MÜLLER ELEKTRONIK
A TRIMBLE COMPANY

Operating Instructions

TRAIL-Control MIDI 3.0

Company details

Table of contents

1 For your safety

1.1 Basic safety instructions

Please read the following safety instructions carefully before using the product for the first time.

- TRAIL-Control may only be used during field work. The system must be deactivated or switched off on public roads and tracks.
- Before you leave the vehicle cab, ensure that all automatic mechanisms are deactivated or manual mode is activated.
- Nobody must stay in the proximity of the tractor or trailed implement during operation.
- Never remove any safety mechanisms or stickers from the product.
- Read the operating instructions to the agricultural device which you want to control by using the product.
- Before charging the tractor battery, always disconnect the tractor from the job computer.
- Before performing any welding on the tractor or the implement, always disconnect the power supply to the job computer.
- Before performing maintenance or repairs on the tractor, always disconnect the job computer from the tractor.
- Do not make any unauthorized modifications to the product. Unauthorized modifications or use may impair safety and reduce the service life or operability of the unit. Modifications are considered unauthorized if they are not described in the product documentation.
- Keep children away from the implement and the job computer.

1.2 Hazard Area

When using TRAIL-Control, there is a danger zone that spreads several metres away from the tractor and from the towed implement in all directions. The bigger the trailed implement, the bigger the hazard area. For example: The greater the width of a spraying boom on a field sprayer, the greater the range when it is unfolded, and the larger the hazard area.

⚠ WARNING
Risk of injury due to uncontrolled movements of the implement
○ Ensure that nobody enters the hazard area.
○ Switch the system off immediately as soon as someone enters the hazard area.

As soon as you have installed and switched on the system, ensure that nobody is in the hazard area.

When TRAIL-Control is switched on, there is a risk of uncontrolled movement of the drawbar or stub axle caused by pressure fluctuations in the hydraulic system.

For example, pressure fluctuations can occur in the following situations:

- If there is a failure in the hydraulic system.
- If you use the hydraulic system for purposes other than controlling the drawbar and stud axle steering.

The hazard area may only be entered if the following requirements are met:

- System is switched off.

All maintenance, configuration, and inspection work is performed with the system switched off.

1.3 User requirements

- Learn to operate the product in accordance with the instructions. Nobody must operate the product before reading these Operating Instructions.
- Please read and carefully observe all safety instructions and warnings contained in these Operating Instructions and in the manuals of any connected vehicles and farm equipment.
- If there is anything within these instructions that you do not understand, please do not hesitate to contact us or your dealer. Müller-Elektronik's Customer Services department will be happy to assist you.

1.4 Layout and meaning of warnings

All safety instructions found in these Operating Instructions are composed in accordance with the following pattern:

⚠ **WARNING**

This signal word identifies medium-risk hazards, which could potentially cause death or serious physical injury, if not avoided.

⚠ **CAUTION**

This signal word identifies hazards that could potentially cause minor or moderate physical injury or damage to property, if not avoided.

NOTICE

This signal word identifies hazards that could potentially cause damage to property, if not avoided.

There are some actions that need to be performed in several steps. If there is a risk involved in carrying out any of these steps, a safety warning appears in the instructions themselves.

Safety instructions always directly precede the step involving risk and can be identified by their bold font type and a signal word.

Example
1. **NOTICE! This is a notice. It warns that there is a risk involved in the next step.**
2. Step involving risk.

2   About these Operating Instructions

2.1   Diagrams in this manual

The screen shots of the software interface are intended to serve as a reference. They help you in finding your way around the software screens.

The information shown on the screen depends on various factors:
- the type of implement,
- the configuration of the implement,
- the status of the sensors and actuators.

For this reason, the pictures in these operating instructions may show different information than the display on the terminal.

Depending on the ISOBUS terminal used, the arrangement of the function icons may differ. Each ISOBUS terminal decides itself about the arrangement of the function icons.

Several icons look different depending on whether the trailed implement has drawbar or stub axle steering. They still both have the same function.

In the instructions we use both types of icons. An overview of the different icons for drawbar or axle steering can be found in the table:

2.2   Directional information in these instructions

All directional information in these instructions, such as "left", "right", "forward", "back", is relative to the movement direction of the vehicle.

2.3   Layout of references

If any references are given in these Operating Instructions, they appear as:

Example of a reference: [→ 7]

References can be identified by their square brackets and an arrow. The number following the arrow shows you on what page the section starts where you can find further information.

2.4   Layout of operating instructions

The operating instructions explain step by step how you can perform certain operations with the product.

We use the following symbols throughout these Operating Instructions to identify different operating instructions:

Type of depiction	Meaning
1. 2.	Actions that must be performed in succession.
⇨	Result of the action. This will happen when you perform an action.
⇨	Result of an operating instruction. This will happen when you have completed all steps.
☑	Requirements. In the event that any requirements have been specified, these must be met before an action can be performed.

3   Product description

3.1   Functions of the ISOBUS-TRAIL-Control system

Functions

TRAIL-Control serves to steer the trailed implement during field operation. In doing so, it supports the driver in the following ways:

- It keeps the trailed implement in the tractor track.
- When working on slopes, it steers the trailed implement up the slope so that it does not slip out of the tractor track.

Versions

The system can control two types of steering systems:

- Drawbar steering - These systems only steer the drawbar to the left or right to influence the course of the trailed implement.
- Stub axle steering - These systems steer the steering axle of the trailed implement to the left or right to influence the course of the trailed implement.

