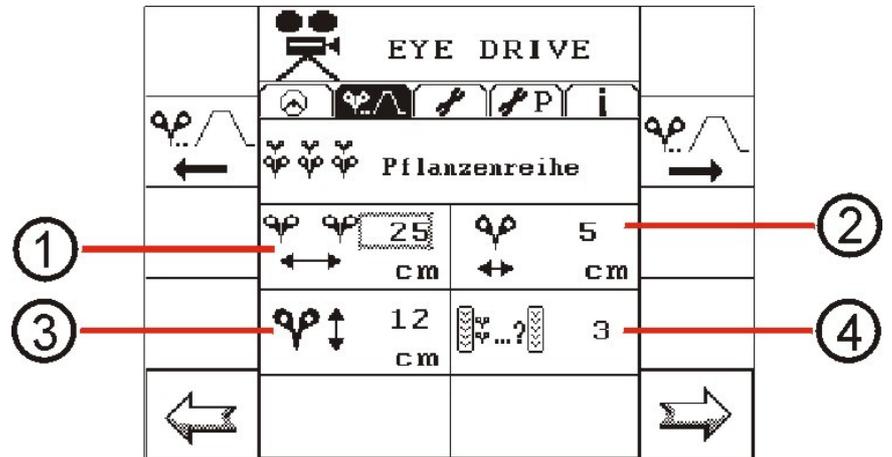
A thicker frame now appears around the value selected for adjustment.

2. Modify the value (by turning the incremental encoder) and save the setting (by pressing the incremental encoder).

The work menu

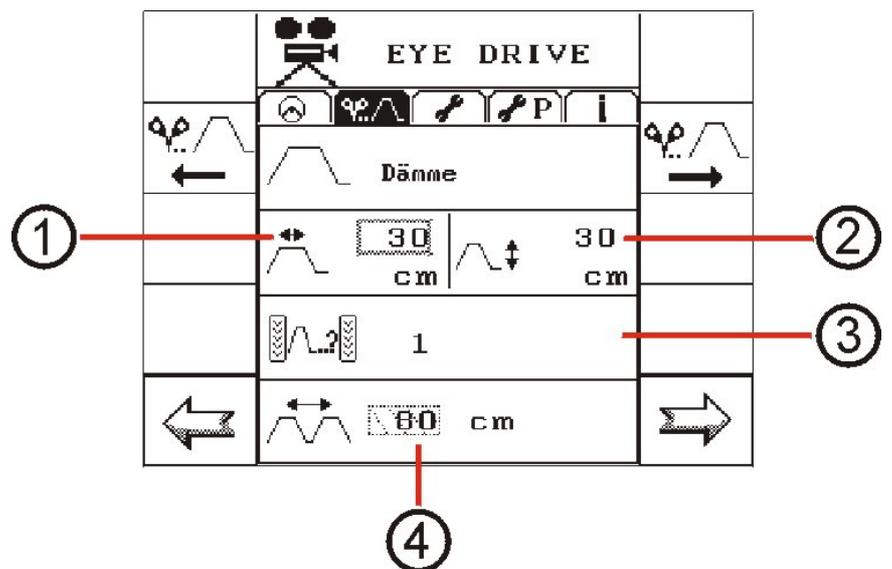
The "Set application" index card

Overview of parameters for "Row of plants" application



1	Row spacing
2	Width of row of plants
3	Plant height The height of the plant is measured from the ground to the highest tip of the plant.
4	Rows of plants per track The number of rows of plants between the tractor tyres.

Overview of parameters for "Ridges" application



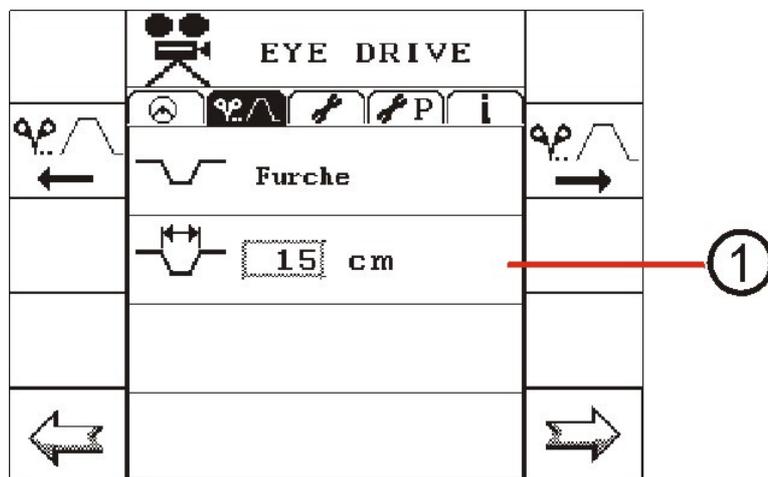
1	Width of ridge
---	----------------

The work menu

The "Set application" index card

2	Height of ridge The height of the ridge is measured from the ground to the highest point of the ridge.
3	Number of ridges Number of ridges between the front tyres.
4	Ridge spacing The ridge spacing is measured from the centre of one ridge to the centre of the next.

