TRIDEC

Steering systems and axle suspensions

2300 EF-S system

User manual

Release (07/2020)

Part no.: 162014 EN-1

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EG -DECLARATION OF COMPLIANCE
Directive 2006/42/EG, Annex II-B

Manufacturer: TRIDEC, Transport Industry Development Centre B.V.
Address : Ekkersrijt 6030,
5692 GA Son,
the Netherlands
hereby declares that the product:

Model : EF-S system

Product number :

613977 / 613996 : 613975 / 613997 / 613976 / 617403
Commercial name : EF-S system
to which this declaration refers, is in compliance with the provisions stipulated in the following guideline:

- ECE Regulation 10, Rev.5

Quality control by:

SGS-International Certification Services GmbH,

Rödingsmarkt 16,

D-20459 Hamburg

Germany

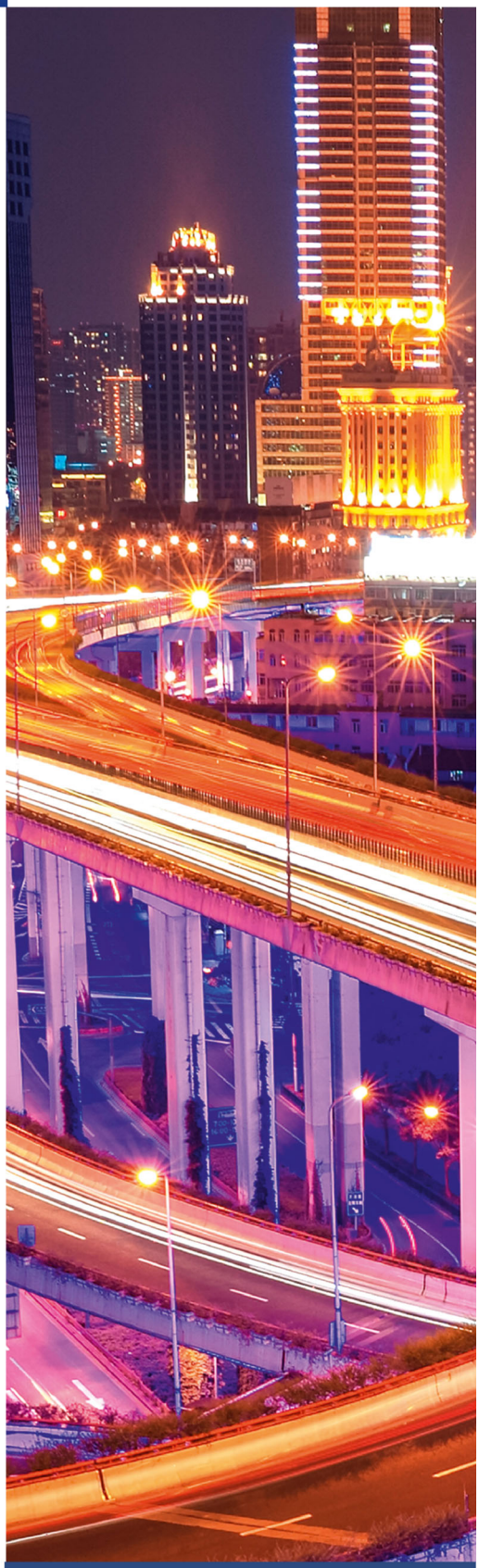
Conducted at Son 1 20-04-2016, the Netherlands

TRIDEC

Frans Lipman

Director

CE



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Foreword

This guide is intended for drivers and/or other EF-S system users and contains the necessary TRIDEC information regarding the use of the EF-S system. This User manual must always be stored in the vehicle.

A separate maintenance and repair manual for service technicians is available on the website: www.tridec.com .

Separate installation instructions for the system are supplied upon delivery of the EF-S system.

Effective use:

The EF-S system system is not designed to be used independently. It has been designed to be mounted as an external steering system to a trailer/semi-trailer. Any modifications whatsoever could compromise the safety of the system. Both the TRIDEC product guarantee and the homologation shall be rendered invalid if these products are modified without written consent from TRIDEC. All guarantee claims against TRIDEC or suppliers of the EF-S system shall be declared invalid if the EF-S system is not installed according to the instructions supplied by TRIDEC.

Prior to putting the system into service, compliance with the applicable national road traffic regulations must be established for the trailer on which the system is installed. The system may only be used in accordance with the manual for the truck and any other trailer manuals. The diagrams in this manual are only included as examples and are not intended for any other purposes. Images shown may vary slightly from the system supplied.

All safety information is outlined in chapter 9 (see "Safety & environment" on page 69). Safety risks are depicted using pictograms in all other chapters.

This manual is based on firmware version B0.02.06

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Date of issue: 05 October 2020 Original version: 1.0

1 Description

The following paragraphs contain information about the components that make up the EF-S system and how the system works.

1.1 Operation

The EF-S system is a total system developed by TRIDEC. Its purpose it to steer trailers/semi-trailers with one or more steered axles.
It allows the driverto alter the steering angle of the wheels on the steered axles when manoeuvring a trailer/semi-trailer, which makes manoeuvring easier. Once the manoeuvring has been completed, the wheels can be turned back to the driving direction, either manually or automatically.
The EF-S system allows the driver to steer the trailer/semi-trailer either manually or automatically. When the “Automatic” function is active, the EF-S system only steers according to the Ackermann principle *(see Figure 1-1)*.

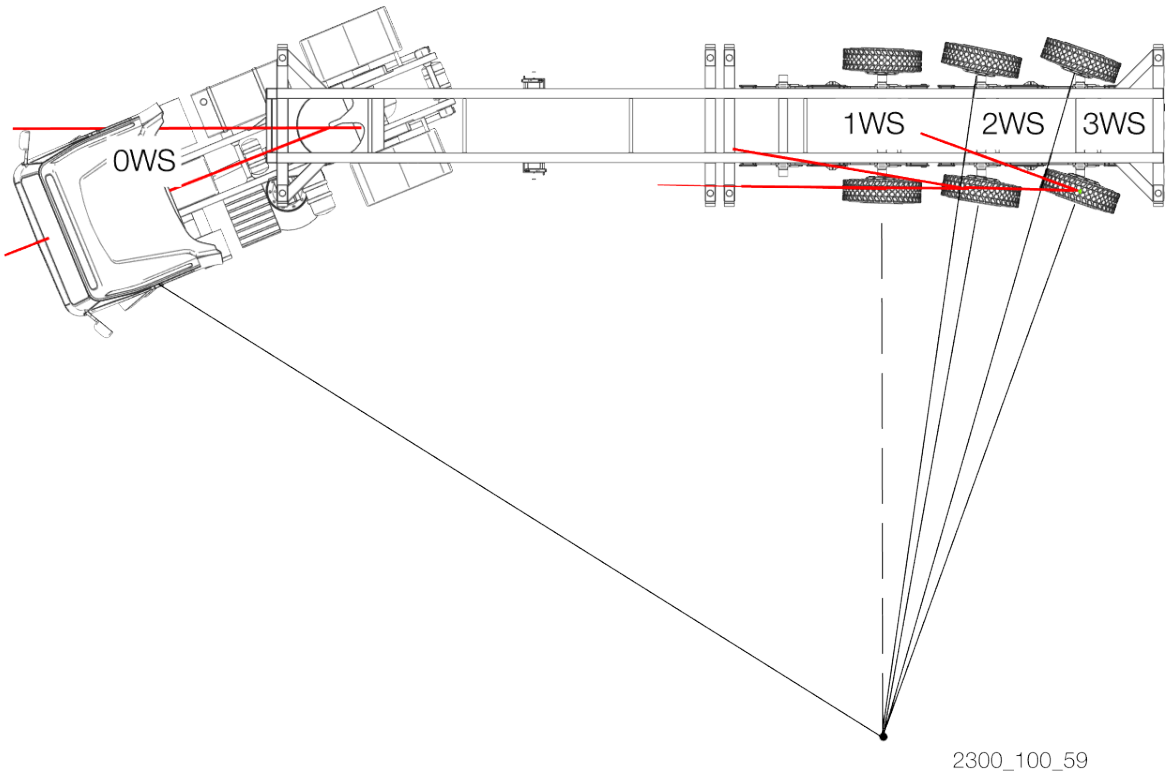


Figure 1-1

With the Ackermann principle, each steered wheel draws a circle. The middle points of these circles are all in the same place.
The wheels of the trailer turn depending on the angle (0WS) (see "System info" on page 74) between the tractor unit and the trailer/semi-trailer. These angular rotations are determined in advance and are set per axle in the EF-S system’s program. The EF-S system has a centring circuit and a number of steering circuits (dependent on the order).

During automatic steering, the angular rotation of the wheels of the trailer/semi-trailer is 100% up to a vehicle speed of 30 km/h*(see Figure 1-2)*. That means that the steering angles of the trailer's wheels are exactly the same as the pre-set angular rotations. The angular rotations reduce at a speed of 30-50 km/h. They are, therefore, smaller than the pre-set angles. At speeds above 50 km/h, the wheels of the trailer/semi-trailer are no longer steered when the tractor unit changes direction. The centring function automatically becomes active at a speed of more than 65 km/h.

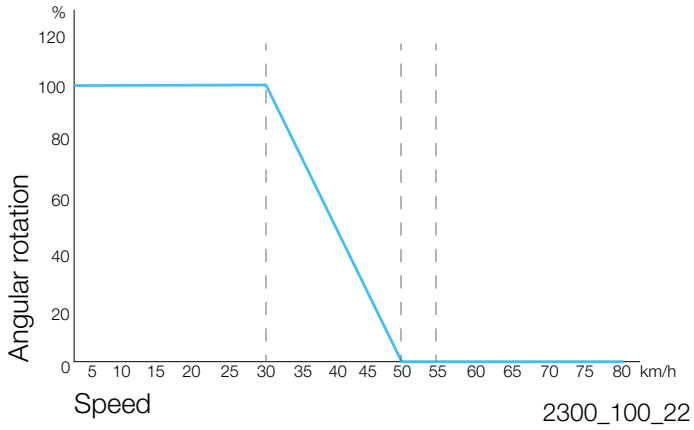


Figure 1-2

The EF-S system uses two EBS signals:

- The speed signal
- The on/off signal

To determine the speed of the articulated vehicle, the EF-S system uses the speed signal. The on/off signal is used to start the battery-charging main control unit when EBS becomes active.

For the EF-S system to work correctly, the wheels of the trailer/semi-trailer must be aligned according to the specifications.

Manually, the wheels can be steered according to both the Ackermann principle and the crab steering principle *(see Figure 1-3)*.

Should an error occur while driving in a bend, then the steering behavior will be different and this will affect the covered track of the trailer/semi-trailer combination.

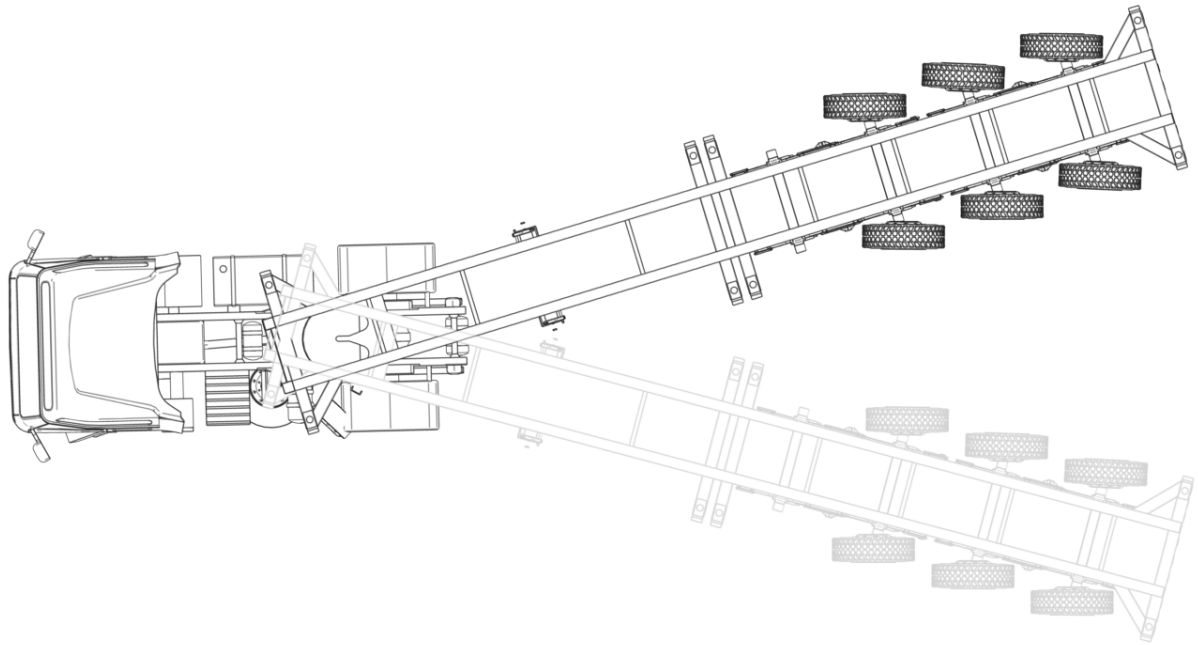


Figure 1-3

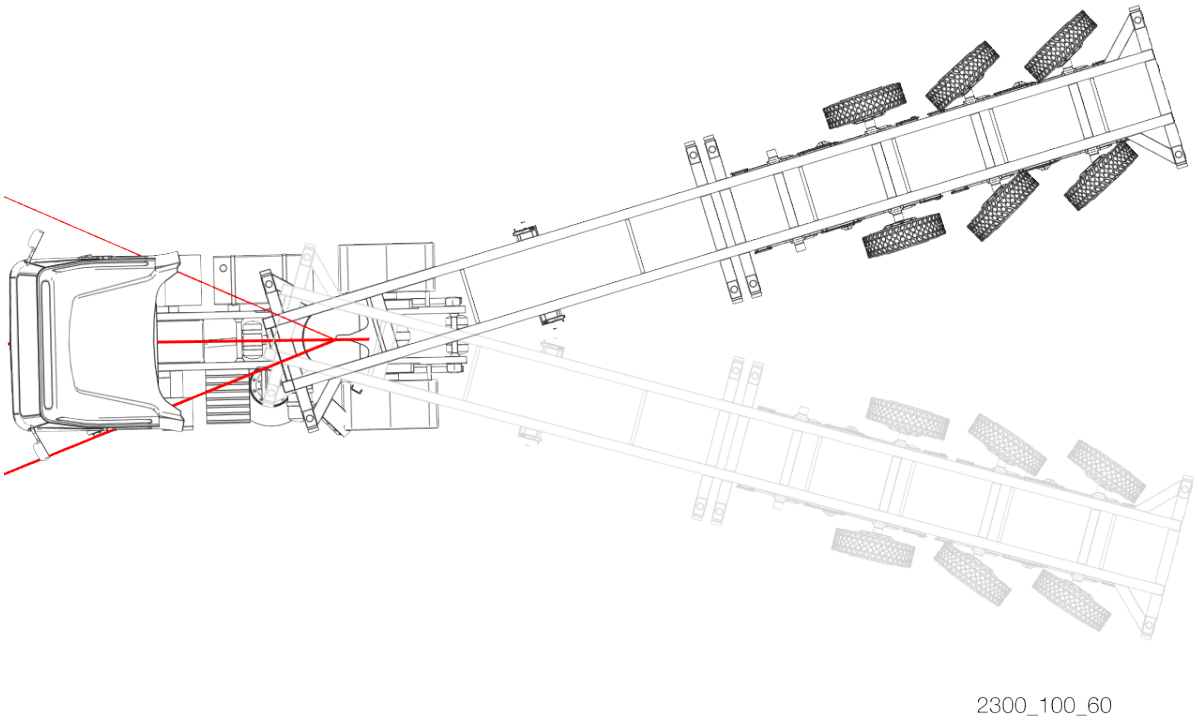


Figure 1-4

1.2 Components

The EF-S system consists of the following main components:

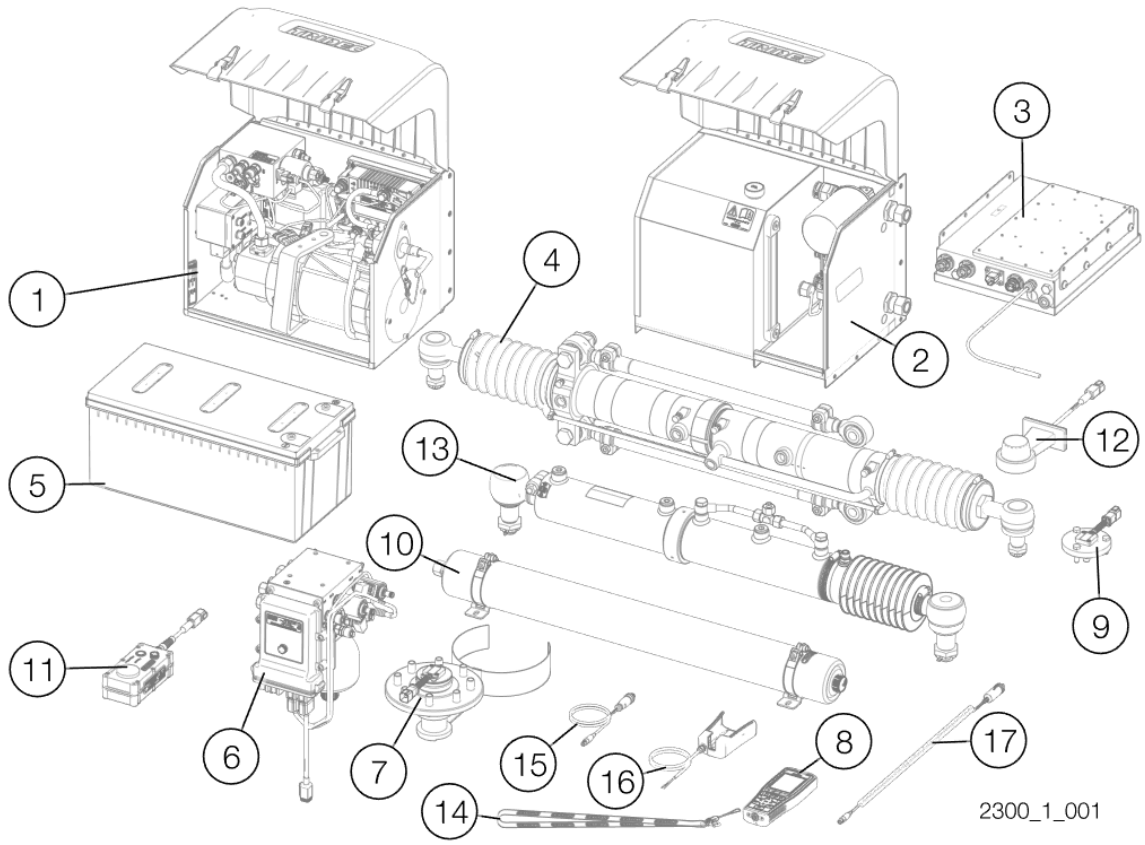


Figure 1-5

1. Generator box
2. Tank/filter box
3. Battery charger
4. Steering/centring cylinder
5. Battery
6. Hydraulic control unit
7. Kingpin with angle sensor
8. Remote control
9. Steering angle sensor
10. Accumulator
11. Bluetooth module
12. Signaal lamp
13. Stuur-/ centreercilinder SRE
14. Keycord
15. Synchronization cable
16. Holder
17. Charging cable remote control

1.3 Battery charger

The batteries for the EF-S system are charged by the generator via the NATO connection with a charging current of no more than 45 A when the tractor unit's engine is running.

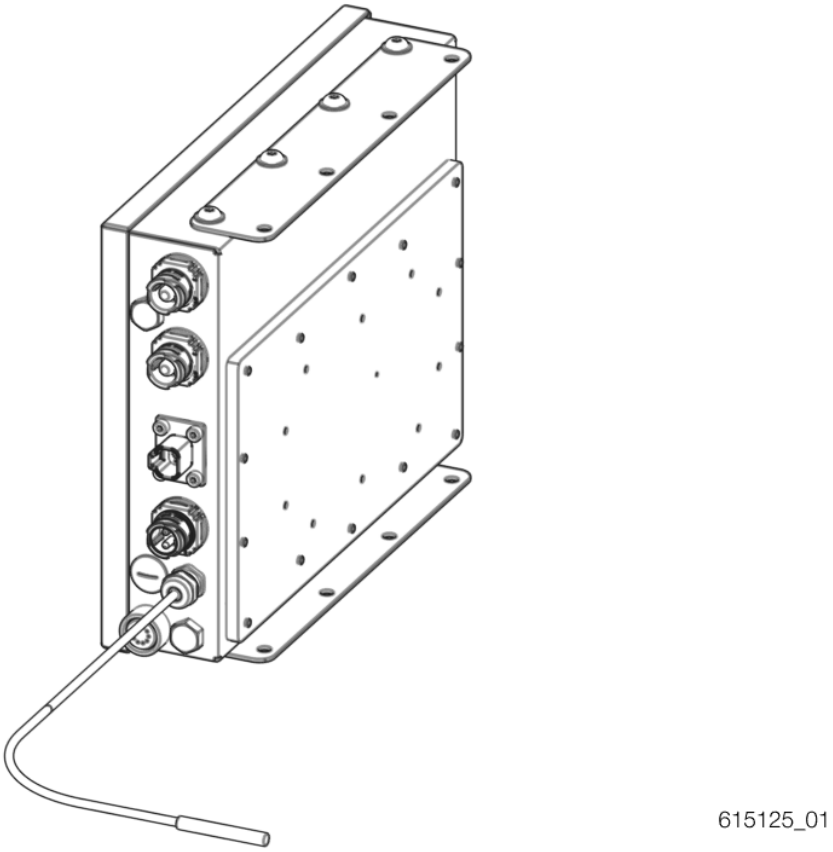


Figure 1-6

The intelligent charger measures the temperature of the batteries. This makes it possible to adjust both the charging current's amperage and charging voltage to the temperature. At a low battery temperature, a higher amperage and voltage are required to keep the battery at the desired voltage. At a higher temperature, the amperage and the voltage can be lower. The charger can provide a maximum current of 45 A. The charger is protected by two fuses. The input has an automatic fuse, while the output has a 60 A replaceable fuse. The charger is sealed. The fuse may only be replaced after permission has been granted by TRIDEC.

The warranty is invalidated if the seal is broken without permission to do so from TRIDEC.

1.4 Warning light

The EF-S system has a warning light. This light has three colour areas:

- Red
- Orange
- White

Each colour area has a separate function and can light up.

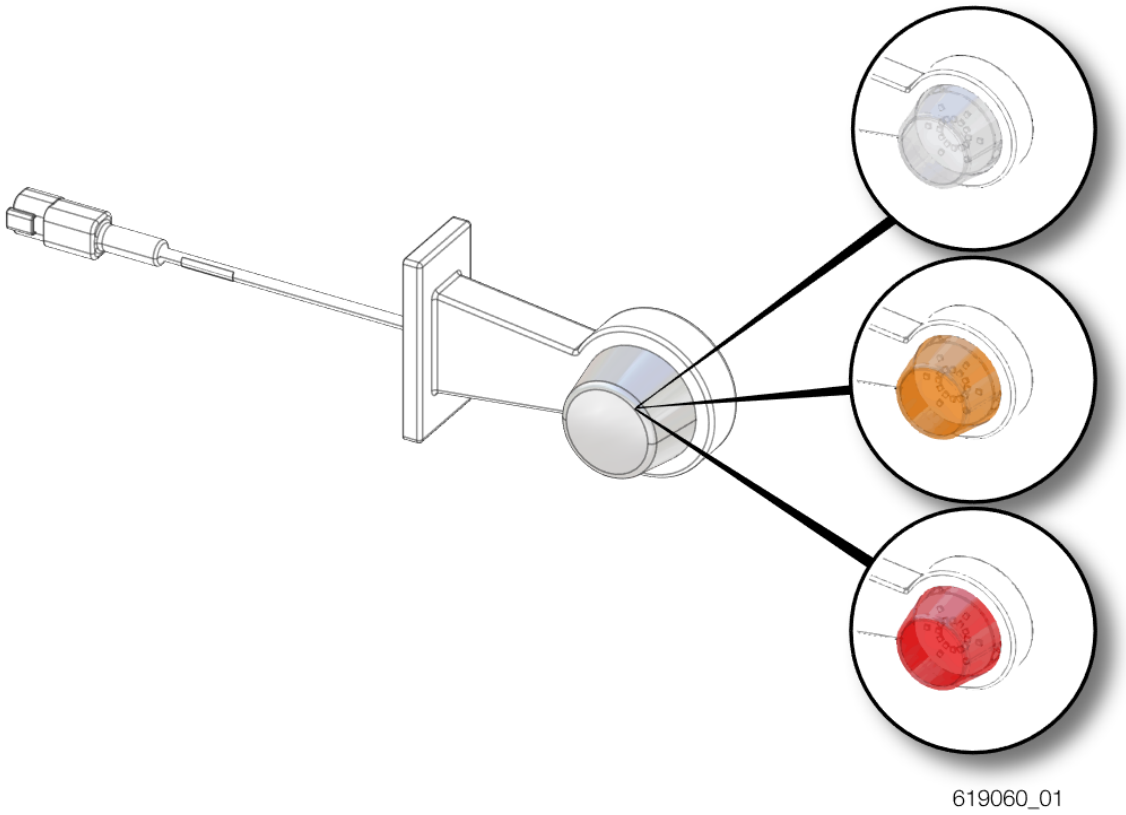


Figure 1-7

The white warning light indicates that the EF-S system does not have any faults and is ready for use. When the system pressure is reached, a message will appear on the display.
By pressing GO you activate the steering system and the signal light will go out.
The orange light indicates a system error or that the system is not yet ready for use. It is still permitted to drive the trailer/semi-trailer. If the red warning light is lit, it is **NOT** permitted to drive the trailer/semi-trailer. Contact the service workshop for further instructions. The warning light must be located in a position where it can easily be seen from the tractor unit's cabin.

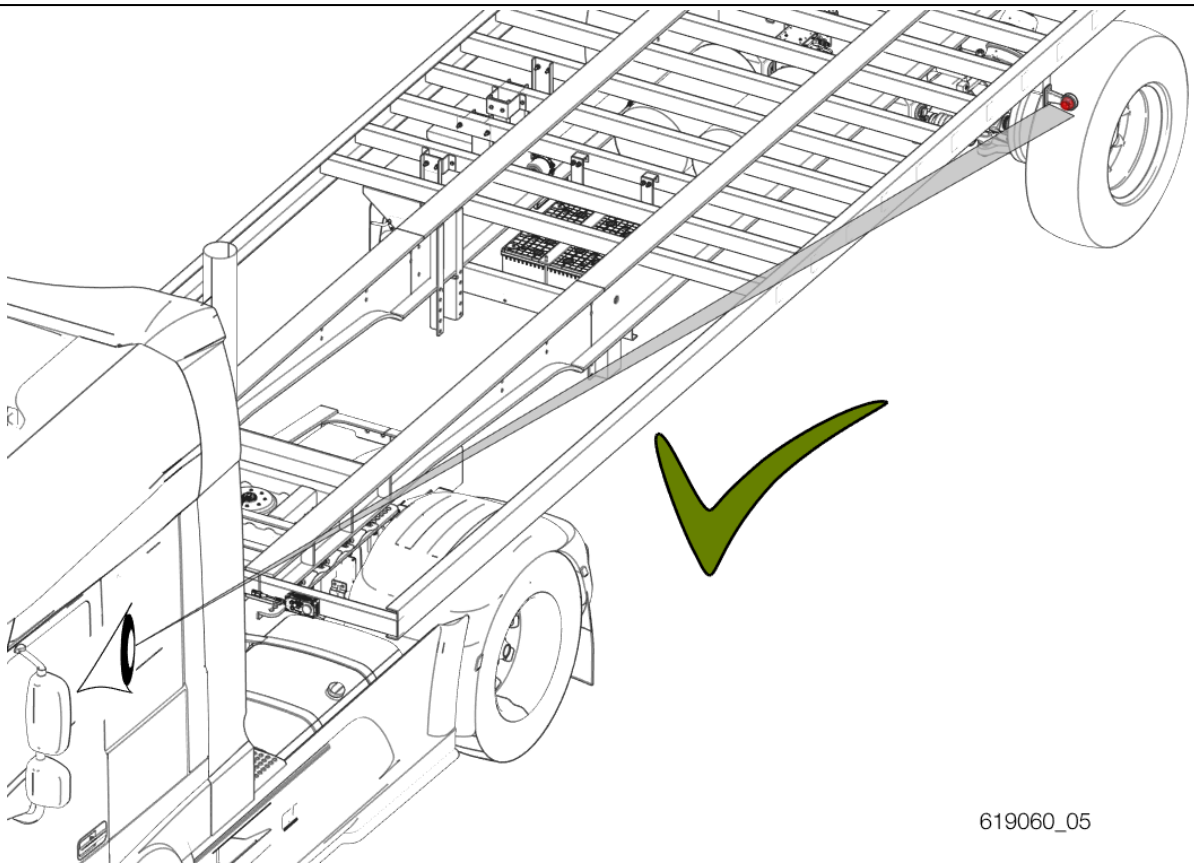


Figure 1-8

2 Remote control

For safety reasons, moving parts must remain in view of the operator when the remote control is used.

The remote control *(see Figure 2-1)*is part of the EF-S system. The EF-S system can be operated with the remote control via a wireless connection (Bluetooth) or via the synchronisation cable.