Requirements

The following requirements must be met for TRAIL-Control to work:

- Minimum speed = 3 km/h. Steering is not possible at lower speeds.
- (Default) Maximum speed = 15 km/h. If you drive faster than 15 km/h, the TRAIL-Control function will be automatically switched off.
  Note: The implement manufacturer is capable of increasing or decreasing the maximum speed before delivering the field sprayer to adjust it for the characteristics of the field sprayer and its intended use.
- The maximum speed can be adjusted for the trailed implement and increased by the implement manufacturer.
- Minimum oil throughput for the hydraulic system of the tractor = 25 l/min. The minimum oil throughput may be greater for large field sprayers.

3.2   System overview
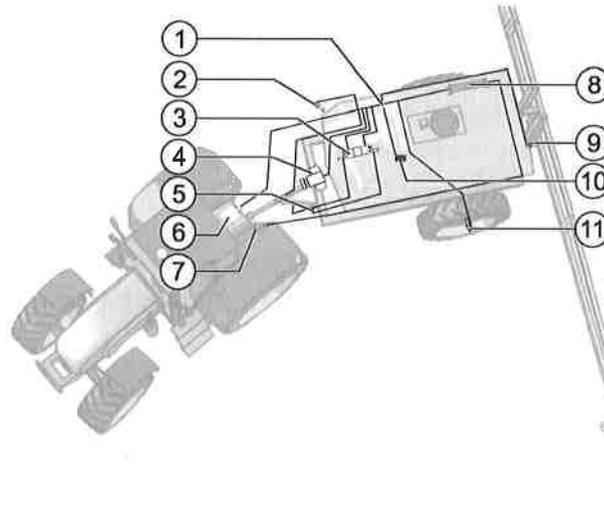
Example for a system with drawbar steering

①	Main cable harness
②	Ladder sensor* The ladder sensor serves to detect whether a ladder has been extended on the trailed implement. In this case, TRAIL-Control is blocked and cannot be activated.
③	Proportional valve
④	Angle sensor Determines the angle of a hydraulic cylinder on the drawbar or on a stub axle. For systems with stub axle steering, this sensor is installed on a stub axle.
⑤	Drawbar locking sensor* Sensor that detects when the drawbar has been locked with a pin.
⑥	Gyroscope with two brackets Detects changes in the driving direction of the tractor.
⑦	ISOBUS cable with connector Cable from the ISOBUS job computer to the ISOBUS power socket on the tractor.
⑧	ISOBUS job computer Control unit that is responsible for system operation.
⑨	"Boom unfolded" position sensor* Sensor that detects when the boom has been unfolded and is ready for field work. This is mandatory for using TRAIL-Control. The system is locked when the boom is folded in.
⑩	Sprayer slope sensor Sensor that detects the tilt of the trailed implement to enable the slope counter-steering function.
⑪	Wheel sensor* Serves to determine the vehicle speed.

* - Optional sensors. Because there is a limited number of sensor inputs, not all of the optional sensors can be installed and used on the implement.

3.3   Layout of the work screen

The work screen is the screen that should be called up after activating the system.

This screen allows you to:

- see the status of the system,
- operate the system using function icons.
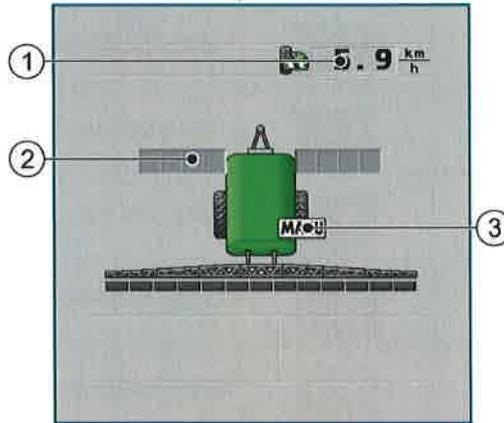
Example: Work screen when the implement is standing still on a system with drawbar steering

①	Current speed	③	Icon: manual mode is activated
②	Scale of the deflection		
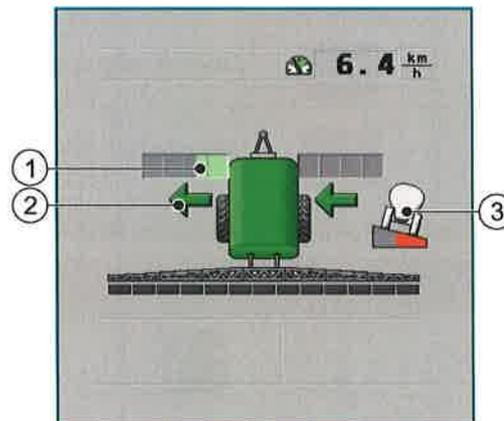
Example: Work screen when the implement is working on a system with drawbar steering

①	The deflection is also shown on a scale.	③	Icon: Slope counter-steering is activated. The scale indicates how much is steered against the slope.
②	The arrows show the direction in which the trailed implement is being steered.		

Beside the work screen, there are function icons that serve to operate the system.

Function icons

Function icon for drawbar steering	Function icon for axle steering	Meaning
		Switches TRAIL-Control on and off.
		Steers the implement to the left.
		Steers the implement to the right.

Function icon for drawbar steering	Function icon for axle steering	Meaning
		Centers the implement.
		Calls up the screens with settings.
		Activates the slope counter-steering function.
		Calls up the "CALIBRATION" screen.
		Starts the calibration of the slope sensor (if equipped).
		Starts the calibration of the middle position.
		Starts the calibration of the left limit stop.
		Starts the calibration of the right limit stop.
		Starts the calibration of the proportional valve.