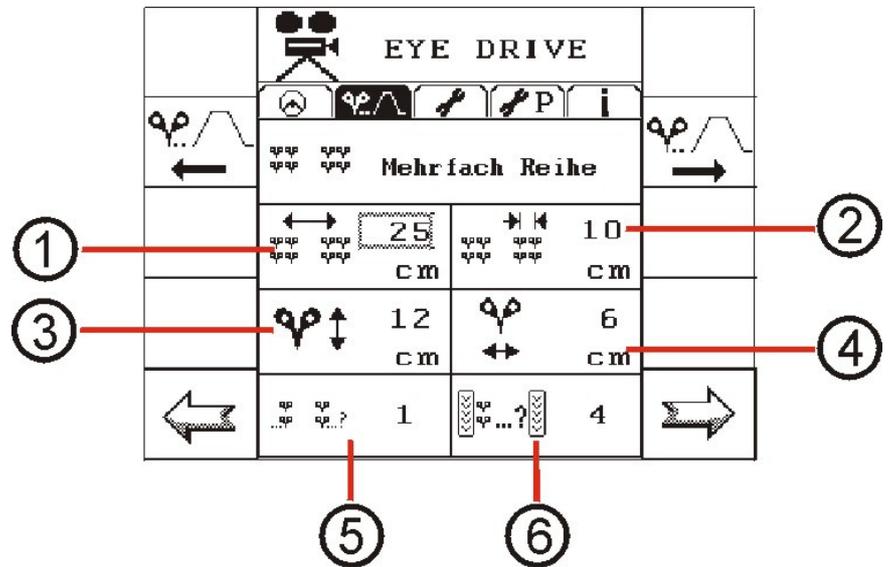
Overview of parameters for "Furrow" application



1	Furrow width
---	--------------

The "Set application" index card

Overview of parameters for "Multiple row" application



1	Spacing of rows of plants (multiple rows).
2	Spacing of rows of plants within a multiple row.
3	Plant height The height of the plant is measured from the ground to the highest tip of the plant.
4	Plant width (WIDTH OF ONE PLANT ONLY, NOT ALL PLANTS IN ROW).
5	Number of rows per row
6	Rows of plants per track The number of rows of plants between the tractor tyres. (NUMBER OF ALL ROWS OF PLANTS BETWEEN THE TRACTOR TYRES IS ENTERED $3 \times 2 = 6$ rows of plants).

The work menu

The "General settings" index card

The "General settings" index card

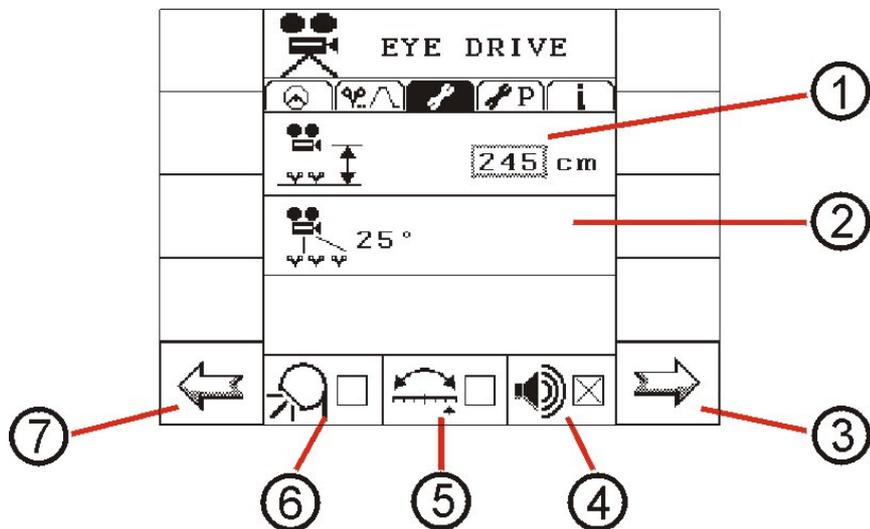


DANGER!

All adjustments (change application, modify sensitivity, adjust lighting, etc.) may only be carried out with the machine at a standstill.

Failure to observe this instruction may result in death or severe injury.

- Before making adjustments and also when this work is in progress, make sure that no persons are present in the steering range / danger zone.



1	Height of camera
2	Angle of camera
3	Next index card
4	Sound on/off
5	Activation of optional function "Dual-Offset on/off". If this function is activated here, it is possible to change between two offsets via the Automatic control system index card.
6	Activation of optional function "Xenon headlight on/off". If this function is activated here, the Xenon headlights can be switched on/off via the Automatic control system index card.
7	Previous index card

How is the height of the camera determined?

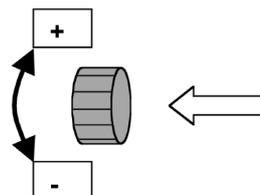
Note

The height of the camera is determined by measuring the distance from the ground (contact surface of tractor tyre) to the centre of the camera.