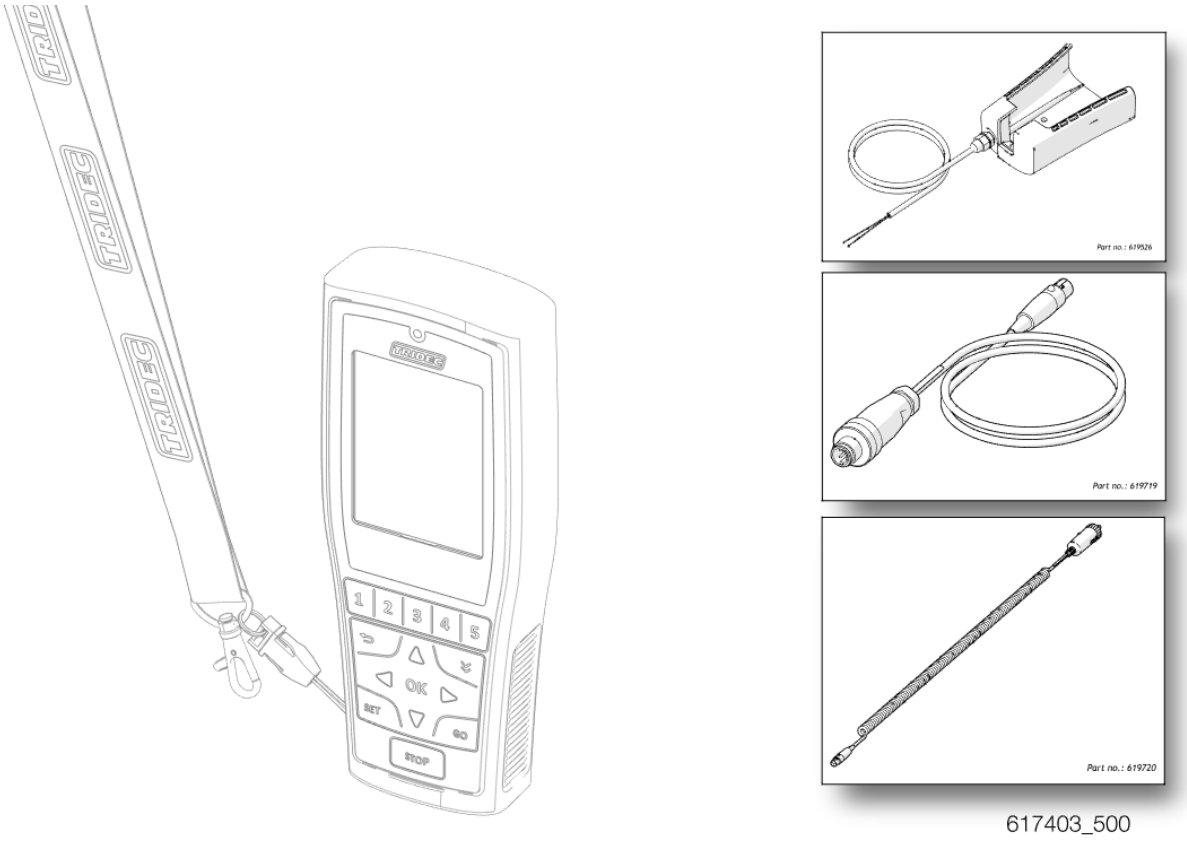


Figure 2-1

The following accessories are available for the remote control:

- A synchronisation cable to synchronise the remote control with a computer.
- A holde, also charger.
- A charging cable. This cable can be used to connect the remote control to a 12 V or 24 V socket.
- A belt.

The remote control is automatically activated when it is connected *(see Figure 2-2)* to the tractor unit's cigarette lighter and when the ignition key is rotated to the accessory position or further.

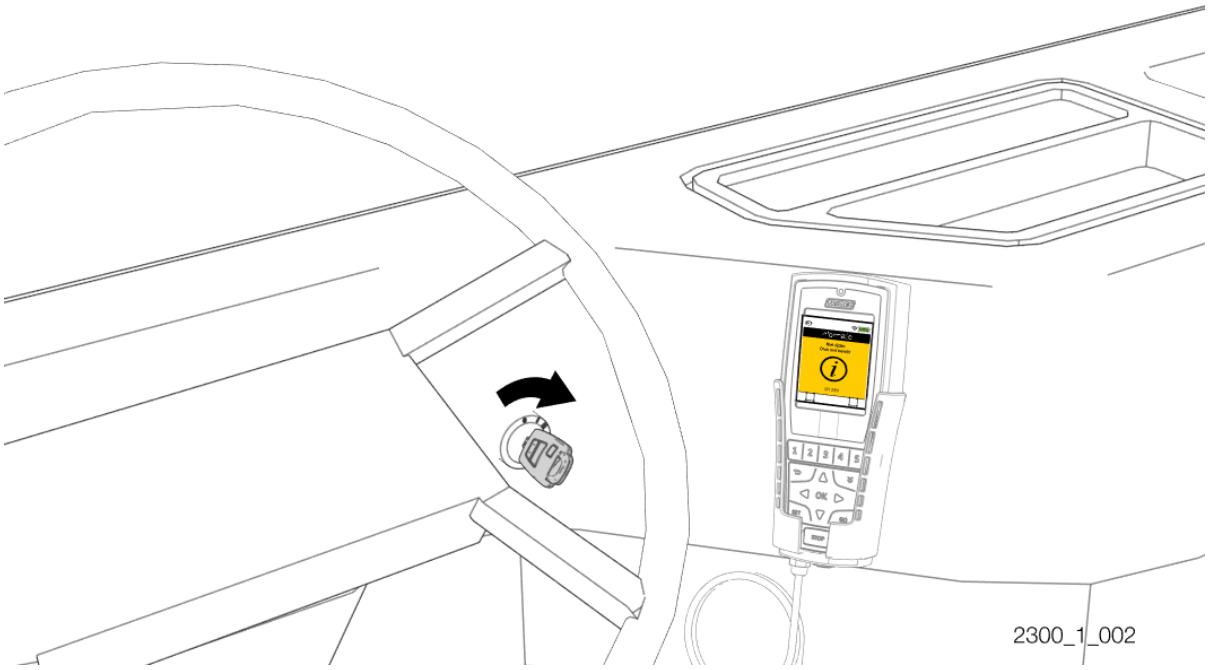
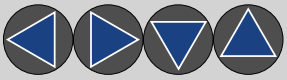


Figure 2-2

2.1 Function keys

In addition to a screen, the remote control also has a number of keys. Use these keys to activate functions or to select menus.

Figure 2-3

No.	Item	Description
1	Screen	
2		Navigate to the next page in the menu.
3		Activate selected functions.
4		Select "System info" or activate automatic functions.
5		Go back to previous page
6		Order-specific menus are linked to the numeric keys.
7		■ Turn the remote control on and off. ■ Go back to the previous menu in the menu structure. ■ Confirmation of message.
8		Select "Setting" or restart the EF-S system.
9		This button has no function with the EF-S

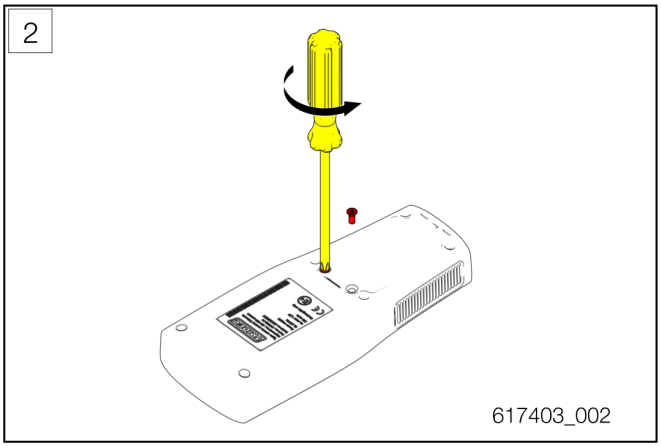
Keys on the remote control.

2.2 Replacing the batteries

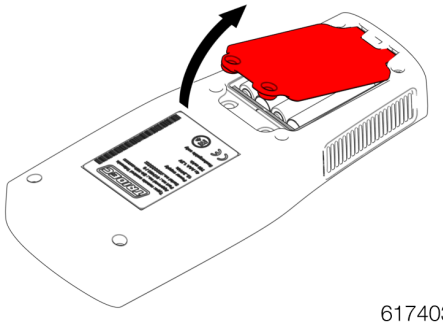
When the batteries have reached the end of their service life, the following message is displayed at the bottom of the screen while charging.

Figure 2-4

- The batteries may only be replaced with rechargeable NiMH (Nickel Metal Hydride) AA-size batteries with a recommended capacity of 2000 mAh.
- The batteries must be removed if the remote control is not going to be used for an extended period of time (longer than one month).
- Do not place fully discharged batteries in the remote control. The system does not have sufficient capacity to charge them.
- Remove the batteries from the remote control when they are fully discharged and recharge them in a charging station.

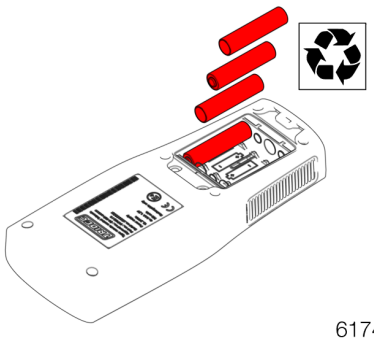


3



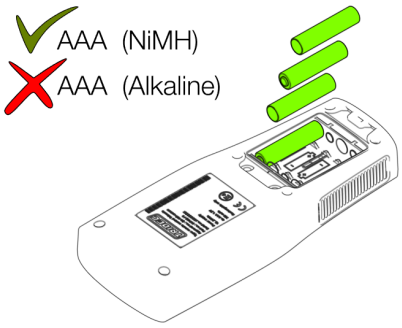
617403_003

4



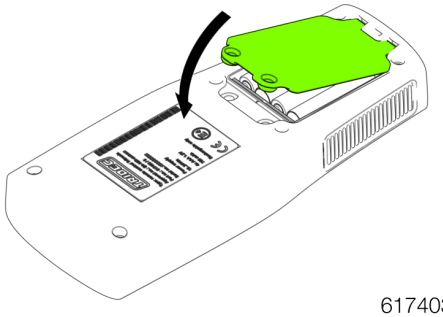
617403_004

5



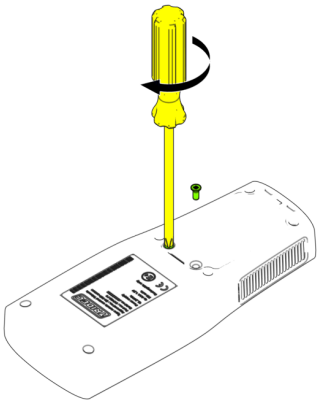
617403_005

6



617403_006

7



617403_007

8

617403_502

Charging the batteries

The batteries in a remote control can be charged in the following ways:

- Using the supplied holder (this is connected to a power source).
- Using the synchronization cable, which can be connected to the distribution box *(see Figure 2-5)* in the generator box.

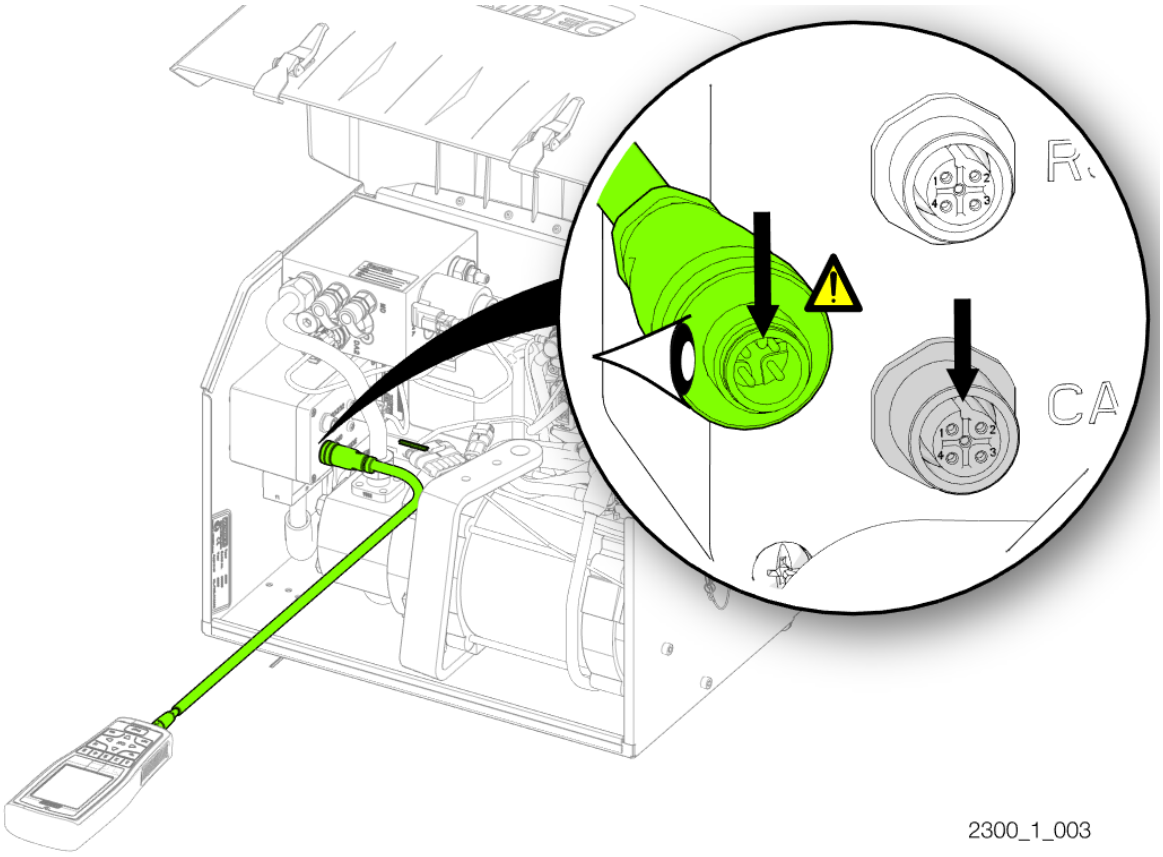


Figure 2-5

The batteries are not overcharged if the remote control is left connected to a 12 V or 24 V power source for an extended period of time.

The following information is displayed on the screen when the remote control is connected to a power source (in. 9V).

617403_503

Figure 2-6

When the remote is turned off and connected to a power source, the following message will appear on the screen.