The following icons may appear on the work screen when TRAIL-Control is being operated:

Icons

Meaning	Icons for drawbar steering	Icons for axle steering
No TRAIL-Control.		
TRAIL-Control is installed but is deactivated.		
TRAIL-Control is in manual mode.		
TRAIL-Control is in automatic mode.		
The drawbar is locked with a pin		

Meaning	Icons for drawbar steering	Icons for axle steering
The implement is being steered to the left.		
The implement is being steered to the right.		

3.4   Rating plate

Abbreviations on the rating plate

Abbreviation	Meaning
K.-Nr.:	Customer number If the product was manufactured for an agricultural machinery manufacturer, the agricultural machinery manufacturer's item number will be shown here.
HW:	Hardware version
ME-NR:	Müller-Elektronik item number
DC:	Operating voltage The product may only be connected to voltages within this range.
SW:	Software version upon delivery
SN:	Serial number

4 Mounting and installation

4.1 Mounting the gyroscope

The gyroscope is a sensor that determines the angular speed when the tractor changes direction.

To mount the gyroscope you must carry out the following:
- Installing the bracket on the tractor

4.1.1 Mounting the bracket for the gyroscope

Bracket

Gyroscope in the bracket

Installing the bracket on the tractor

The bracket on the tractor is used for fastening the gyroscope to the tractor for the duration of work on the field.

Procedure

1. Determine the position for mounting the bracket on the tractor.
   The bracket must be mounted vertically and without vibration on the rear of the tractor.
   Make sure that the connection cable of the gyroscope does not become too tight when fastened in the bracket

2. **CAUTION! Before drilling a hole, make sure that you will not damage any lines while drilling.**

3. Drill holes for the bolts.

4. Fasten the bracket.
   The bracket must be fastened securely to prevent shaking while driving.

4.1.2 Using the gyroscope

Procedure

1. Fasten the gyroscope into the bracket on the tractor and screw tight with the wing screw.
   The side with the **TOP-OBEN** label must be on the top:

2. After work, fasten the gyroscope into the bracket on the trailed implement and screw tight with the wing screw.

4.2 Checking the installation position of sensors

You can measure the voltage on the sensor input of the job computer to check if the selected sensors are mounted correctly.

The following sensor voltages are correct:

Sensor voltages

Sensor type	Position during measurement	Correct voltage
Angle sensor	Center position: The drawbar (or wheels of the trailed implement) is (are) aligned to drive straight ahead.	2.5 V (+/- 0.1 V)
	Voltages when the trailed implement is steered to the maximum left or right.	Approx. 1.5 V and 3.5 V (+/- 0.1 V)
	Short circuit.	0.1 V
Slope sensor	The trailed implement is standing on level ground.	2.5 V (+/- 0.1 V)
Gyroscope	Sensor is in the bracket on the tractor. The tractor is at a standstill.	2.5 V (+/- 0.1 V)

5 Operating the system

5.1 Switching TRAIL-Control on and off

⚠	⚠ WARNING
	Moving implement
	Before you switch on the system, make sure that there are no persons or objects nearby.

Procedure

To switch on the system:

☑ The vehicle is standing on the field.

☑ There are no persons close to the vehicle.

☑ The boom is unfolded. The "Boom unfolded" sensor (if the sensor is installed) is activated.

☑ The drawbar is not mechanically locked.

☑ The ladder is not extended or unfolded. (If the ladder sensor is installed).

1. Fasten the gyroscope onto the tractor.

2. Connect the ISOBUS cable of the job computer to the ISOBUS power socket of the tractor.

3. Start the terminal.

4. ⬚ - Open the job computer application using the selection menu of the terminal.

   ⇨ The following screen appears:

   On systems with axle steering:

   On systems with drawbar steering:
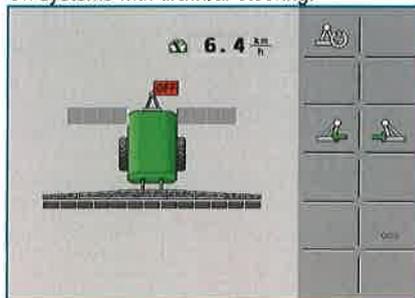
   ⇨ Only the current speed appears on the screen. The system is not yet activated.

5. ⬚ / ⬚ - Switch on TRAIL-Control. By pressing again, you can switch off the system.

   ⇨ The system is switched on, however, it is only working in manual mode. This means that you must actuate a function icon to steer the trailed implement.

⇨ New symbols appear on the work screen [→ 10].

On systems with axle steering:

On systems with drawbar steering:

You can now read the following section:
- To obtain more information on the icons on the screen: Layout of the work screen [→ 10]
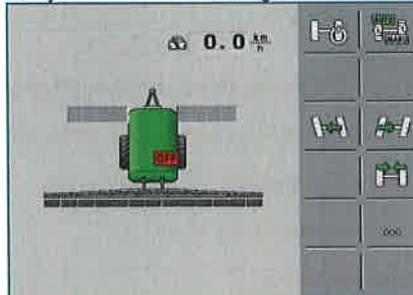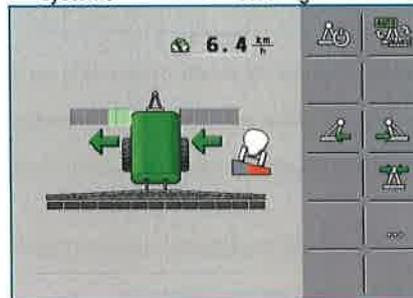- If you still have to configure the system: Configuring TRAIL-Control [→ 22]
- If the system has already been configured:
  - Steering in automatic mode [→ 17]
  - Steering in manual mode [→ 17]

5.2 Steering the trailed implement

⚠	⚠ WARNING
	Danger of injury from trailed implement movement
	The trailed implement moves to the side during steering.
	This may cause danger for persons and materials in direct proximity to the trailed implement.
	○ Ensure that nobody is in the range of the implement before steering the trailed implement.