1. Open the **General settings** index card in the work menu, also see also chapter entitled "Open the individual index cards of the work menu as follows" on page 18.
2. Turn the incremental encoder until a frame appears around the field in which the camera height is specified:



Then press the knob.



Note

A thicker frame now appears around the value selected.

3. Modify the value (by turning the incremental encoder) and save the setting (by pressing the incremental encoder).

The values shown in the following tables are recommended settings for the camera height. The height of the camera must always be adapted to the **field and operating conditions**.

Important note!

THE ACTUAL HEIGHT OF THE CAMERA MUST BE EXACTLY THE SAME AS THE HEIGHT ENTERED.

The work menu

The "General settings" index card

Camera Position

The camera position must be found as a trade off between row distance, number of rows and plant size. Hence, the following points have influence of the camera performance.

Consequences of camera height setting:

Selecting more or less rows:	<ul style="list-style-type: none"> The more rows the camera is looking at, the more robust is the system against weeds and missing plants. The more rows the camera is looking at, the higher the camera position has to be to have the plants in the field of view of the camera.
Higher or lower camera position	The higher the camera is placed, the harder it is for the camera to see the plants. Thus the camera should always be kept in the lowest possible position.
Different angle	In case that the camera is in very low positions it might be an advantage using a bigger angle in order to increase the field of view.
Location	Selecting an even number of rows (2 or 4) the camera must be placed in the middle of the rows. Selecting an uneven number of rows (1, 3 or 5) the camera must be placed straight above one row.
Angle	The recommended camera angle is 20 degrees corresponding to the <i>brown</i> dot on the camera bracket. In case that the camera is in very low positions it might be an advantage using a bigger angle in order to increase the field of view.

Camera height for plants (0 – 15 cm) with **20 degrees angle:**

No of Rows [cm]	Row Distance [cm]	Camera Height [cm]	Plant height[cm]
1	<i>Camera has to be placed on centre of row !!!</i>	50	0 – 5 <i>for higher plants change to 2-5 row settings</i>
2	25	60	0 – 15
2	50	80	0 – 15
2	75	100	0 – 15
3	25	80	0 – 15
3	50	120	0 – 15
3	75	160	0 – 15
4	25	100	0 – 15
4	50	160	0 – 15
5	25	120	0 – 15

Camera high for plants (15 – 35 cm) with **20 degrees angle:**

No of Rows [cm]	Row Distance [cm]	Camera Height [cm]	Plant height[cm]
2	25	80	15 – 35
2	50	100	15 – 35
2	75	120	15 – 35
3	25	100	15 – 35
3	50	140	15 – 35
3	75	180	15 – 35
4	25	120	15 – 35
4	50	180	15 – 35
5	25	140	15 – 35

Camera height for plants (35 – 55 cm) with **20 degrees angle:**

No of Rows [cm]	Row Distance [cm]	Camera Height [cm]	Plant height[cm]
2	25	100	35 – 55
2	50	120	35 – 55
2	75	140	35 – 55
3	25	120	35 – 55
3	50	160	35 – 55
3	75	200	35 – 55
4	25	140	35 – 55
4	50	200	35 – 55
5	25	160	35 – 55

The work menu

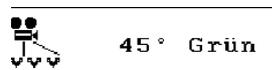
The "General settings" index card

How is the camera angle determined?

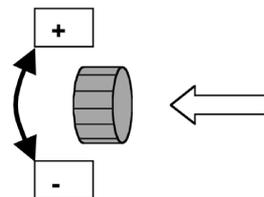
Note

The camera angle specified **must** correspond to the actual angle of the camera.

1. Open the **General settings** index card in the work menu, also see also chapter entitled "Open the individual index cards of the work menu as follows" on page 18.
2. Turn the incremental encoder (clockwise or anticlockwise) until a frame appears round the field for the camera angle setting:



Then press the knob.



3. A menu opens in which the angle can be specified (by turning the incremental encoder). Confirm your selection by pressing the incremental encoder.

The recommended camera angle for each application is marked with an x in the following table.

Note

The angle setting bracket includes corresponding coloured markings for assistance when setting the angle.

Camera angle	Colour	Plant row	Furrow	Ridges
20°	Brown	x	x	X
30°	Yellow		(x)	(x)
40°	Red			

How is the "Xenon headlight on/off" option activated/deactivated?

If this function is activated, the Xenon headlights can be switched on/off via the **Automatic control system** index card.

1. Open the **General settings** index card in the work menu, also see also chapter entitled "Open the individual index cards of the work menu as follows" on page 18.
2. Turn the incremental encoder (clockwise or anticlockwise) until a frame appears round the function activation field:



then press the knob (incremental encoder).

<input checked="" type="checkbox"/>	the function is available in the Automatic control system index card
<input type="checkbox"/>	not available

How is the optional "Dual Offset" function activated/deactivated?

If this function is activated, it is possible to change between two offsets via the **Automatic control system** index card.