617403_222

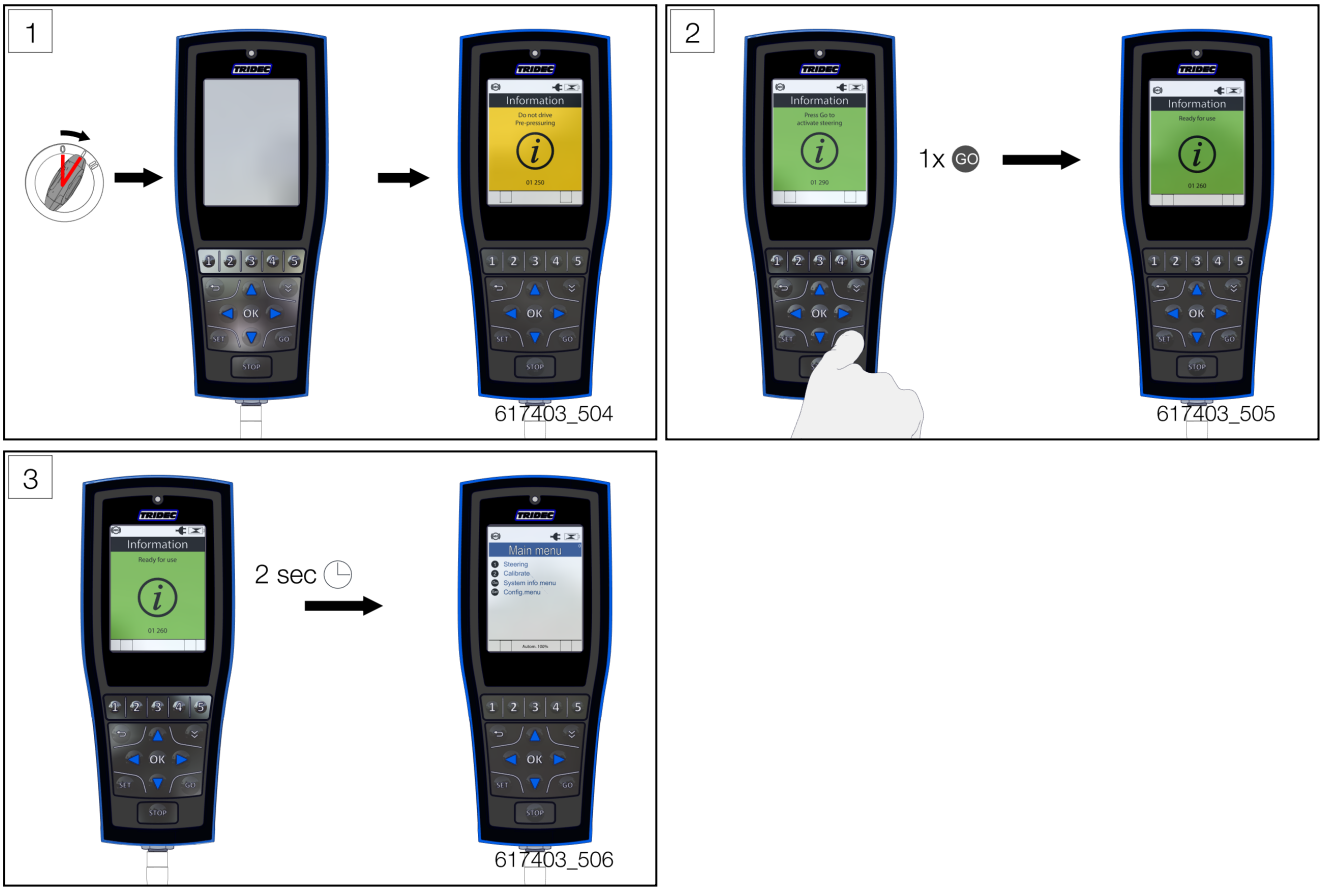
Figure 2-7

2.3 Turning on and off

The way in which the remote can be turned on depends on whether it is connected to the tractor unit's 12 V or 24 V connection or not.

2.3.1 Connected to the 12 V or 24 V connection

1. *Carry out the instructions given below to turn on the remote control (the ignition switch must be in the accessory position or further).*



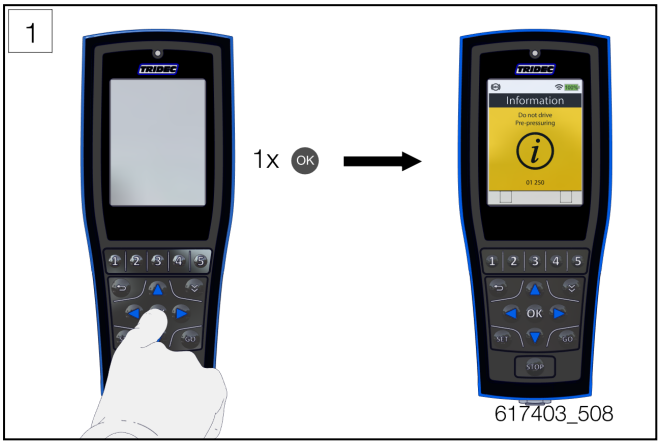
2. *Carry out the instructions given below to turn off the remote control.*

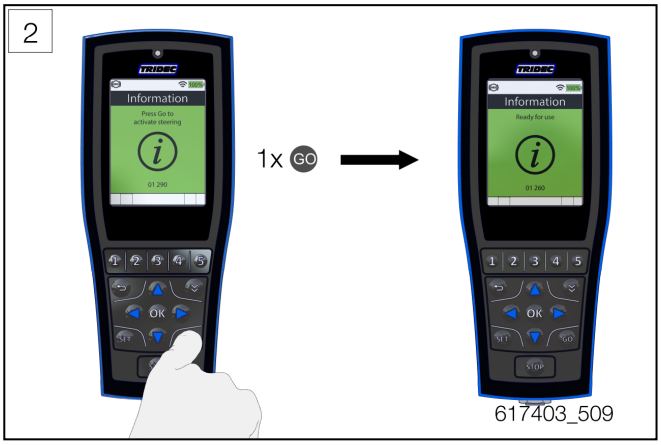
The EF-S system starts the shutdown procedure (it can be delayed) when the ignition key is turned to position “0”. This takes some time to complete. Various messages are displayed on the screen. The remote control is turned off after the shutdown procedure has been completed.

2.3.2 Not connected to the 12 V or 24 V connection

Procedure:

1. Carry out the instructions given below to turn on the remote control.





2. Carry out the instructions given below to turn off the remote control.

Connect the remote control to the charger after use.

Note: The EF-S system is not turned off if the remote control is turned off while it is not connected to the voltage source (12V or 24 V)! The orange warning light is lit to indicate that the remote control is turned off *(see Figure 2-8)*.

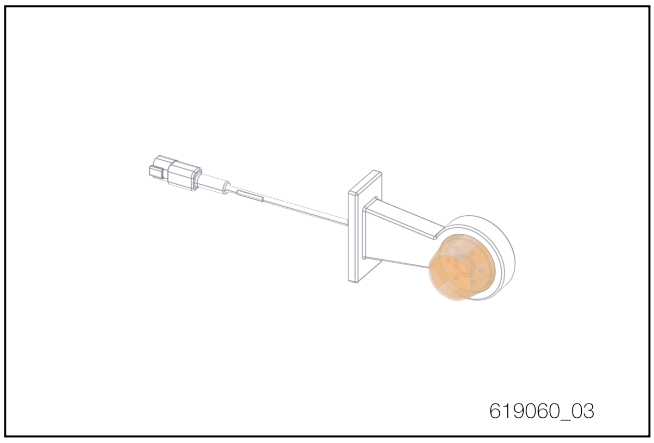


Figure 2-8

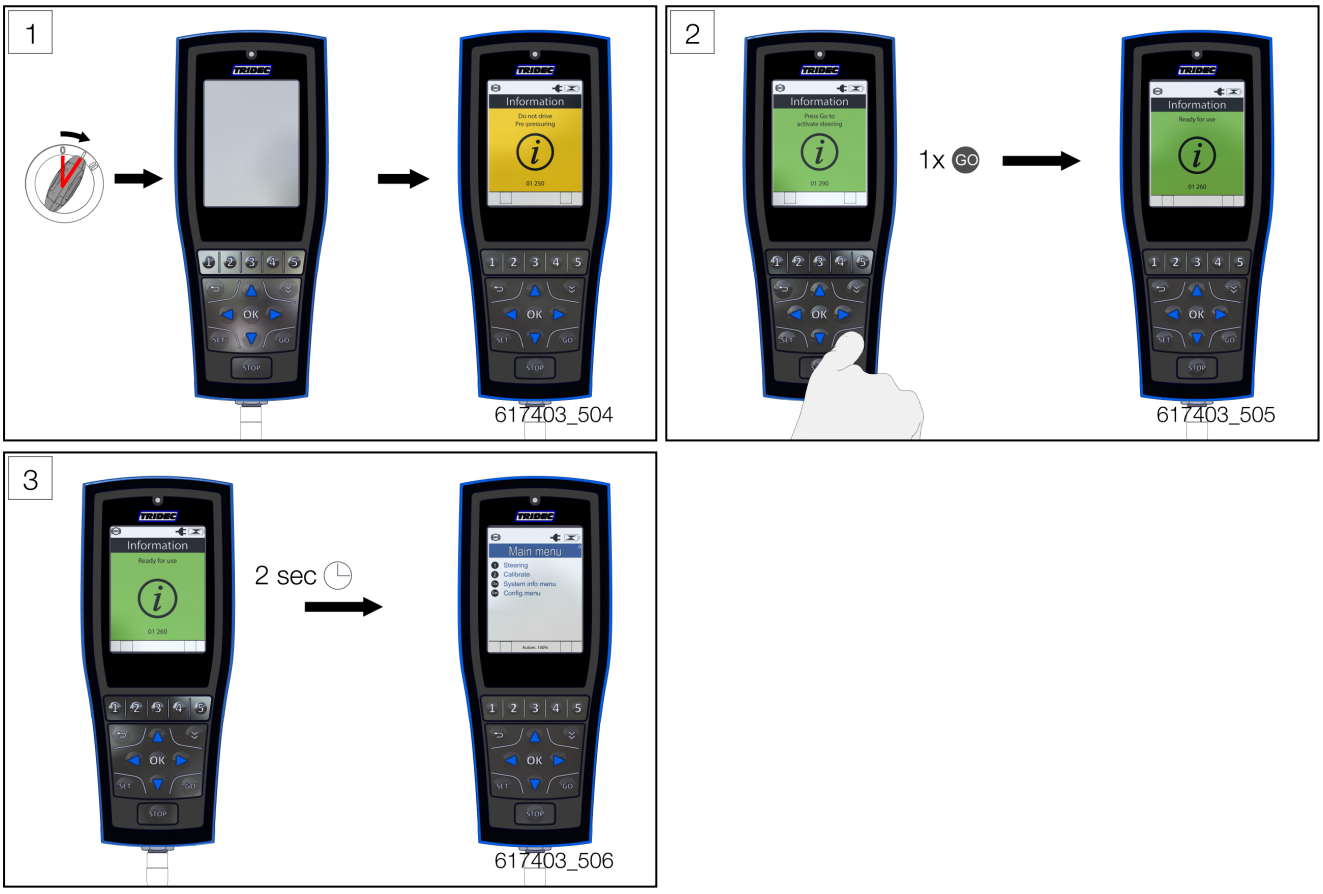
2.4 Selecting the language

The remote control's default start-up language is order specific. Other languages can be selected manually.

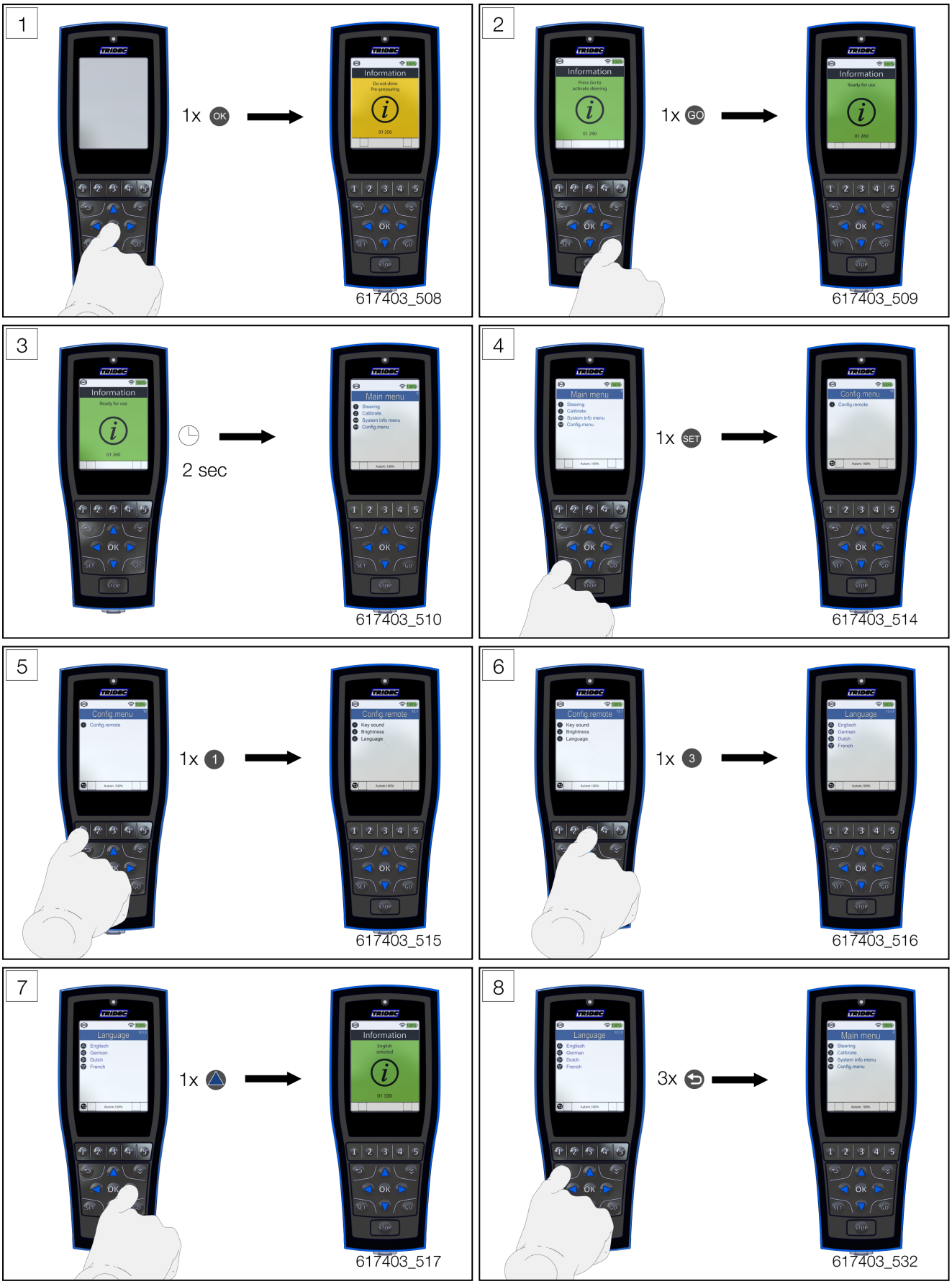
1. *Follow the procedure below to select English.*

Procedure

- Connected to the tractor unit's 12 V or 24 V connection (then continue with, Not connected to the 12V-24V connection of the tractor step 4).



- Not connected to the tractor unit's 12 V or 24 V connection.