5.2.1 Steering in automatic mode

When you work in automatic mode, the trailed implement is steered automatically.

The gyroscope measures the change in direction of the tractor and the job computer calculates the required angle for steering the trailed implement.

The icons on the work screen show the direction in which the trailed implement is being steered.

5.2.2 Steering in manual mode

In manual mode, you must steer the trailed implement manually.

Procedure

To drive to the right in a curve:

1. Drive the tractor to the right.

2. ▢ / ◿ - Steer the trailed implement for driving to the right.

⇨ With drawbar steering: The drawbar is steered to the left.

⇨ With axle steering: The wheels are steered to the left.

⇨ Arrows pointing left appear on the work screen.

Procedure

To drive straight ahead again:

1. Drive the tractor straight ahead.

2. ▢ / △ - Steer the trailed implement to the middle position.

⇨ The trailed implement slowly moves to the middle position.

⇨ An arrow appears on the work screen. It shows the direction in which the drawbar or axle is steering.

⇨ If the implement is centred, the following symbol appears:

Procedure

To drive to the left in a curve:

1. Drive the tractor to the left.

2. ▢ / ◺ - Steer the trailed implement for driving to the left

⇨ With drawbar steering: The drawbar is steered to the right.

⇨ With axle steering: The wheels are steered to the right.

⇨ Arrow pointing right appear on the work screen.

5.2.3

Steering the trailed implement against the slope

For working on slopes, you can use the 'slope counter-steering' function.

Mode of operation

When you activate the 'slope counter-steering' function, you can offset the track of the trailed implement to the left or right. The direction in which the track is offset depends on if the slope climbs or declines to the left or right of the implement.

The aim of the "slope counter-steering" function is to prevent the trailed implement from driving inclined to the direction of work on a slope.
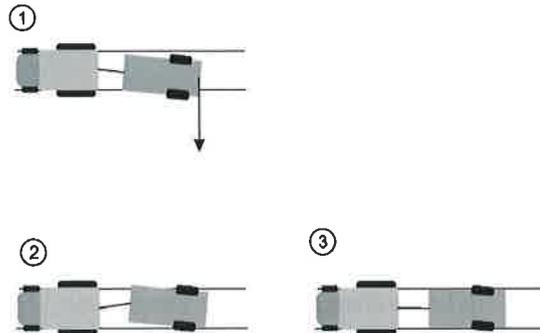
Steering the trailed implement against the slope

①	Without TRAIL-Control	③	TRAIL-Control with stub axle steering
②	TRAIL-Control with drawbar steering		

Slope countersteer

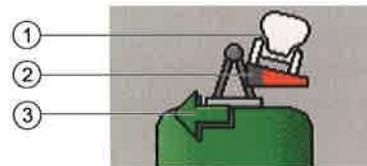|	
①	Slope direction
②	Degree of the slope. Measured by the slope sensor. On level ground, the [icon] icon must appear here when the function is activated. If this is not the case, the slope sensor is not calibrated. The slope sensor is calibrated during the TRAIL-Control calibration. Repeat this calibration when the slope sensor has to be calibrated.
③	Steering direction of the system. While driving, the system steers the trailed implement against the slope until the desired angle is achieved. Then the arrow is no longer displayed.

Procedure

To activate the "Slope counter-steering" function:

1. Switch to the "TRAIL-Control" screen:

   [icon] > [icon]

   or

   [icon] > [icon]
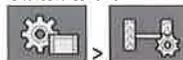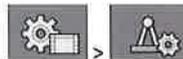
2. [icon] - Activate or deactivate function.

   ⇨ On the screen, you can see whether the function is activated:

   [icon] - Function enabled

   [icon] - Function disabled.

Using slope counter-steering in automatic mode

When you work in automatic mode, the trailed implement is steered automatically.

Procedure

To steer against the slope in automatic mode:

☑ The trailed implement is equipped with a slope sensor.

☑ During the calibration of TRAIL-Control, the slope sensor was mounted on the frame of the sprayer. The sensor position has not changed since.

☑ Automatic mode is activated.

☑ "Slope counter-steer" function is activated.

☑ The vehicle with the trailed implement is moving on the slope.

1. [icons] , or [icons] , - Manually steer the trailed implement to the correct position behind the tractor.

⇨ The work screen displays the icon [icon]. The red colour marks the target position of the angle sensor on the drawbar.

⇨ Each time you press a function icon, the triangle becomes more or less red in colour.

⇨ TRAIL-Control will try to steer the trailed implement into this position, until you correct the position manually again.

⇨ If you use a joystick, you can also correct the position manually.

2. After turning, when the slope lies on the other side of the trailed implement, the angle will be reproduced on the other side.

Using slope counter-steering in manual mode

In manual mode, you must steer the trailed implement manually against the slope. Here, you can decide yourself whether the trailed implement should follow the track of the tractor or whether it should be offset.

5.3 Preparing TRAIL-Control for road driving

Before driving with the field sprayer on a public road, you must switch TRAIL-Control off and if possible lock it with a locking pin.

⚠	⚠ **WARNING**
	Risk of accident through lateral movement of the trailed implement
	In road traffic, TRAIL-Control can lead the trailed implement to the side of the tractor track. This may cause a traffic accident.
	Before you drive on a road:
	○ Steer the trailed implement into the middle position.
	○ Switch off TRAIL-Control.
	○ Lock TRAIL-Control.