1. Open the **General settings** index card in the work menu, also see also chapter entitled "Open the individual index cards of the work menu as follows" on page 18.
2. Turn the incremental encoder (clockwise or anticlockwise) until a frame appears round the function activation field:



then press the knob (incremental encoder).

<input checked="" type="checkbox"/>	the function is available in the Automatic control system index card
<input type="checkbox"/>	not available

The work menu

The "General settings" index card

How is the sound switched on/off?

1. Open the **General settings** index card in the work menu, also see also chapter entitled "Open the individual index cards of the work menu as follows" on page 18.
2. Turn the incremental encoder (clockwise or anticlockwise) until a frame appears round the sound field:



then press the knob (incremental encoder).

<input checked="" type="checkbox"/>	Sound on
<input type="checkbox"/>	Sound off

The "Service (advanced settings)" index card

The "Service (advanced settings)" index card



DANGER!

All adjustments (change application, modify sensitivity, adjust lighting, etc.) may only be carried out with the machine at a standstill.

Failure to observe this instruction may result in death or severe injury.

- Before making adjustments and also when this work is in progress, make sure that no persons are present in the steering range / danger zone.

Performing a calibration

To set the system after mounting the camera on an attachment, it is necessary to perform a calibration procedure.

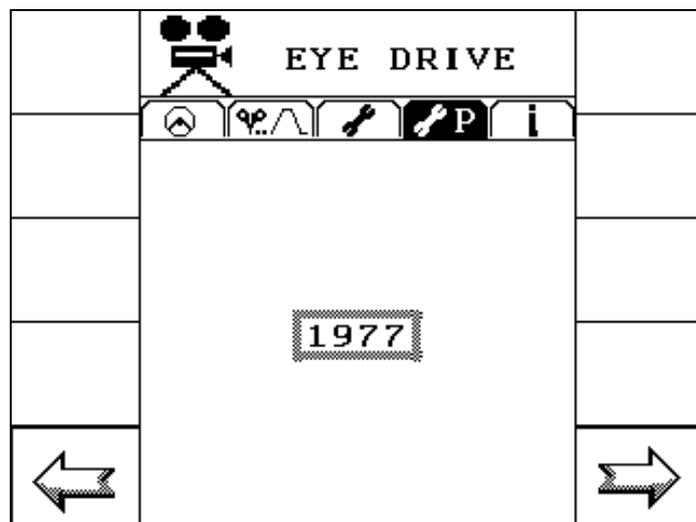
The following information is determined during calibration:

- number of pulses every 100 metres from speed sensor
- Positions of the steering cylinder (left, centre, right)

The camera is calibrated during an additional step (if the bracket is not mounted exactly in the centre or at a slight angle).

How to open the calibration menu

1. Open the **Service (advanced settings)** index card in the work menu, also see also chapter entitled "Open the individual index cards of the work menu as follows" on page 18.



Note

The calibration menu is protected by the number code 1977. To open the menu, you must enter the number code.

The work menu

The "Service (advanced settings)" index card

2. Press the incremental encoder (a thicker frame appears round the input field for the number code) and enter number code 1977.

To do this, turn the incremental encoder quickly clockwise (or anticlockwise to reduce the current value). The quicker you turn, the greater the number increments will be (100 increments).

Note

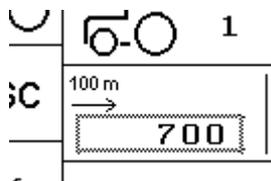
Briefly stop turning the knob when you approach the value 1977 then continue turning more slowly in 10 or 1 increments.

3. Once you reach 1977, press the incremental encoder – this opens the calibration menu.

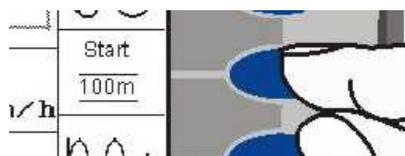
Carrying out a 100 m calibration journey

Before starting the calibration, measure out a distance of 100 metres as accurately as possible (mark the start and end point).

1. Make sure that the calibration menu in the **Service (advance settings)** index card is open.
2. Drive to the starting point of the 100 metre route then turn the incremental encoder (clockwise or anticlockwise) until a frame appears round the calibration journey field:



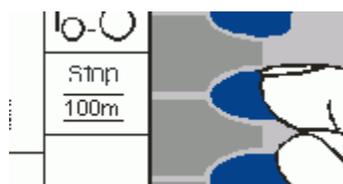
3. Press the start softkey then drive the 100 metres.



Note

The travel speed is irrelevant in this case – the impulses from the speed sensor are counted.

4. Press the stop softkey at the end of the 100 metres.



Note

You can reset the value to its original value by pressing the ESC softkey.

The work menu

The "Service (advanced settings)" index card

If the value of the impulse number is known:

You can also enter the number of impulses for every 100 metres manually (if known). Press the incremental encoder when the frame is displayed around the calibration journey field (a thicker frame then appears around the field) then adjust the value by turning the incremental encoder. then press the incremental encoder again.