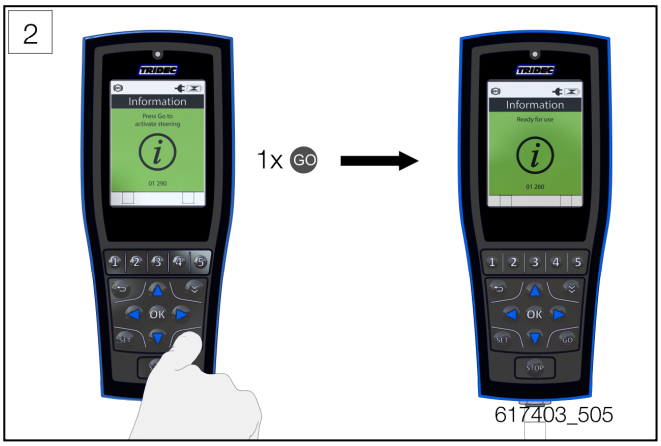

1
1x OK
617403_508
2
1x GO
617403_509
3
2 sec
617403_510
4
1x SET
617403_514
5
1x 1
617403_515
6
1x 3
617403_516
7
1x
617403_517
8
3x
617403_532

2.5 Screen brightness

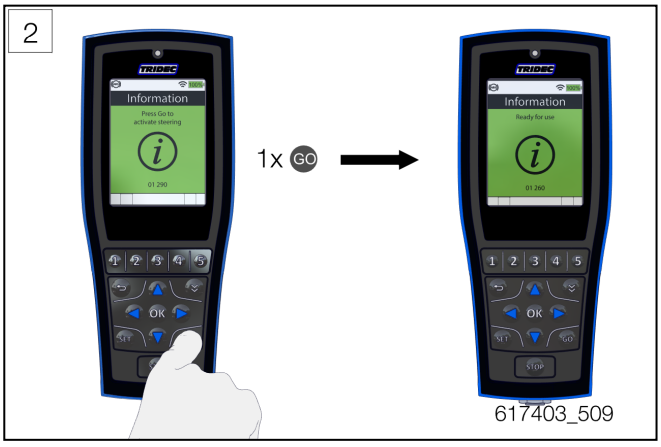
1. *Follow the procedure below to adjust the screen brightness.*

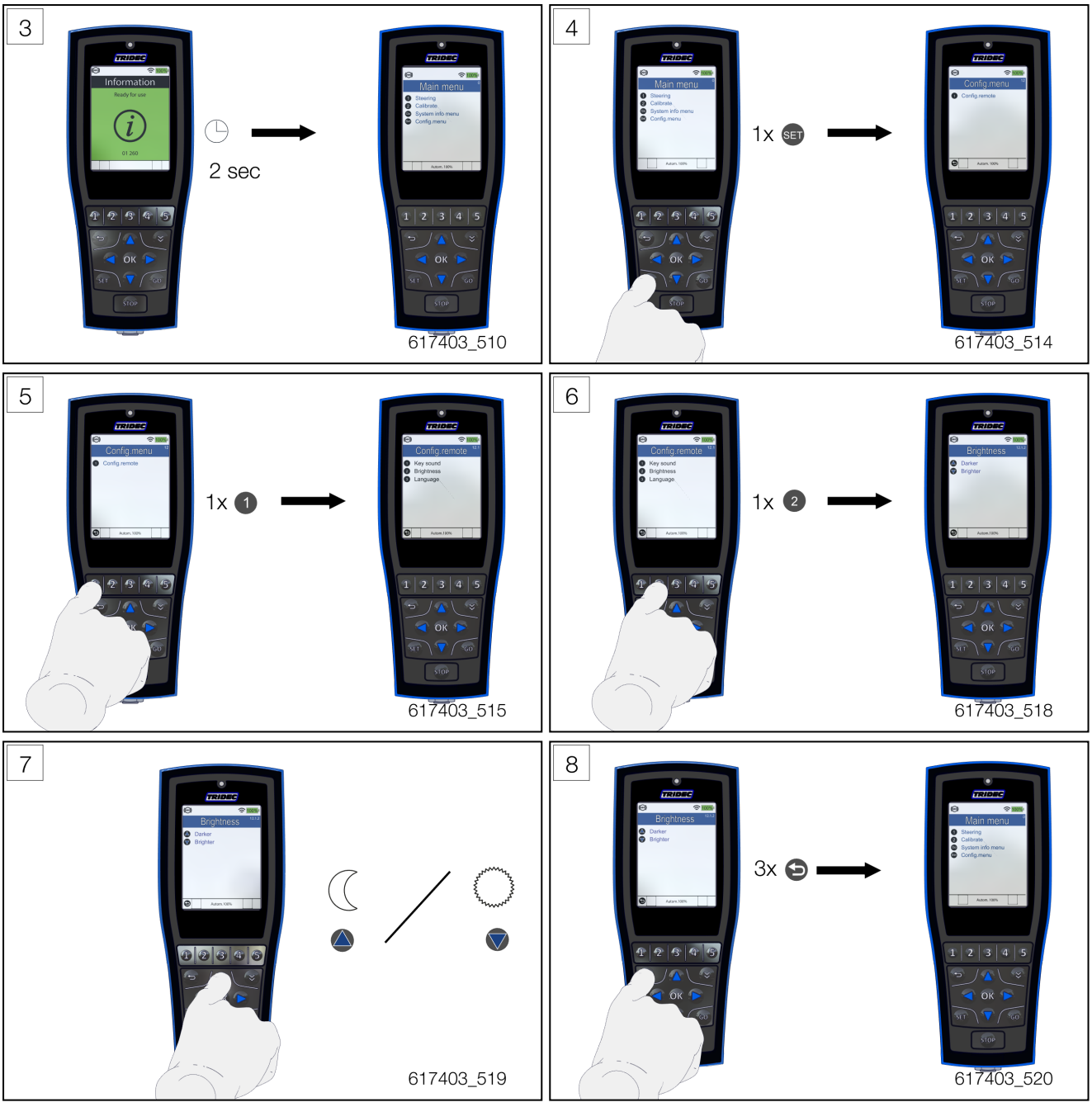
Procedure

- Connected to the tractor unit's 12 V or 24 V connection (Then continue with, Not connected to the 12V-24V connection of the tractor step 4).



- Not connected to the tractor unit's 12 V or 24 V connection.




3
Information
2 sec
Main menu
617403_510
4
Main menu
1x SET
Config.menu
617403_514
5
Config.menu
1x 1
Config.remote
Key sound
Brightness
Language
617403_515
6
Config.remote
1x 2
Brightness
Darker
Brighter
617403_518
7
Brightness
Darker
Brighter
617403_519
8
Brightness
3x
Main menu
617403_520

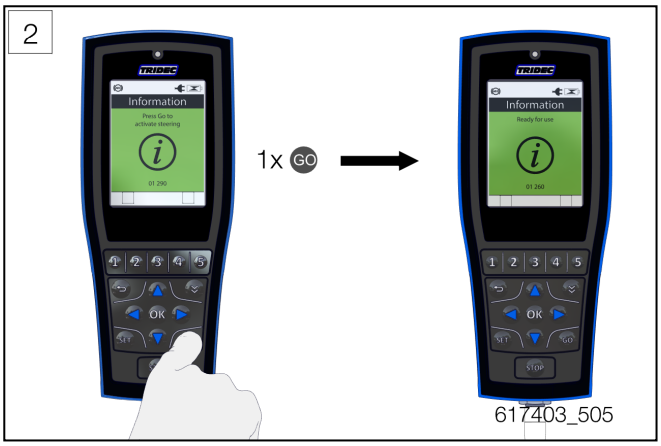
2.6 Configuring key sounds

1. *Carry out the instructions given below to turn the key sounds on or off.*

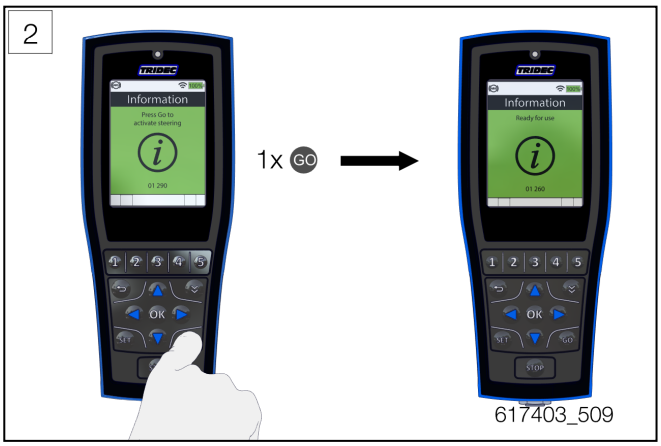
> The "*" sign indicates whether the key sounds are turned on or off.

Procedure

- Connected to the tractor unit's 12 V or 24 V connection (Then continue with, Not connected to the 12V-24V connection of the tractor step 4).

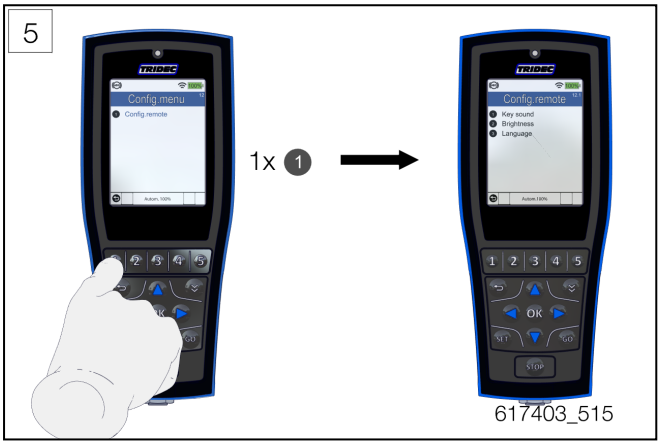


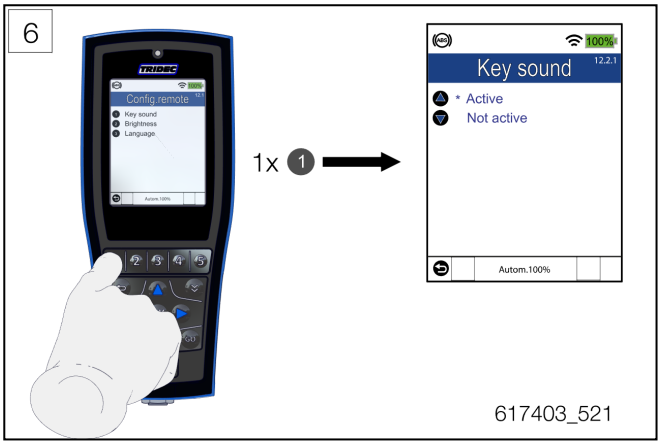
- Not connected to the tractor unit's 12 V or 24 V connection.




3
Information
2 sec
Main menu
617403_510


4
Main menu
1x SET
Config.menu
617403_514


5
Config.menu
1x 1
Config.remote
Key sound
Brightness
Language
617403_515


6
Config.remote
1x 1
Key sound
Active
Not active
Autom.100%
617403_521


7
Key sound
617403_522


8
Key sound
3x
Main menu
617403_523

2.7 Connecting to a computer

The remote control can be connected to the main control unit in two ways:

1. Wireless via Bluetooth.
2. Via the synchronisation cable.

The icon is displayed on the screen if there is a Bluetooth connection between the remote control and the main control unit.
The icon is displayed on the screen if the remote control is connected to the distribution box by a cable.
A message is displayed on the screen if a wireless connection cannot be made.

617403_524

The diagram *(see 2.7)* shows in which situations a Bluetooth connection is possible and/or when data transfer is taking place between the remote control and the main control unit.

2.7.1 Synchronization

It is only possible for the EF-S system's main control unit to communicate with a Bluetooth device (remote control) after the Bluetooth device has been registered in the main control unit. This prevents just any Bluetooth device from being able to communicate with the main control unit.
Communication between the Bluetooth module and the remote control can be interrupted for the following reasons:

- The distance between the Bluetooth module and the remote control is too great.
- There is a large object situated between the remote control and the Bluetooth module.
- The connection between the Bluetooth module and the remote control has been interrupted.
- The Bluetooth module is faulty. The warning light is lit orange. The corresponding message can only be viewed by the Service department.
- The remote control has not been registered in the main control unit (e.g. after replacing the remote control).

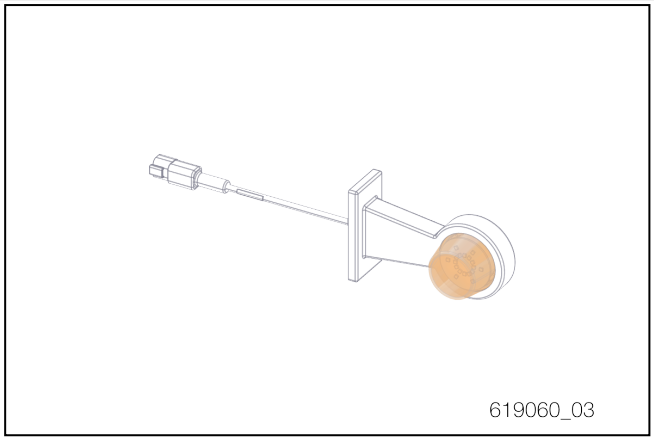
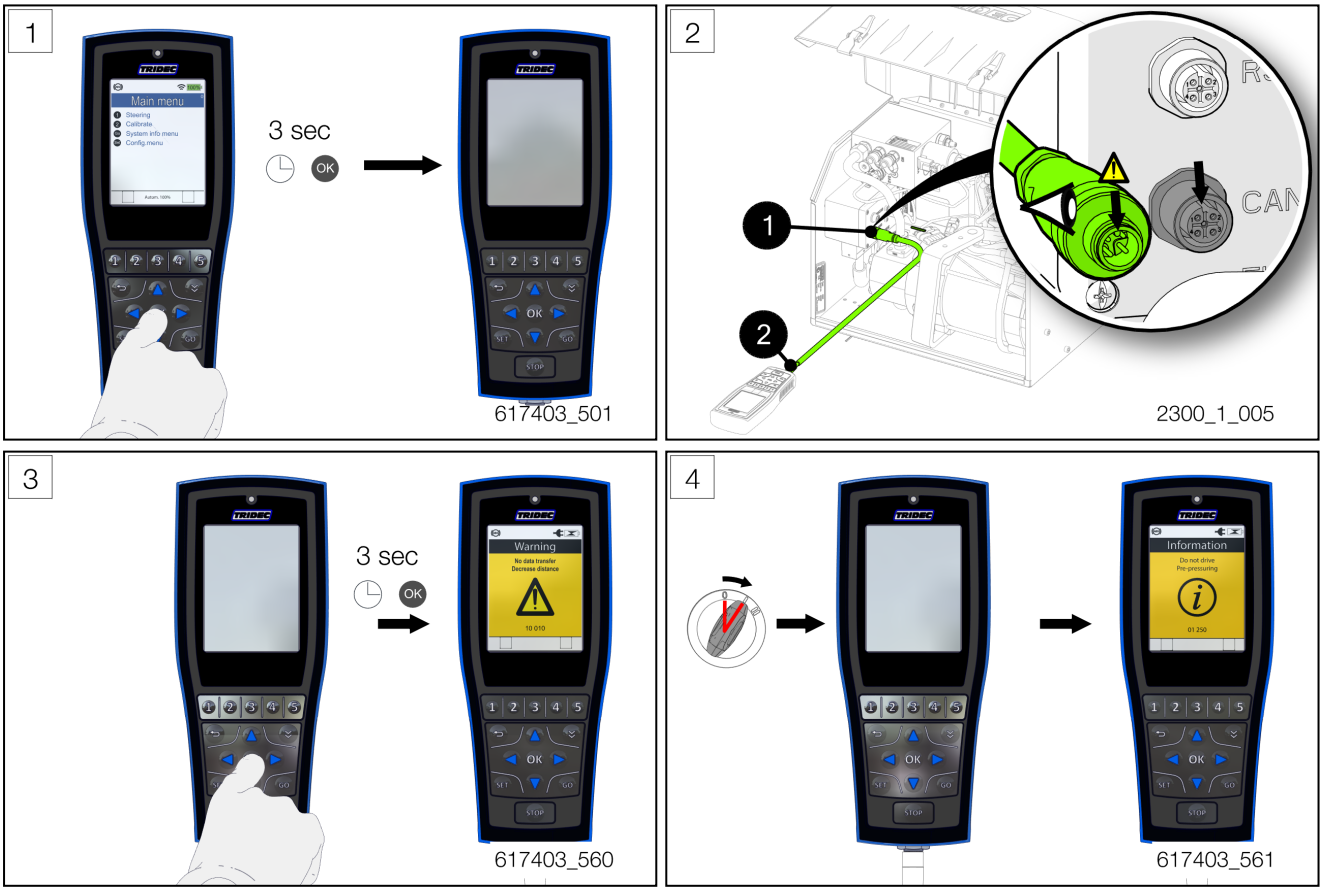