> ⚠ **WARNING**
>
> **Risk of accident with uncalibrated TRAIL-Control**
> If the middle position is not calibrated, the trailed implement may move with an offset relative to the tractor's tracks. This may cause a traffic accident.
> Before you drive on a road:
>
> ° Calibrate TRAIL-Control.
>
> ° Ensure that when driving straight ahead, the trailed implement is pulled in a line behind the tractor.
>
> ° Switch off TRAIL-Control.
>
> ° Lock TRAIL-Control.

5.4 Driving in reverse

The operation of the trailed implement when driving in reverse depends on several factors:

- If no reverse driving signal [→ 28] is available, you can deactivate TRAIL-Control or set it to manual mode before driving in reverse.
- As a standard, TRAIL-Control stops working if a reverse driving signal is detected. In this case, the automatic mode remains activated, but the hydraulic valves are not being controlled.
- You can configure the reaction for TRAIL-Control when a reverse driving signal is detected. To do so, read section: Configuring automatisms when driving in reverse [→ 30]

When a reverse driving signal is detected, a flashing icon always appears on the work screen:

5.5 Locking TRAIL-Control

If the drawbar can be locked with a locking pin, the system can monitor this locking device with a lock sensor. As long as the lock sensor detects locking, the system will be blocked. During this time, the hydraulic valves cannot be controlled.

Procedure

1. Activate manual mode.
   ⇒ The work screen displays the icon: MANU or MANU
2. Steer the trailed implement to the middle position.
   ⇒ Drawbar or stub axle will be steered to the middle position.
   ⇒ Lock drawbar steering with the locking pins.
   ⇒ The work screen displays the icon MANU
   ⇒ TRAIL-Control is ready for driving on the road.
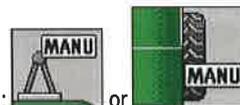
6 Configuring TRAIL-Control

6.1 Adjusting the configuration to the tractor

As a user, you have the option of changing several parameters. These can slightly influence the reaction of the system or enable connection to a different tractor.

Procedure

To call up the parameters:

☑ Start screen is called up.

1. Switch to the "TRAIL-Control" screen:

or

⇨ The "TRAIL-Control" screen appears.

2. Configure the parameters according to the specifications in the parameter list.
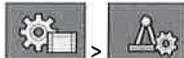
6.1.1 "Slope countersteer" parameter

You can activate the slope counter-steering using the function icon.

- - Slope counter-steering deactivated

- - Slope counter-steering activated - The system steers the trailed implement as soon as the slope sensor detects a slope. The system always steers the implement up the slope.
This function can only be configured when the TRAIL-Control system is activated.
To prevent problems during operation, deactivate this parameter when you are not working on slopes. [→ 18]

6.1.2 "Compensation Time" parameter

Enter only for trailed implements with a bang-bang valve.
- The greater the value, the earlier cornering is commenced in automatic mode.
- The lesser the value, the later cornering is commenced in automatic mode.

Normally the value is between: 700 ms and 1000 ms.

6.1.3 "Hydraulic Flow Gain" parameter

Enter only for implements with a proportional valve.

Hydraulic flow is a value for setting the steering speed.

Normally the value is between: 1.5 %/° and 3 %/°

6.1.4 "Deviation Tolerance" parameter

The deviation tolerance influences the behaviour of steering in the central position area.

The lower the tolerance is set, the more sensitive the control reacts to small changes.
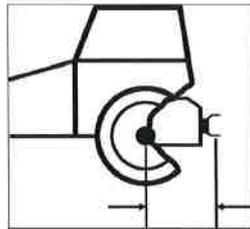
Normally the value is between: 2° and 3°

6.1.5   "Track Width" parameter

Sprayer track width - distance between the centre of the wheels on the axle.

6.1.6   "Tractor Axle<->Coupling" parameter

Distance between the center of the rear axle of the tractor and the towing hook of the tractor.

6.2   Calibrating TRAIL-Control

	⚠ **WARNING**
	Danger of injury from trailed implement movement When calibrating the proportional valve, the trailed implement moves automatically. This may pose a risk to you and to persons in the immediate vicinity of the trailed implement. ○ Ensure that nobody is in the regulation range of the trailed implement. ○ Abort the calibration with the [⬛] or [⬛] function key as soon as someone approaches the trailed implement.

When should you calibrate?
- Prior to initial start-up.
- At the start of each season.
- When inaccuracies occur.
- if you use the job computer on another tractor.

Sequence

There are three steps involved in calibrating TRAIL-Control:
- Step 1: Calibrate the slope sensor.
  To do so, the slope sensor must be installed. Its position may no longer be changed after this.
- Step 2: Teach-in the central position and limit stops.
  In this step you teach the job computer the position of the drawbar and/or the axle in the middle, left and right positions.
  The job computer calculates all intermediate positions itself.
- Step 3: Calibrate the hydraulics of the proportional valve
  Only for trailed implements with proportional valves
  In this step, the trailed implement is automatically steered to both sides and the voltages are measured.
  The calibration runs automatically.

6.2.1   Calibrating the slope sensor

Procedure

☑ TRAIL-Control is in manual mode.

☑ Ground is not sloped. Slope sensor must not recognize any slope. Otherwise the "Slope counter-steering" function will not work properly.

1. Switch to the "Calibration" screen:

   > >

   or

   > >

2. The "Calibration" screen appears.

3. Set up the trailed implement on flat ground in a line behind the tractor. Drive straight ahead for a few meters until the wheels of the field sprayer run precisely in the tracks of the tractor.