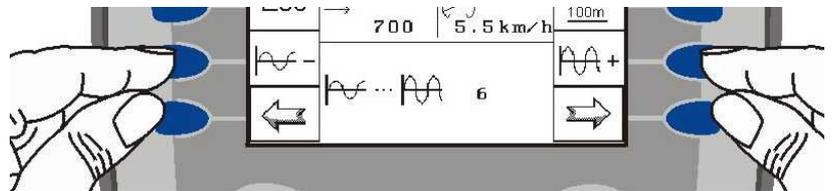
The sensitivity of the control system

You can use the sensitivity setting to specify how fast or slow the control system should respond.

- 1-2 low sensitivity (control system responds very slowly)
- 9-10 high sensitivity (control system responds very quickly)

We recommend setting the sensitivity to 6.

1. Make sure that the calibration menu in the **Service (advance settings)** index card is open.
2. To set the sensitivity, press one of the softkeys shown below (several times, if necessary) on the "Service index card (Extended Settings)" :



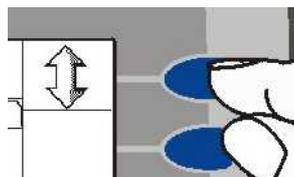
Calibration of steering angle sensor

1. Make sure that the calibration menu in the **Service (advance settings)** index card is open.

Note

The steering angle sensor must initially be adjusted when the calibration is started. For this purpose, the attachment must be perfectly straight !

2. Press the softkey on the top right-hand side (the expanded calibration menu opens).

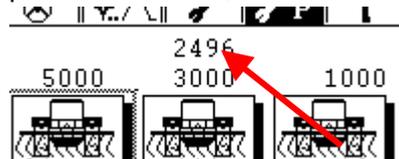


3. Calibrate the steering angle sensor as follows:
 - Move the attachment until it is as close as possible to the straight-ahead position.

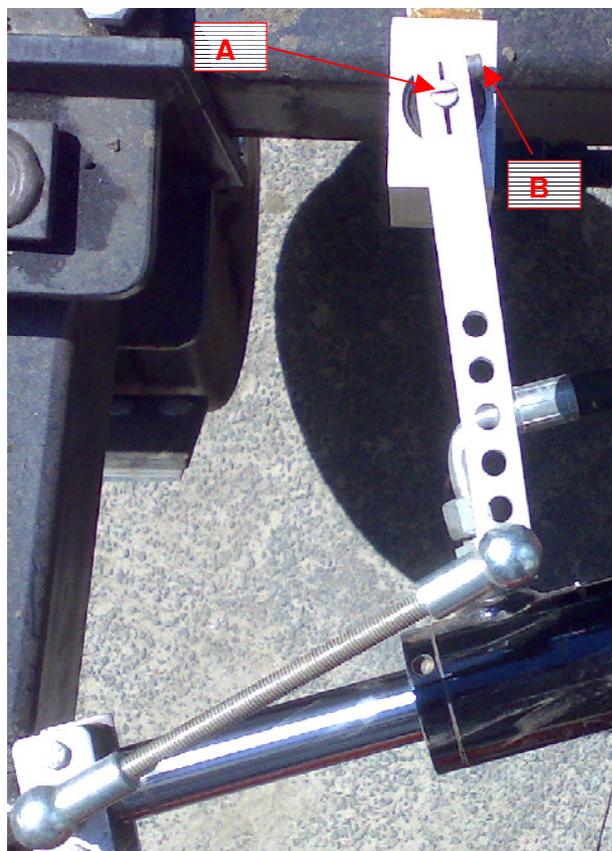
The work menu

The "Service (advanced settings)" index card

- Undo the screw (B), see illustration below.
- Turn potentiometer (A) of the steering angle sensor until the value displayed in the calibration menu is as close as possible to **2495**, see illustration below:



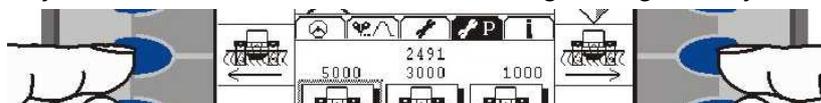
- Tighten the screw (B).



4. Now turn the incremental encoder until a frame appears around the left steering angle field:



Adjust the attachment left as far as it will go using the keys:



and press the incremental encoder.

The work menu

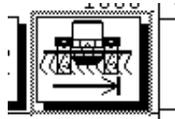
The "Service (advanced settings)" index card

- Turn the incremental encoder until a frame appears around the centre position field:



Adjust the attachment so it is exactly in the centre using the buttons and press the incremental encoder.

- Now turn the incremental encoder until a frame appears around the right steering angle field:

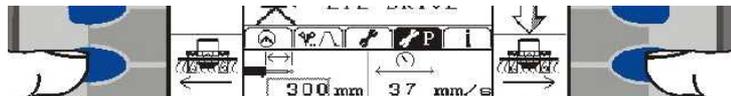


Adjust the attachment as far right as it will go using the buttons and press the incremental encoder.