Figure 2-9

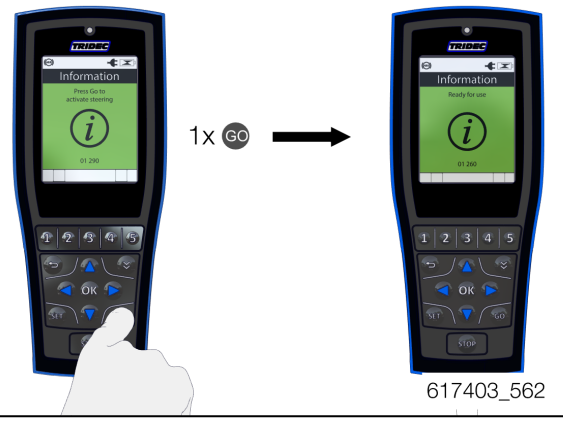
2.7.2 Registering a new remote control

Procedure:

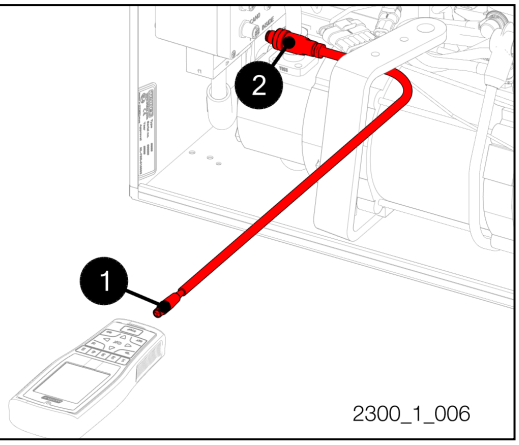
1. *Carry out the following to register the remote control.*



5



6



7

The trailer/semi-trailer must be coupled and fully connected.

2.8 Stop button

A stop function is included in the remote control program .As soon as the corresponding button STOP is pressed, nothing happens, in a later version all running processes will be stopped.

The button STOP is NOT an géén The button is not an EMERGENCY STOP.

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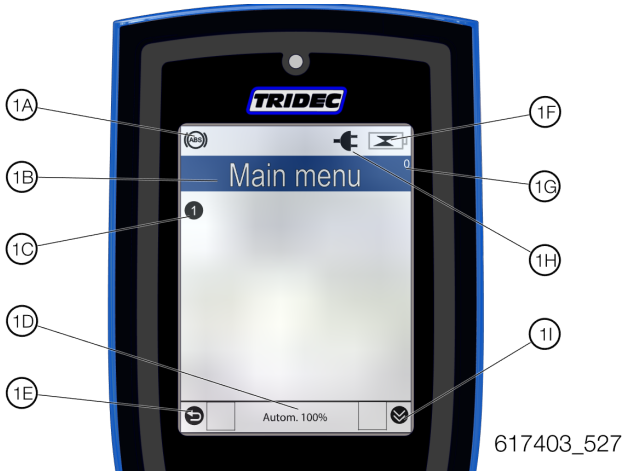
The STOP button is not intended to abort actions during normal use. In that case, use the appropriate keys or key combinations.

2.9 Icons on the display

Specific information is displayed on the screen by icons. The meaning of each of these icons is described in the table.



Afb.2-10

Icons and texts

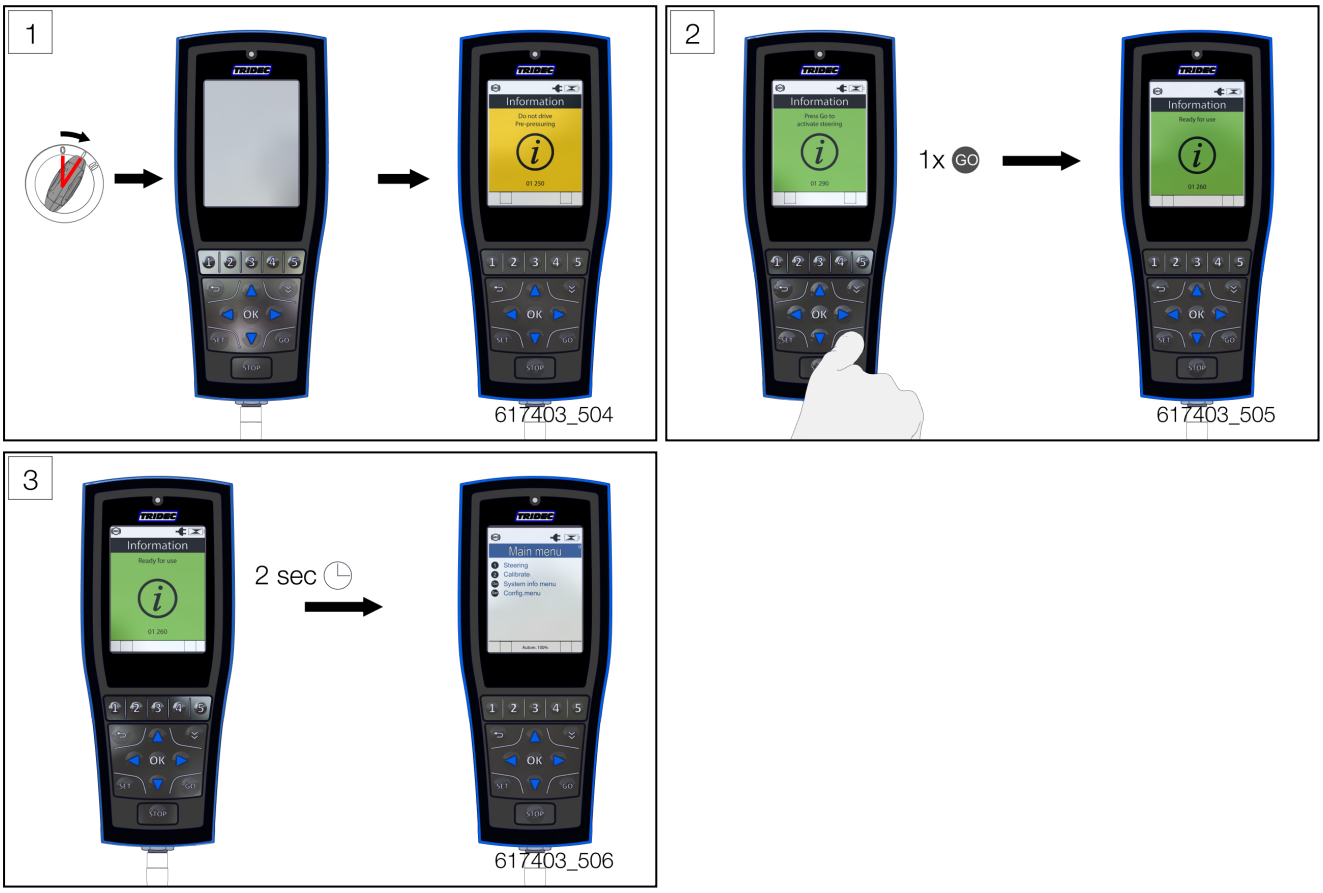
Positie	Icoon	Beschrijving
1A	ABS	ABS/EBS signal is active.
1A	-	No ABS/EBS
1B	Main menu	Text line where active menu is visible
1C	1	Numbering of options / buttons to be pressed
1D	Autom.	The wheels of the steered axles turn through an angle that depends on the towing angle.
1D	Axle rigid	The wheels of the semi-trailer / trailer are in the straight-ahead position.
1D	Calibrate	The trailer / semi-trailer wheels turn to the straight ahead position and the kingpin sensor value is set to 0.
1D	Crab steer	Crab steering makes all the wheels turn to one direction, so you can drive diagonally.l
1D	Manual	Manual steering of the semi-trailer / trailer wheels up to a speed of 15 km / h.
1D	Pressure relief	System pressure is released
1D	Pressurize	System is pressurized

Positie	Icoon	Beschrijving
1D	Pump freq.	Speed of the pump
1D	Shutting down	The EF-S system switches off
1D	Steer.angles	The angle the wheels make to the steered axle
1E		Go back 1 step in the menu
1F		Battery fully charged
1F		Battery partially charged
1F		Battery empty
1F		Battery is charging.
1G	0	Menu number
1G		Bluetooth connection active.
1H		The remote control is connected to a power source.
1I		Next page as soon as the menu consists of several pages.

Tabel-1 Icons

3 Using the EF-S system

The EF-S system is turned on when the ignition key is placed in the ignition position. First, thetractor unit's EBS system is activated. This system then turns on both the EF-S system and the battery charger. The remote control is turned on via the accessory position and starts automatically. Various messages are displayed on the remote control's screen.



NEVER drive with an articulated vehicle whose EF-S system has not been pressurized!

After the GO button is pressed, the angular rotation of the wheels of the trailer/semi-trailer is changed, if necessary, to match the angular rotation of the tractor unit with regard to the trailer/semi-trailer.

If you forget to press button GO, the EF-S system's operating system is started automatically as soon as the vehicle's speed exceeds 2 km/h or if the tractor unit is at an angle to the trailer/semi-trailer.

Before pressing the GO button, make sure there are no people or animals near the wheels because there is a risk of becoming trapped!

The EF-S system starts in two phases:

1. The hydraulic system is pressurized.
2. The system is activated.

During the first phase, the wheels of the trailer/semi-trailer do not move. During the second phase, the wheels can move.


Always select the “Automatic steering” function when driving on a public road(see "Automatic steering" on page 37).

3.1 Coupling

There is a sticker on the trailer/semi-trailer *(see Figure 3-1)*. This sticker contains information on how to couple the trailer/semi-trailer to the tractor unit.

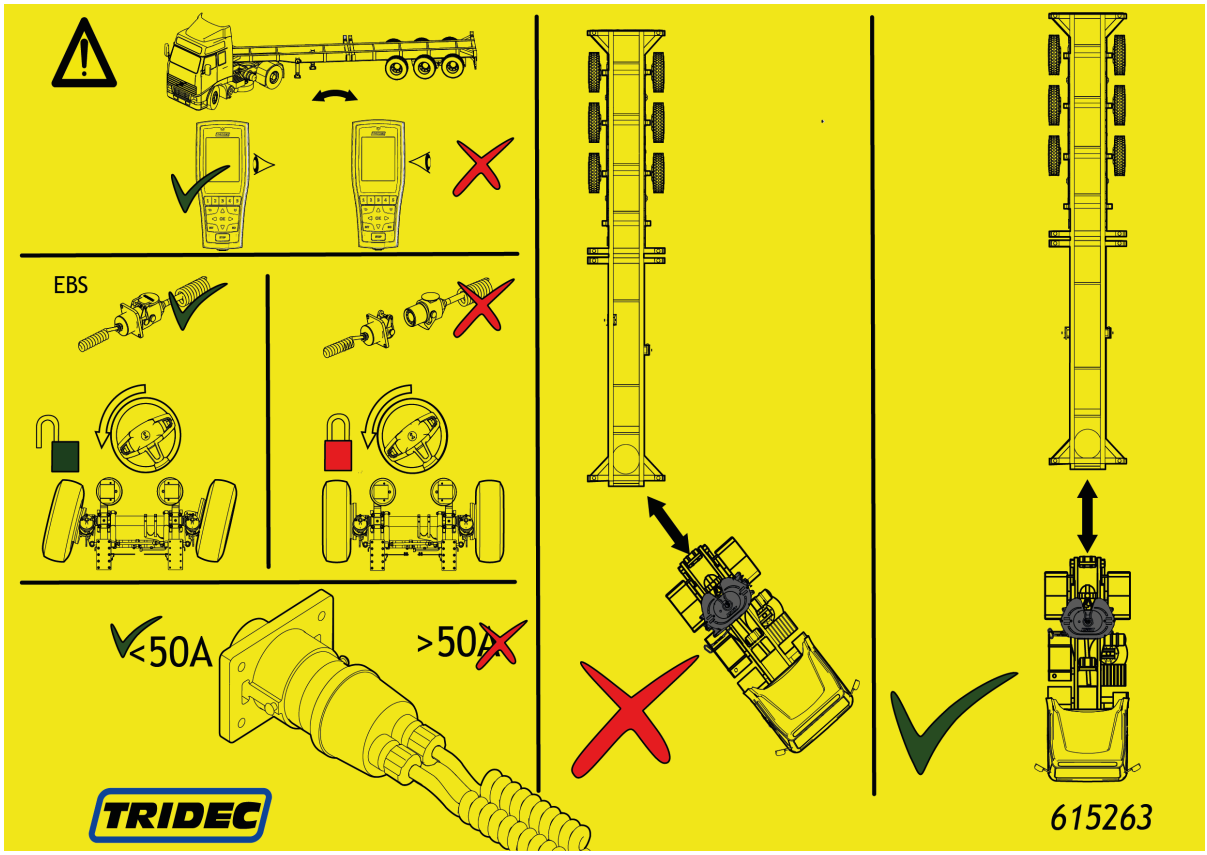


Figure 3-1

1. Always couple and uncouple the trailer/semi-trailer while it is in a straight line with the tractor unit.

DO NOT couple or uncouple the trailer/semi-trailer while it is at an angle to the tractor unit.