4. Stop the tractor as soon as the field sprayer is exactly in line behind the tractor.

5. - Start the calibration of the slope sensor.
   ⇨ The following message appears:
   "Slope sensor: Calibration is ready"

6. - Confirm within 3 seconds. The time will be counted by a red clock:
   ⇨ Calibration is initiated.
   ⇨ The following message appears:
   "Slope sensor: Calibration running"

   ⇨ A blue clock shows the progress:
   ⇨ The calibration is completed when the message "Slope sensor: Calibration running." is no longer displayed.

⇨ You have calibrated the slope sensor.

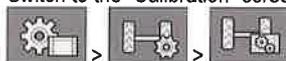## 6.2.2   Teaching-in the central position and limit stops

Phase 1: Recording the middle position

Procedure

☑ TRAIL-Control is in manual mode.

☑ Ground is not sloped. Slope sensor must not recognize any slope. Otherwise the "Slope counter-steering" function will not work properly.

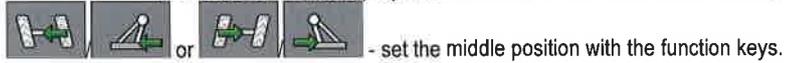1. Switch to the "Calibration" screen:

   > >

   or

   > >

2. The "Calibration" screen appears.

3. Set up the trailed implement on flat ground in a line behind the tractor. Drive straight ahead for a few meters until the wheels of the field sprayer run precisely in the tracks of the tractor.

    or - set the middle position with the function keys.

4. Stop the tractor as soon as the field sprayer is exactly in line behind the tractor.

5. - Start the calibration of the middle position.
    ⇨ The following message appears:
        "Middle Position: Calibration is ready"

6. - Confirm within 3 seconds. The time will be counted by a red clock:
    ⇨ Calibration is initiated.
    ⇨ The following message appears:
        "Middle Position: Calibration running"

    ⇨ A blue clock shows the progress:
    ⇨ Phase 1 is completed when the message "Middle position: Calibration running." is no longer displayed.
    ⇨ You have calibrated the middle position.

7. You can start phase 2 of the calibration.

Phase 2: Recording the limit stops

Procedure

1. - Steer the trailed implement fully to the left.

2. - Start calibration.
    ⇨ The following message appears:
        "Most Left Position: Calibration is ready"

3. - Confirm within 3 seconds. The time will be counted by a red clock:
    ⇨ Calibration is initiated.
    ⇨ The following message appears:
        "Most Left Position: Calibration running"

    ⇨ A blue clock shows the progress:

4. Wait until the message "Most left position: Calibration running." is no longer displayed.

5. - Steer the trailed implement fully to the right.

6. - Start calibration.
    ⇨ The following message appears:
        "Most Right Position: Calibration is ready"

7. - Confirm within 3 seconds. The time will be counted by a red clock:
    ⇨ Calibration is initiated.

⇨ The following message appears:
"Most Right Position: Calibration running"

⇨ A blue clock shows the progress:

8. Wait until the message "Most right position: Calibration running." is no longer displayed.

⇨ Phase 2 of calibration has been completed.

6.2.3 Calibrating the hydraulics of the proportional valve

You must only calibrate the hydraulics of the proportional valve when you use a trailed implement with proportional valve.

⚠ WARNING

Danger of injury from trailed implement movement

When calibrating the proportional valve, the trailed implement moves automatically.

This may pose a risk to you and to persons in the immediate vicinity of the trailed implement.

○ Ensure that nobody is in the regulation range of the trailed implement.

○ Abort the calibration with the [icon] or [icon] function key as soon as someone approaches the trailed implement.

Procedure

☑ TRAIL-Control is in manual mode.

☑ Ground is not sloped. Slope sensor must not recognize any slope. Otherwise the "Slope counter-steering" function will not work properly.

☑ You have enough space to drive straight ahead for about 30 seconds.

1. Switch to the "Calibration" screen:

   [icon] > [icon] > [icon]

   or

   [icon] > [icon] > [icon]
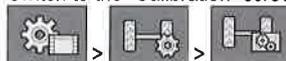
2. The "Calibration" screen appears.

3. Set up the implement on flat ground in a line behind the tractor. Drive straight ahead for a few meters until the wheels of the field sprayer run precisely in the tracks of the tractor.

   [icon] , [icon] or [icon] - set the middle position with the function keys.

4. Stop the tractor as soon as the field sprayer is exactly in line behind the tractor.

5. Drive straight ahead very slowly. While driving, the friction of the wheel corresponds to the real working conditions and makes the calibration more precise. However, you can also perform this calibration while the implement is standing still.

6. [icon] / [icon] - Start calibration.

   ⇨ The following message appears:
   "Hydr. Output: Calibration is ready"

7. [icon] - Confirm within 3 seconds.

⇨ The following message appears:
"Hydr. Output: Calibration running."

⇨ The trailed implement (or its drawbar or stub axle) now moves slowly to the left and then slowly to the right.

⇨ This procedure may last up to 20 seconds.

⇨ The calibration is completed when the message 'Hydraul. Output: Calibration running." is no longer displayed.

8. Come to a stop.

6.2.4 Selecting and configuring the speed sensor

You must enter the source from which the job computer shall obtain the current speed.

The configuration procedure can differ depending on the speed source.

Selecting the speed source

Supported speed sources:

- "Sensor" – Sensors that are installed on the implement and connected to the job computer:

  – Examples: Wheel sensor, radar sensor, impulse-transmitting GPS speed sensor

  – Configuration: Configure the number of impulses per 100 meters.