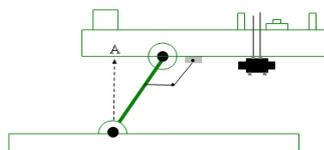
Determining the max. swing width

The system needs to know the max. left/right swing width in mm of the implement. Proceed as follows:

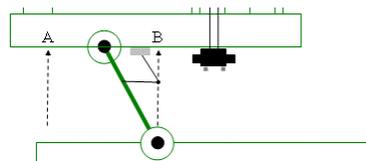
- Make sure that the calibration menu in the **Service (advance settings)** index card is open.
- Using the buttons, move the implement all the way to one side



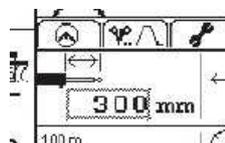
and mark a point of the swinging implement on either a non-moving part or on the ground.



- Move the implement all the way to the other side and mark another point.



- Measure the distance in mm and enter this value:



The work menu

The "Service (advanced settings)" index card

Determining the steering speed and performing a steering cylinder test

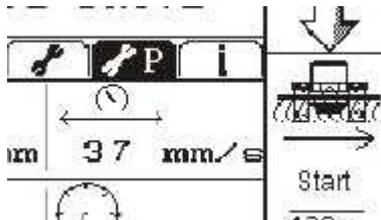
Note

In addition to the steering cylinder test, the purpose of this function is also to determine the steering speed, see following chapter entitled "**Checking the oil flow rate and/or determining the steering speed**" on page 46.

1. Make sure that the calibration menu in the **Service (advance settings)** index card is open.
2. In order to determine the steering speed and/or test the steering cylinder for proper operation, press one of the softkey buttons as shown in the picture below:



The steering speed is shown in mm/s:



We recommend a steering speed of **35-45mm/sec**. Change the oil flow rate as shown in chapter "Checking the oil flow rate and/or determining the steering speed" on page 46 if necessary.

The "Service (advanced settings)" index card

Calibration of camera

The camera should be calibrated following installation to compensate for any inaccuracies that occur when attaching the camera or camera bracket (if the camera bracket is not installed precisely in the centre or if the bracket is mounted slightly at an angle). The following calibration options exist:

- You can lay a green tube at the workshop centrally in front of the tractor in a straight line or drive the tractor over the tube keeping it centred on the tube and then perform the calibration using the **Row of plants** application setting.
- You can centre the vehicle at the start of one of (the first) lanes or at the start of a row of plants, ridge etc. and then perform the calibration.

Note

Make sure that all application settings as well as the camera height and camera angle have been set correctly, see also chapter entitled "How can I select an application or its corresponding parameters?" on page 28 or both chapters entitled "How is the height of the camera determined?" on page 33 and "How is the camera angle determined?" on page 36.

1. Make sure that the calibration menu in the **Service (advance settings)** index card is open.
2. Press the softkey on the top right-hand side (the expanded calibration menu opens).



3. Press the start softkey.



Note

The value should settle down to an average value after roughly 1 minute. Make sure that the signal quality displayed in the lower margin is at least 80 - 90%.

4. Press the Stop softkey once the calibration is complete.



The work menu

Setting the steering speed

Setting the steering speed



DANGER!

All adjustments (change application, modify sensitivity, adjust lighting, etc.) may only be carried out with the machine at a standstill.

Failure to observe this instruction may result in death or severe injury.

- Before making adjustments and also when this work is in progress, make sure that no persons are present in the steering range / danger zone.

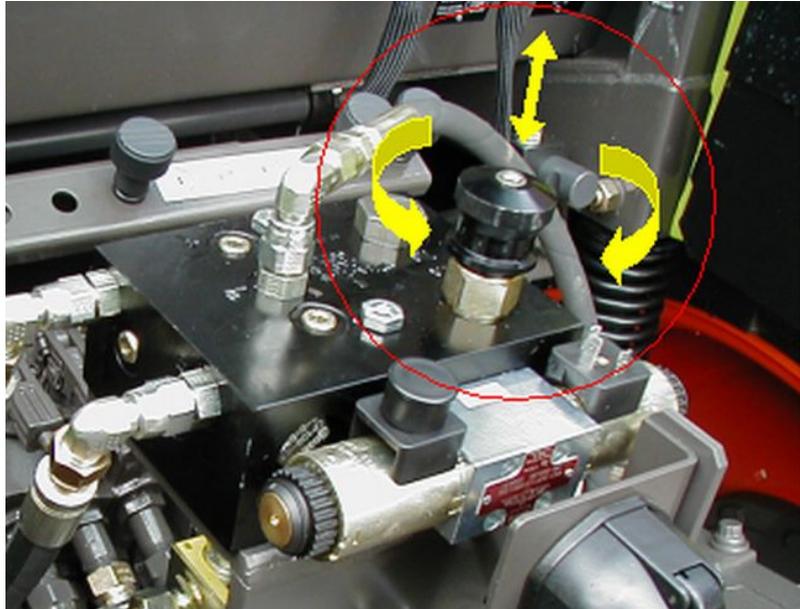
Checking the oil flow rate and/or determining the steering speed

The steering system uses a constant oil flow. Correct adjustment of the oil quantity is decisive for optimum performance of the control system.