2. Connect or disconnect the NATO plug.

The current must be at least 50 A.

Keep the remote control within view during operation.

3.2 Main menu

The main menu of the remote control of the EF-S system has four menu options:

- Steering
- Calibration
- System info
- Settings

The diagram *(see Figure 3-2)*shows the main menu of the EF-S system's operating system.

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Figure 3-2

1. *Briefly press the keys 1, 2, GO or SET to activate the corresponding menu.*

3.3 Automatic steering

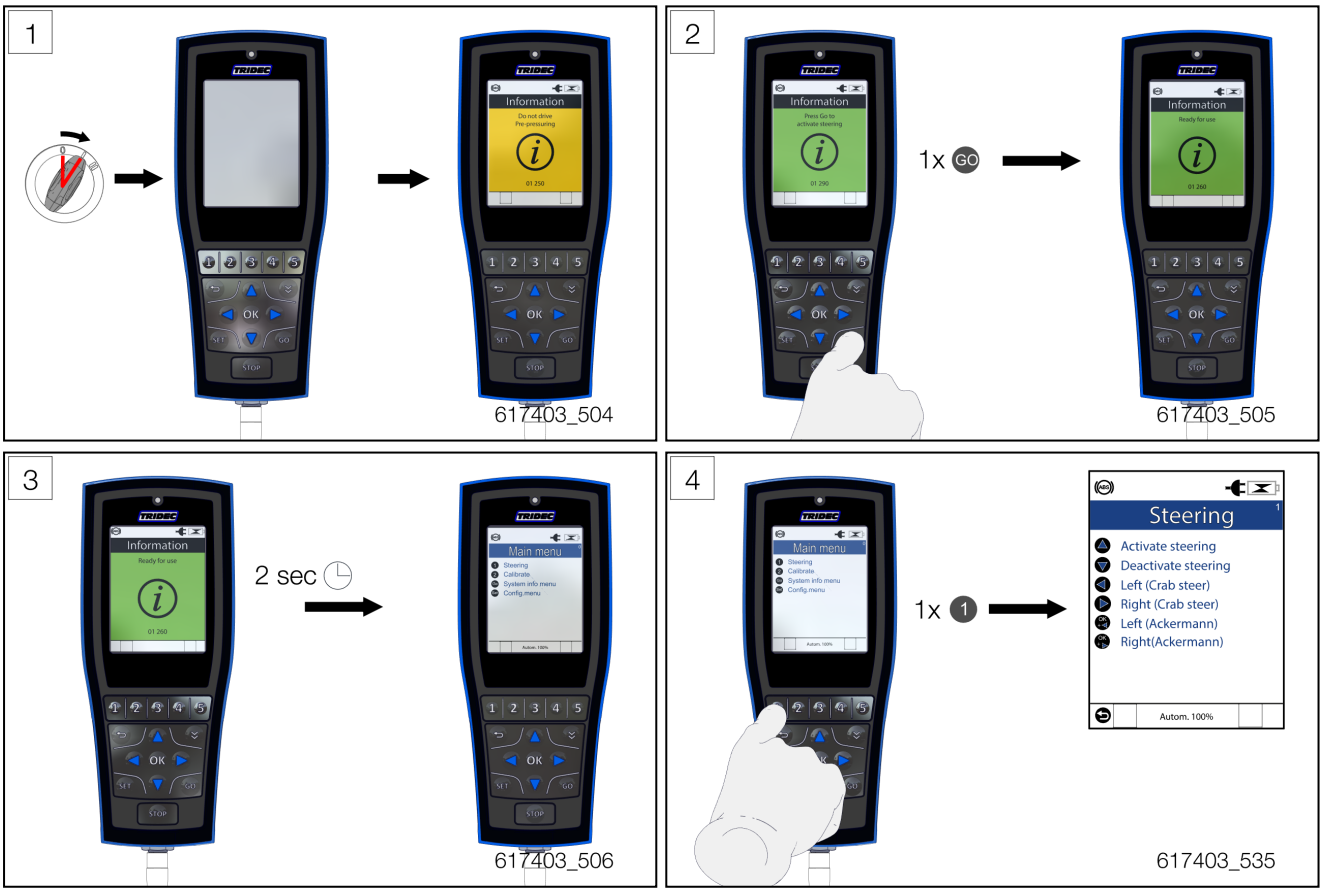
Carry out the following procedure to activate automatic steering of the trailer/semi-trailer. The wheels of the steered axles rotate through an angle that is dependent on the towing angle.

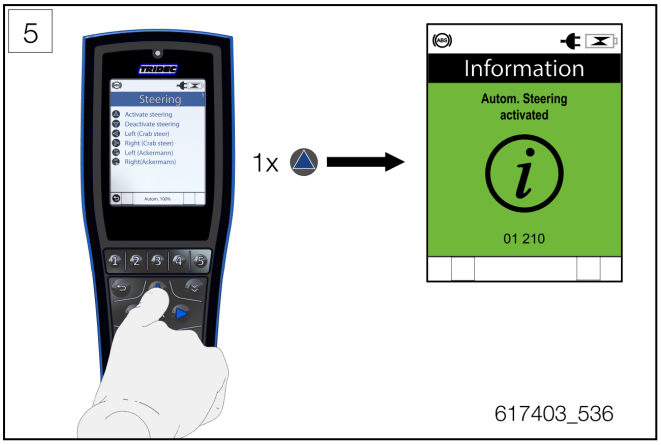
If an error occurs while driving in a bend, the steering behavior will be different and this will affect the covered path of the semi-trailer / trailer combination.

For this procedure, it is assumed that the remote control is connected to a 12-24 V power source.

Procedure

1. *Carry out the following.*





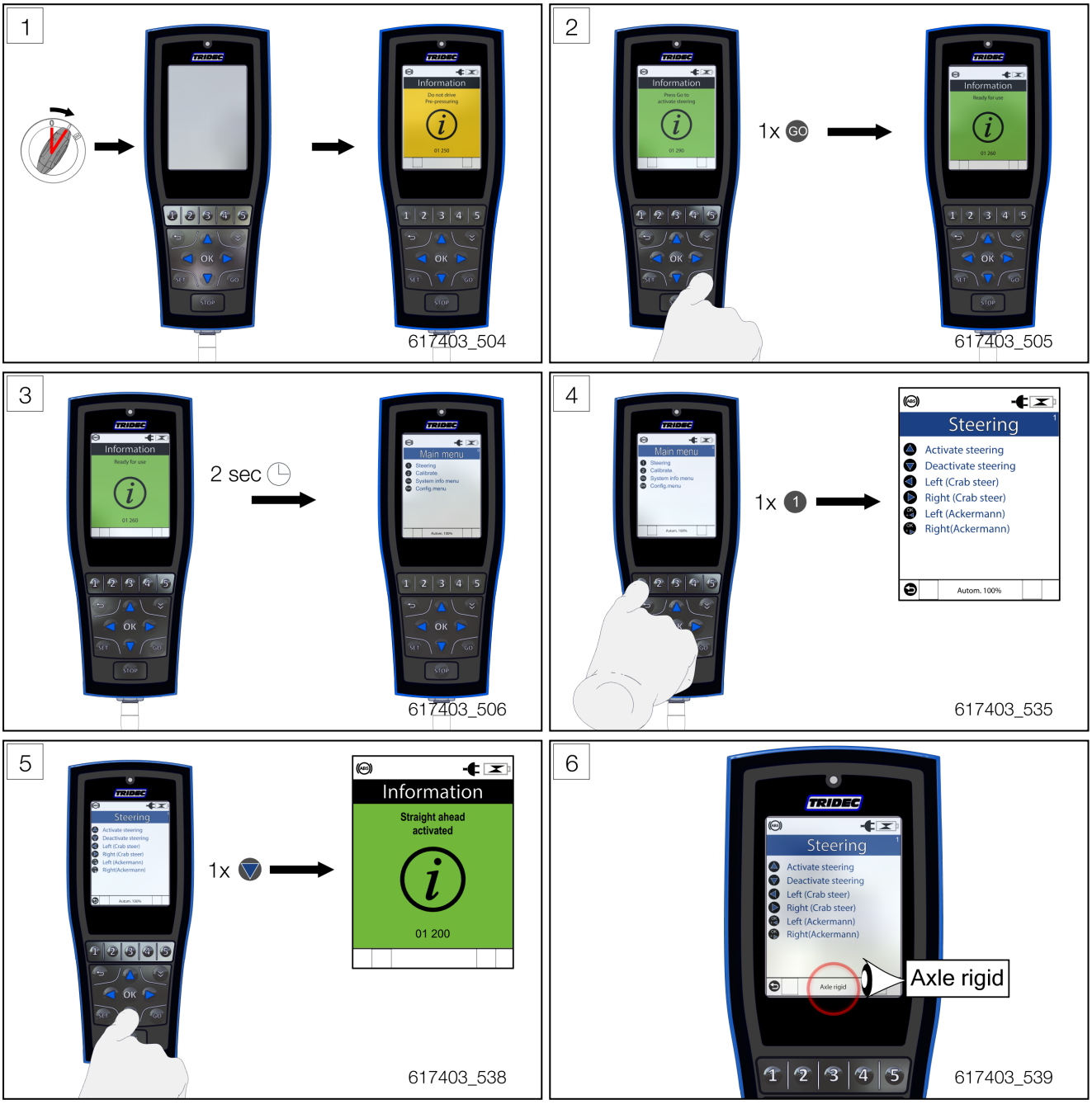
The trailer's wheels are steered automatically after the button is pressed. It is not necessary to keep the button pressed!

3.4 To the straight-ahead position (centring)

Carry out the following procedure after the steering angle of the EF-S system has been manually altered or when steering is not desired. The wheels turn back to the straight-ahead position.

Procedure

1. *Follow the procedure given below.*



The wheels automatically move back to the straight-ahead position after the button is pressed. It is not necessary to keep the button pressed!

Select “Autom. steering” when the articulated vehicle is driven again.

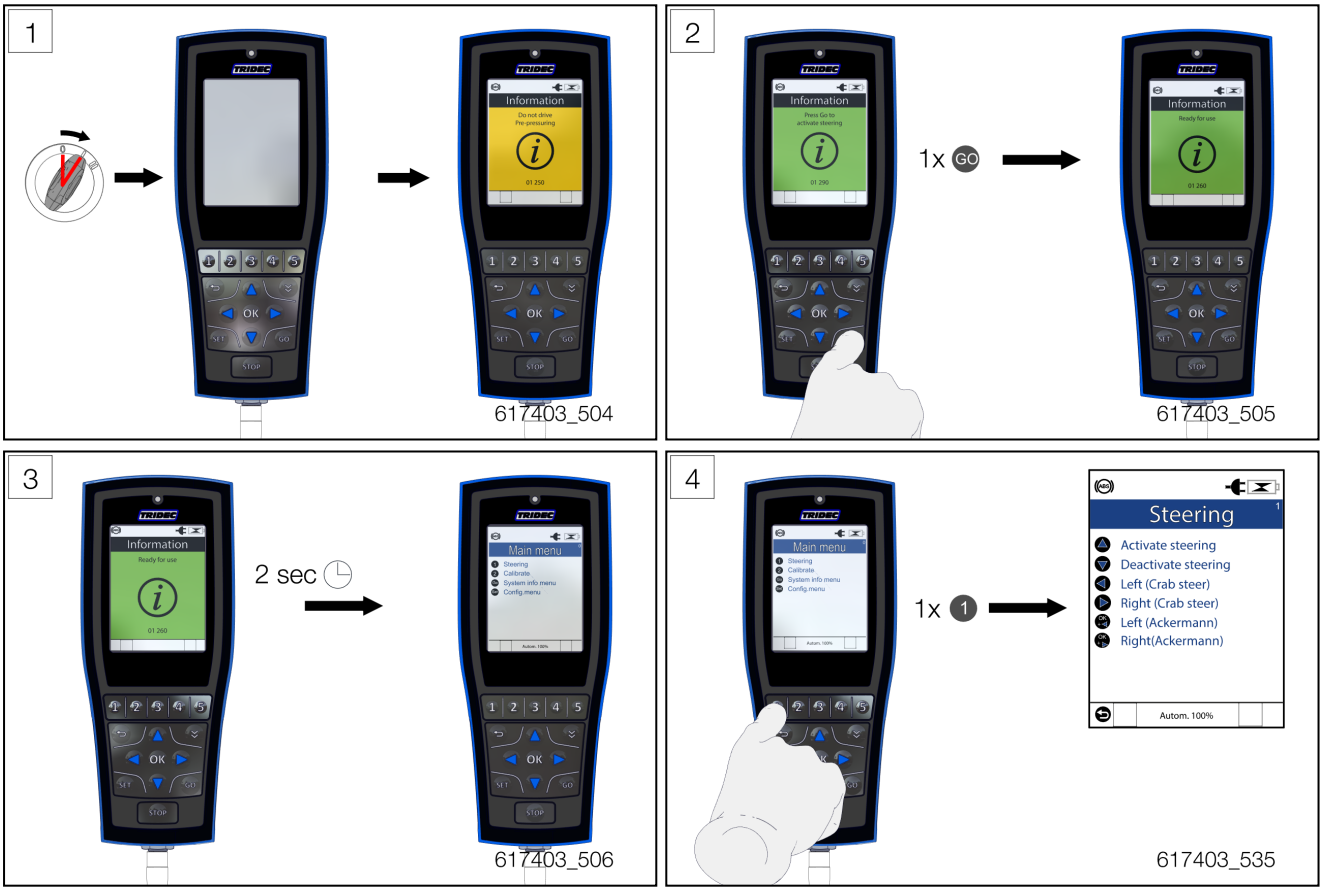
3.5 To the left (Ackermann)

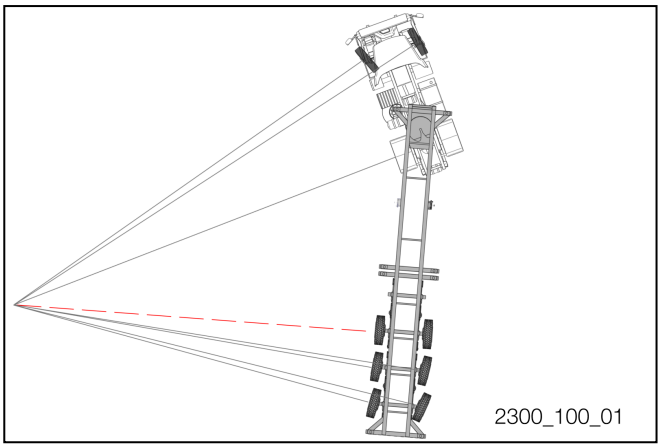
If this function is activated, the trailer/semi-trailer steers to the left according to the Ackermann principle. In that case, the imaginary plumb lines go through the wheels of the articulated vehicle through a point that is to the **left** of the articulated vehicle. The angular rotation differs per wheel on the steered axle.

> Depending on the customer's requirements, left and right can be swapped over.