- "ISOBUS" – Sensors that are installed on the tractor and whose signal is received through the ISOBUS.

  – Examples: GPS receiver, wheel sensor on the tractor, signal socket

  – Configuration: For systems without the option of selecting the sensor input, the "Wheel impulses" parameter must be set to 0.

- "Auto" – Some systems enable automatic detection of the speed source.

  – Mode of operation: If a speed signal is detected on the ISOBUS, this speed will be used as a basis. In the case of signal failure, the job computer will take the impulses from the sensor connected to the job computer as a basis for determining the speed.

  – Configuration: For systems that have two sensor types, it is recommended to calibrate the sensor that is connected to the job computer. In other cases, set the "Wheel Impulses" parameter to 0.

Procedure 1

To configure the speed source:

1. On the work screen, press the following keys successively:

   [icon] > [icon] .
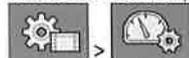
   ⇨ The "Speed" screen appears.

2. Configure the "Speed source" parameter.

Procedure 2

If the "Speed source" parameter does not appear on the "Speed" screen, and the speed signal should be received through the ISOBUS, proceed as follows:

☑ The speed signal can be received through the ISOBUS.

1. Switch to the "PARAMETERS" screen:

   [icon]

2. Set the "Wheel impulses" parameter to "0".

Calibrating the speed sensor with the 100m method

When calibrating the speed sensor with the 100m method, you determine the number of impulses received by the speed sensor in a distance of 100m. When you know the amount of impulses, the job computer can calculate the current speed.

If you know the number of impulses for the wheel sensor, you can also enter this number manually.

You can enter different pulse values for up to three different wheels.

Procedure

☑ Wheel sensor, radar sensor or GPS speed sensor is installed on the implement.

☑ A distance of 100m has been measured and marked. The distance must correspond to the field conditions. It should therefore lead over a meadow or a field.

☑ The tractor with connected implement is ready for a 100m drive and is at the start of the marked distance.

1. Ensure that all prerequisites have been fulfilled.

2. Switch to the "CALIBRATION – wheel impulses" screen:

    > >

3. - Start calibration.

   ⇨ The following function icons appear:

    - Stop calibration.

    - Abort calibration.

4. Drive the previously measured 100m distance and stop at the end.

   ⇨ During the drive, the currently determined impulses are displayed.

5. - Stop calibration.

6. - Exit the screen.

⇨ The number of impulses appears on the "Wheel impulses" line

Configuring the reverse driving sensor

If the trailed implement or the tractor sends a reverse driving signal through the ISOBUS, the job computer can use this signal to adjust its regulating behaviour when driving in reverse.

You can find more information in this section: Configuring automatisms when driving in reverse [→ 30]
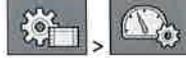
Signal sources

The following signal sources are possible:
- "None" - The job computer should not expect a reverse driving signal. Even if a reverse driving signal is transmitted through the ISOBUS, the job computer will ignore the signal.
- "ISOBUS" - The reverse driving signal is sent by the tractor or a different job computer through the ISOBUS.
- "Sensor" - A reverse driving sensor is connected to the junction box or cable harness of the job computer.

Procedure

To select the reverse signal source:

1. Switch to the "SPEED" screen:

2. Select the box below the "Reverse drive sensor" parameter.
   ⇨ The available signal sources appear. See the description at the beginning of this section.

3. Select the signal source.

4. Restart the job computer.

## 6.3 Configuring the automatic centering

The system is capable of centering the position of the trailed implement in certain situations. With drawbar steering, this means positioning the drawbar straight, and with stub axle steering, aligning the wheels straight.

As the user, you can decide which automatisms should be activated and configure them to a certain extent.
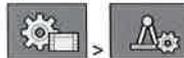
Procedure

To activate the automatisms:
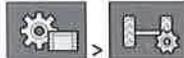
1. Switch to the "TRAIL-Control" screen:

   or

   ⇨ The "TRAIL-Control" screen appears.

2. - Press.
   ⇨ The second page of "TRAIL-Control" appears.
   ⇨ An automatism is described on each line. On the left in the brackets, you can see the conditions under which a mechanism is executed. On the right, the effects.

3. To activate functions, set the check mark on the desired line. These functions will be explained in the following sections.

6.3.1 Centering when exceeding the maximum speed

The system will center the trailed implement as soon as the maximum speed has been exceeded. The maximum speed is generally 9.32 mph, however, it can be increased by the manufacturer in some cases when the construction allows it.
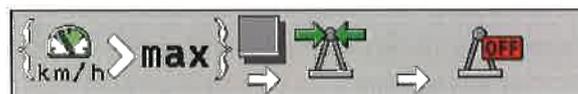
For activation, mark the box near these icons.

Mode of operation

As soon as the maximum speed has been exceeded, an error message appears. At the same time, the trailed implement will be centered. It does this regardless of whether the system was previously working in manual or in automatic mode.

During the centering procedure, the icon for manual mode appears on the work screen:

or

The centering may not take longer than eight seconds. After this time, the function is aborted, regardless of whether the middle was reached. TRAIL-Control will then be deactivated.

The automatic centering procedure can be aborted by pressing the   (,

) function keys. Furthermore, the system is switched off.

6.3.2 Centering when switching to manual mode

The system will center the trailed implement as soon as the operating mode is changed from automatic to manual.

If the steering system is actuated during the centering procedure, the centering is aborted. The system remains in manual mode.
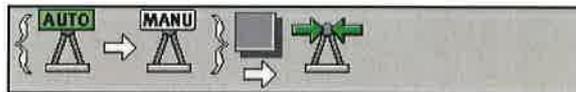
For activation, mark the box near these icons.