The flow speed may need to be adjusted regularly if changes are made to the equipment, basic speed and field characteristics in order to ensure an even response of the system and to minimise track errors.

Changing the flow rate

First, release the lock of the valve head by lifting it. You can now turn the valve. Turn the valve knob anticlockwise to increase the volume of oil and turn it clockwise to reduce the volume of oil. Now check the turning speed of the rear wheels once again.



Increasing the flow rate:

Leads to more acute steering adjustments and reduced track errors. If the flow rate is too high this leads to instability of steering adjustment and major errors.

Reducing the flow rate:

Leads to a more stable steering adjustment and gentler responses. If the flow rate is too low the steering adjustment becomes more sluggish and major track errors occur.



Due to the differences in viscosity the flow rate should only be adjusted when the machine is at operating temperature

The precision of the steering system can vary as this depends on the ground conditions, machine type, weight distribution of the machine, tyre pressure and equipment combination.

When using implements it must be ensured that the corresponding implement is correctly set according to the specifications in the user manual.

The service menu

The "System information" index card

The "System information" index card

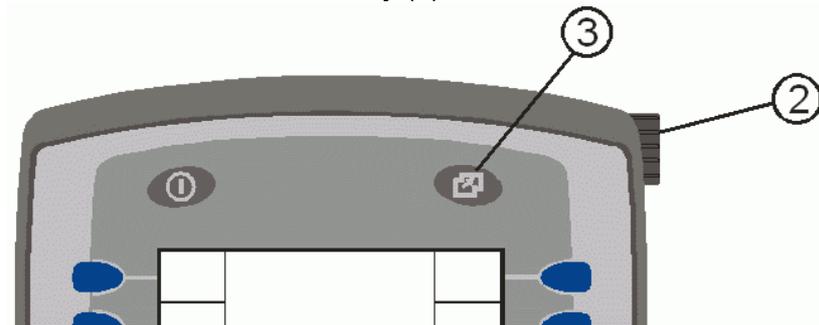
The software version numbers are shown on this index card:

- Vision software: camera
- Module software: steering module (UBM module)

The service menu

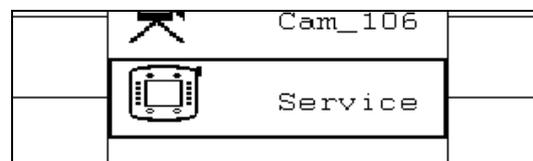
Change to the service menu as follows

1. Press the **menu** selection key (3).

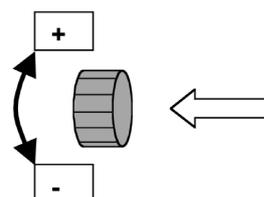


All available menus or ISO bus applications are then displayed.

2. Turn the incremental encoder (2) in the clockwise or anticlockwise direction until a frame appears around the **service** menu.



3. Press the incremental encoder (2).



The settings of the service menu



DANGER!

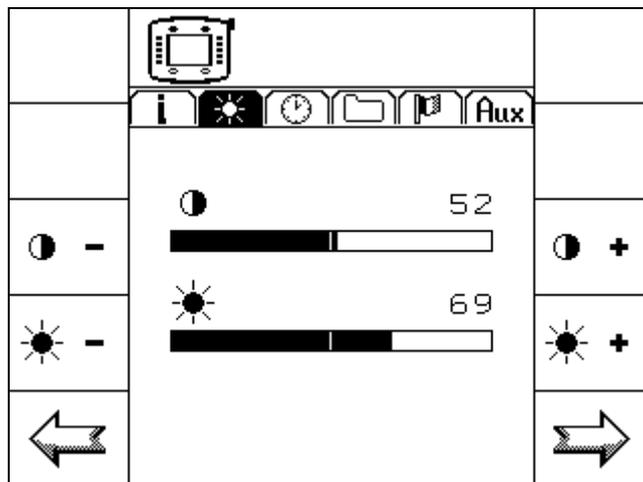
All adjustments (change application, modify sensitivity, adjust lighting, etc.) may only be carried out with the machine at a standstill.

Failure to observe this instruction may result in death or severe injury.

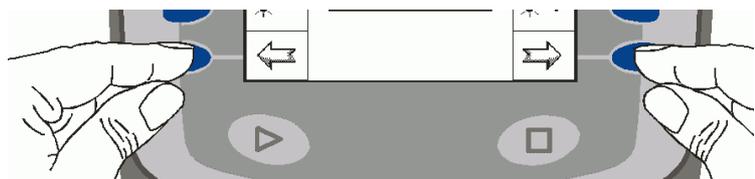
- Before making adjustments and also when this work is in progress, make sure that no persons are present in the steering range / danger zone.

Brightness/contrast

1. Open the **service** menu, see also chapter entitled "Change to the " on page 48.
2. Open the **Brightness/contrast** index card.



To do this, press the corresponding softkeys (several times if required):



3. Specify the required values for brightness and/or contrast by pressing the corresponding softkey (several times if required).

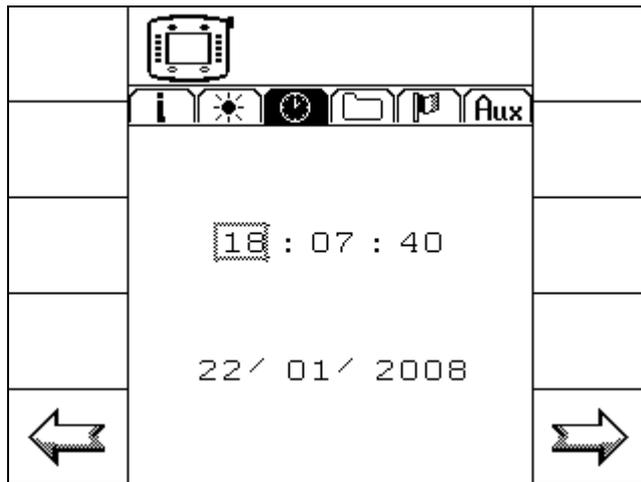


The service menu

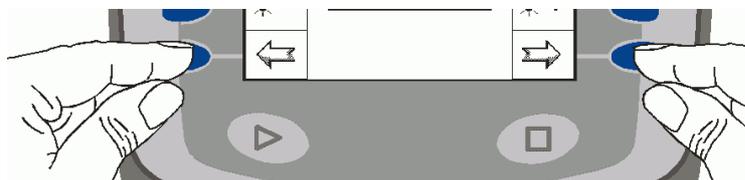
The settings of the service menu

Time/date

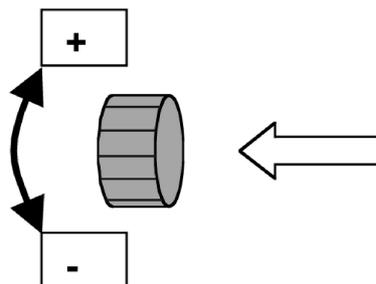
1. Open the **service** menu, see also chapter entitled "Change to the " on page 48.
2. Open the **Time/date** index card.



To do this, press the corresponding softkeys (several times if required):



3. Turn the incremental encoder (clockwise or anticlockwise) until a frame appears round the required value then press the knob.



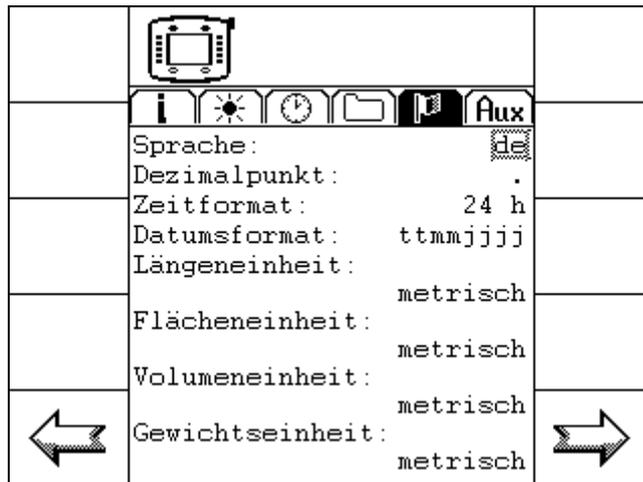
Note

A thicker frame now appears around the value selected for adjustment.

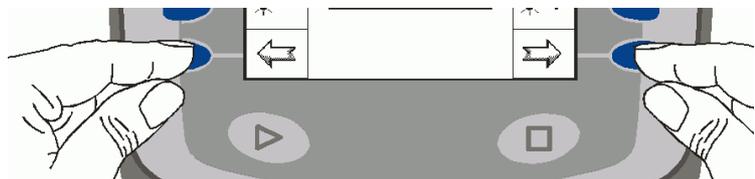
4. Modify the value by turning the incremental encoder.
5. Save the value by pressing the incremental encoder.

Language, decimal point, time or date format, lengths, areas, volumes and/or unit of weight

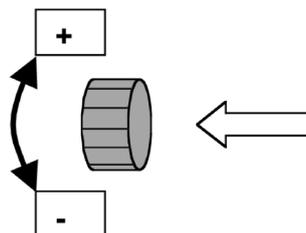
1. Open the **service** menu, see also chapter entitled "Change to the " on page 48.
2. Open the **Settings** index card.



To do this, press the corresponding softkeys (several times if required):



3. Turn the incremental encoder (clockwise or anticlockwise) until a frame appears round the required value then press the knob.



Note

A thicker frame now appears around the value selected for adjustment.

4. Modify the selected value or select another by turning the incremental encoder further.
5. Save the value by pressing the incremental encoder.

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