6.3.3 Centering when tapping the centering icon

When you are working in automatic mode and tap the   or   function icon, the system automatically centers the trailed implement. To do so, the system is switched to manual mode. In addition, you can define after how many seconds the automatic mode should be reactivated.

For activation, mark the box near these icons.

6.4 Configuring automatisms when driving in reverse

Several tractors can send a signal through the ISOBUS to all ISOBUS job computers when the reverse gear is engaged. TRAIL-Control can then detect a reverse driving signal and react to it.
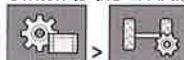
As a standard, TRAIL-Control stops working if a reverse driving signal is detected. In this case, the automatic mode remains activated, but the hydraulic valves are not being controlled.

You can configure how TRAIL-Control should react when a reverse driving signal is received.

Procedure   To activate the automatisms:

1. Switch to the "TRAIL-Control" screen:

   or

⇨ The "TRAIL-Control" screen appears.

2. - Press.

⇨ The second page of "TRAIL-Control" appears.

⇨ An automatism is described on each line. On the left in the brackets, you can see the conditions under which a mechanism is executed. On the right, the effects.

3. To activate functions, set the check mark on the desired line. These functions will be explained in the following sections.

6.4.1   Reaction to the reverse driving signal in automatic mode

If you are in automatic mode and the reverse signal is detected, the manual mode is activated. Most drivers prefer to steer the trailed implement manually when driving in reverse.

For activation, mark the boxes near these icons.

6.4.2   Reaction to the reverse driving signal in manual mode

When the system is working in manual mode and the vehicle drives in reverse, the trailed implement can be centered.

Centering with reverse driving signal

Mode of operation

As soon as the vehicle comes to a stop (speed = 0 km/h), the icon appears on the screen (for axle steering). If you drive in reverse in the next 10 seconds, the trailed implement will be centered. If you only drive in reverse after the 10 seconds have expired, nothing happens. This aims to prevent the trailed implement from being centered when parked vehicles are driven in reverse.

Important remarks:

- When the ( ) icons appear, you can immediately steer the trailed implement manually.
- If you press the ( ) or ( ) buttons during the automatic centering procedure, the centering will be aborted.
- The centering procedure never takes longer than 8 seconds. If the trailed implement is not centered after 8 seconds, the centering procedure is aborted.
- Several tractors send a reverse driving signal unexpectedly or without reason, even if they are standing still. To minimize the risks for the driver, the automatic centering can only be automatically activated in the first 10 seconds after the vehicle comes to a stop. If the vehicle has been standing for longer than 10 seconds and only then driven in reverse, automatic centering will not be performed.

7 Technical specifications

7.1 Technical specifications of the job computer

ECU-MIDI 3.0 job computer

1st processor:	32-bit ARM Cortex™-M4 CPU 168 MHz, 2048 KB flash; 256 KB RAM
2nd processor:	32-bit ARM Cortex™-M4 CPU 168 MHz, 2048 KB flash; 256 KB RAM
External memory:	SPI-Flash 16 MB; SDRAM 16 MB; FRAM 16 kByte
Connections:	• 42-pin connector for connecting actuators/sensors • 2x 16-pin connector for power supply and CAN The connectors can be locked and equipped with single conductor insulations.
Interfaces:	up to 3xCAN*
Power supply:	12 V electrical system (9-16 V), maximum current consumption 30 A
Current consumption (IN):	500 mA (at 14.4 V without power output, without supply to external sensors)
Standby current (OFF):	70 µA (typ.)
Temperature range:	-40 ... +70 ºC
Housing:	Anodized aluminium continuous cast casing, plastic lid with seal and pressure compensation element, stainless steel screws
Protection rating:	IP6K6K (with installed connectors)
Environmental tests:	Vibration and shock testing in accordance with DIN EN 60068-2 Temperature testing in accordance with IEC68-2-14-Nb, IEC68-2-30 and IEC68-2-14Na Protection testing in accordance with DIN EN 60529 Electromagnetic compatibility according to DIN EN ISO 14982: 2009-12
Dimensions:	Approx. 262 mm x 148 mm x 62 mm (L x W x H, without connector)
Weight:	ca. 1 kg

7.2 Pin assignment 42-pin plug

Pin	Signal	Pin	Signal
1	12 VL	32	12 VE

Pin	Signal	Pin	Signal
5	Sprayer right	33	0 VE
14	12 VE	34	TRAIL-Control wheel sensor
15	Locking	38	TRAIL-Control sprayer slope sensor
17	Gyroscope	39	Drawbar locked
18	Drawbar angle sensor	40	Ladder sensor
19	Sprayer left	41	Boom folded
28	TRAIL-Control circulation	42	0 VL
29	12 VL		

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8 Spare parts

Optional for job computer MIDI 3.0

Designation	Item number
Gyroscope with 2x bracket, with AMP connector	30303685
Angle sensor with AMP connector, without cable, with boom	30303015

Optional

Designation	Item number
Electronic slope sensor with 1 m cable and AMP connector	30303690
Proportional valve	302922

Connector cable for sensors and gyroscope

Designation	Item number
Connector cable for sensors, 2 m with 3-pin AMP socket to junction box	30303294
Connector cable for sensors, 4 m with 3-pin AMP socket to junction box	30303296
Connector cable for sensors, 6 m with 3-pin AMP socket to junction box	30303295
Connector cable for sensors, 8 m with 3-pin AMP socket to junction box	30303297