Procedure:

1. *Follow the procedure given below.*





If the ◀+OK button remains pressed, the angular rotation of the wheels is increased until the maximum permissible steering angle is reached.

Manual steering of the wheels of the trailer/semi-trailer is possible up to a speed of 15 km/h. At higher speeds, the wheels of the steered axles are steered automatically to correspond to the angular rotation of the kingpin. A message is displayed on the remote control's screen *(see Figure 3-3)*.

Figure 3-3

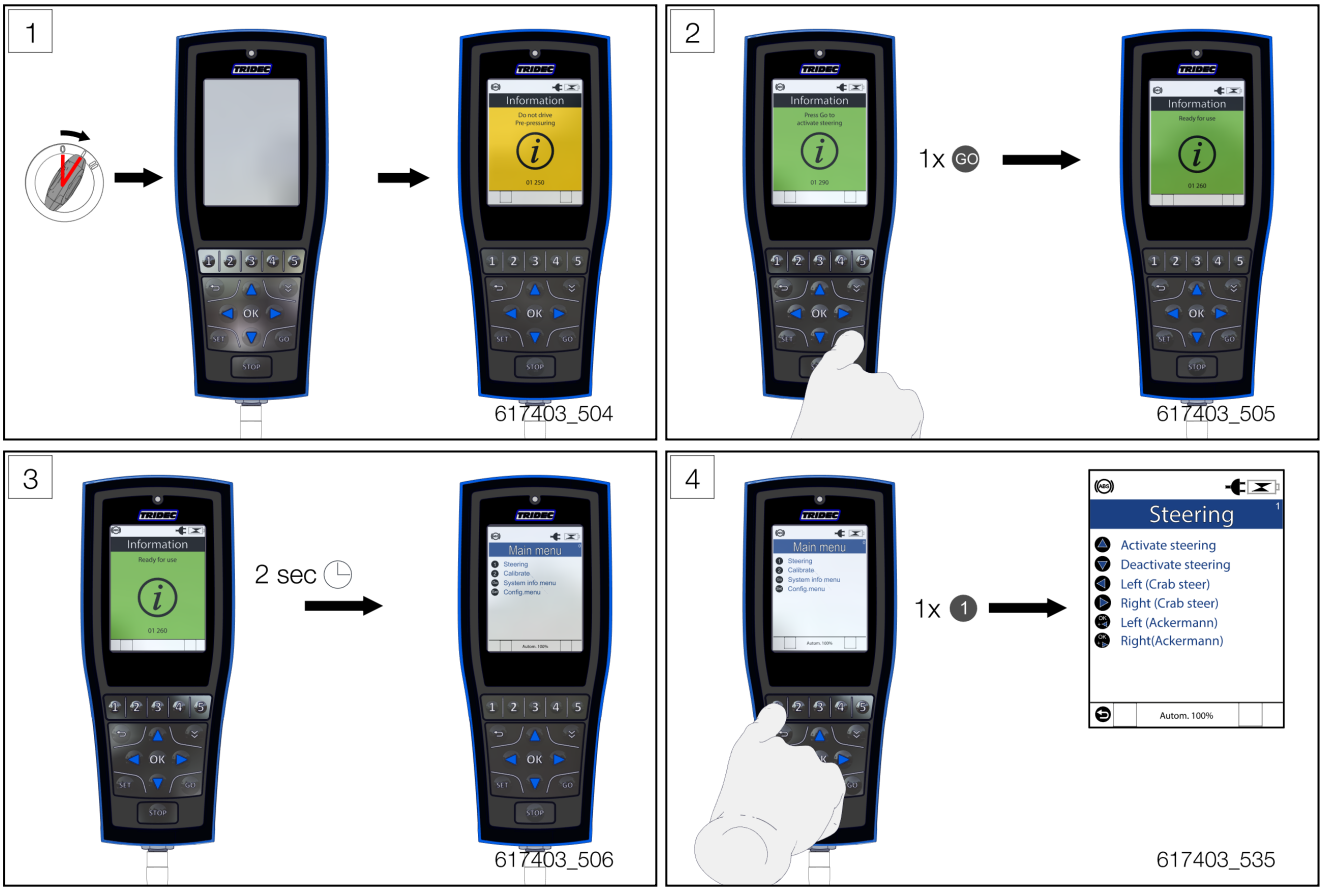
3.6 To the right (Ackermann)

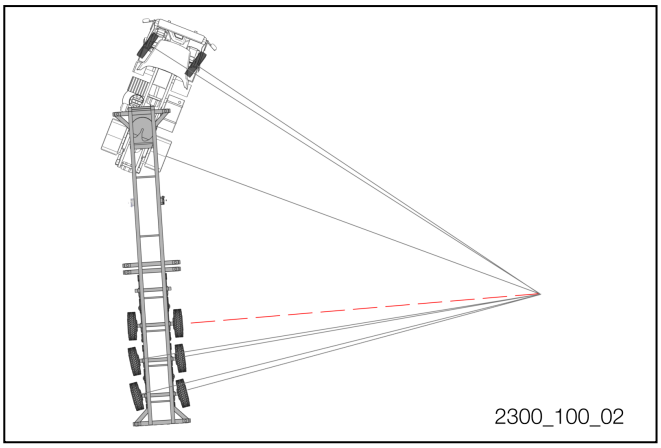
If this function is activated, the trailer/semi-trailer steers to the right according to the Ackermann principle. In that case, the imaginary plumb lines go through the wheels of the articulated vehicle through a point that is to the **right** of the articulated vehicle. The angular rotation differs per wheel on the steered axle.

> Depending on the customer's requirements, left and right can be swapped over.

Procedure:

1. *Follow the procedure given below.*





If the + button remains pressed, the angular rotation of the wheels is increased until the maximum permissible steering angle is reached.

Manual steering of the wheels of the trailer/semi-trailer is possible up to a speed of 15 km/h. At higher speeds, the wheels of the steered axles are steered automatically to correspond to the angular rotation of the kingpin. A message is displayed on the remote control's screen *(see Figure 3-4)*

Figure 3-4

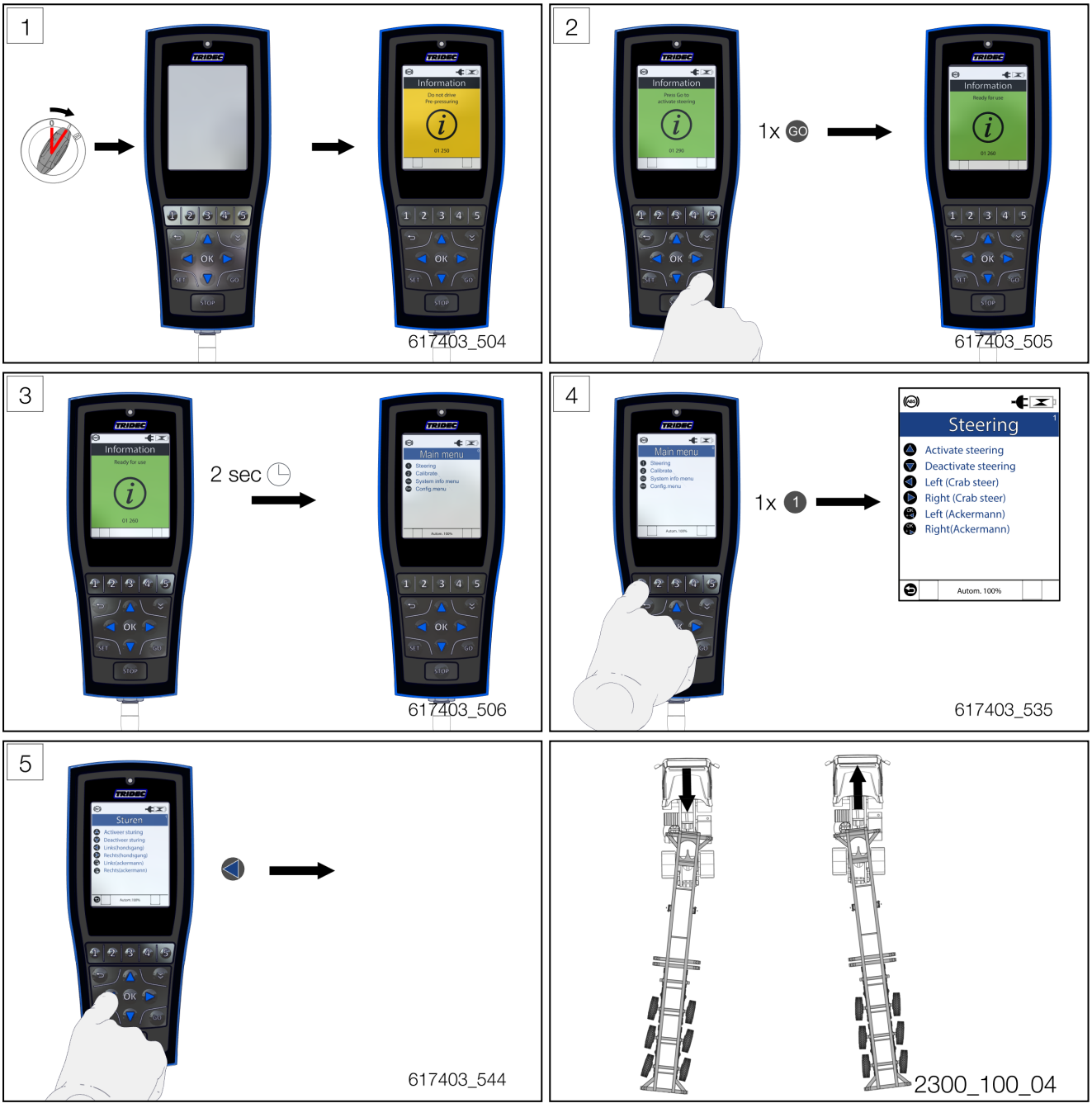
3.7 To the left (crab steering)

If this function is activated, the trailer/semi-trailer steers to the left. In the Crab Steering function, the imaginary plumb lines run parallel through the wheels of the trailer/semi-trailer. The angular rotation of the wheels on the steered axles is the same.

> Depending on the customer's requirements, left and right can be swapped over.

Procedure:

1. *Follow the procedure given below.*



If the buttons remain pressed, the angular rotation of the wheels is increased until the maximum permissible steering angle is reached.

Manual steering of the wheels of the trailer/semi-trailer is possible up to a speed of 15 km/h. At higher speeds, the wheels of the steered axles are steered automatically to correspond to the angular rotation of the kingpin. A message is displayed on the remote control's screen *(see Figure 3-5)*.

Figure 3-5

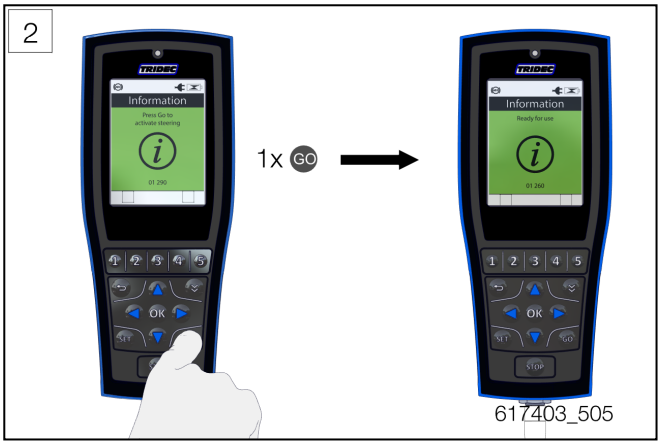
3.8 To the right (crab steering)

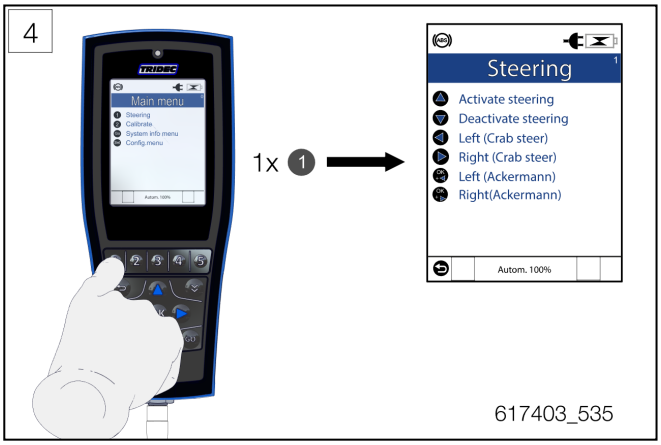
If this function is selected, the trailer/semi-trailer steers to the right. In the Crab Steering function, the imaginary plumb lines run parallel through the wheels of the trailer/semi-trailer. The angular rotation of the wheels on the steered axles is the same.

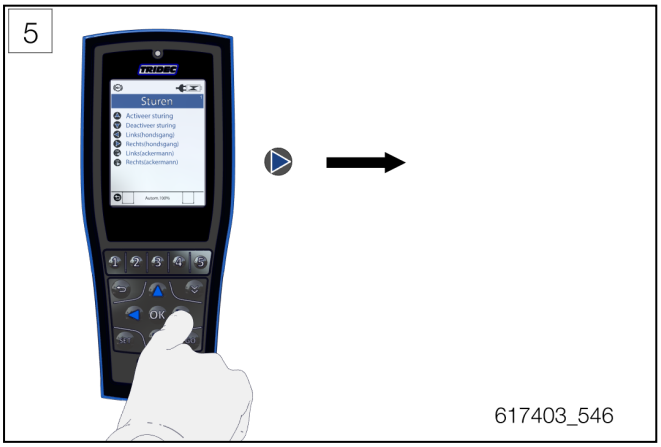
> Depending on the customer's requirements, left and right can be swapped over.

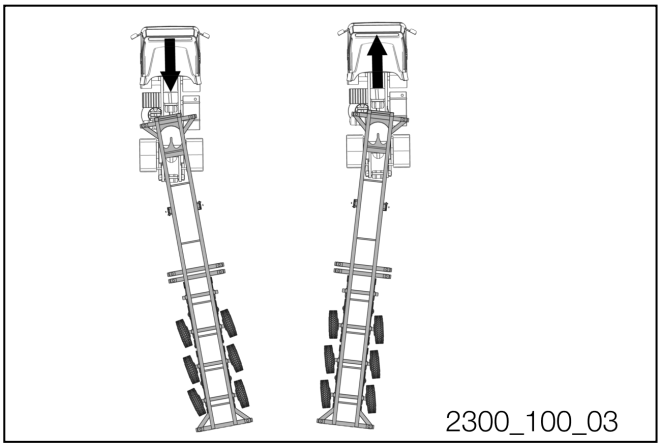
Procedure:

1. *Follow the procedure given below.*









If the button remain pressed, the angular rotation of the wheels is increased until the maximum permissible steering angle is reached.

Manual steering of the wheels of the trailer/semi-trailer is possible up to a speed of 15 km/h. At higher speeds, the wheels of the steered axles are steered automatically to correspond to the angular rotation of the kingpin. A message is displayed on the remote control's screen *(see Figure 3-6)*

Figure 3-6

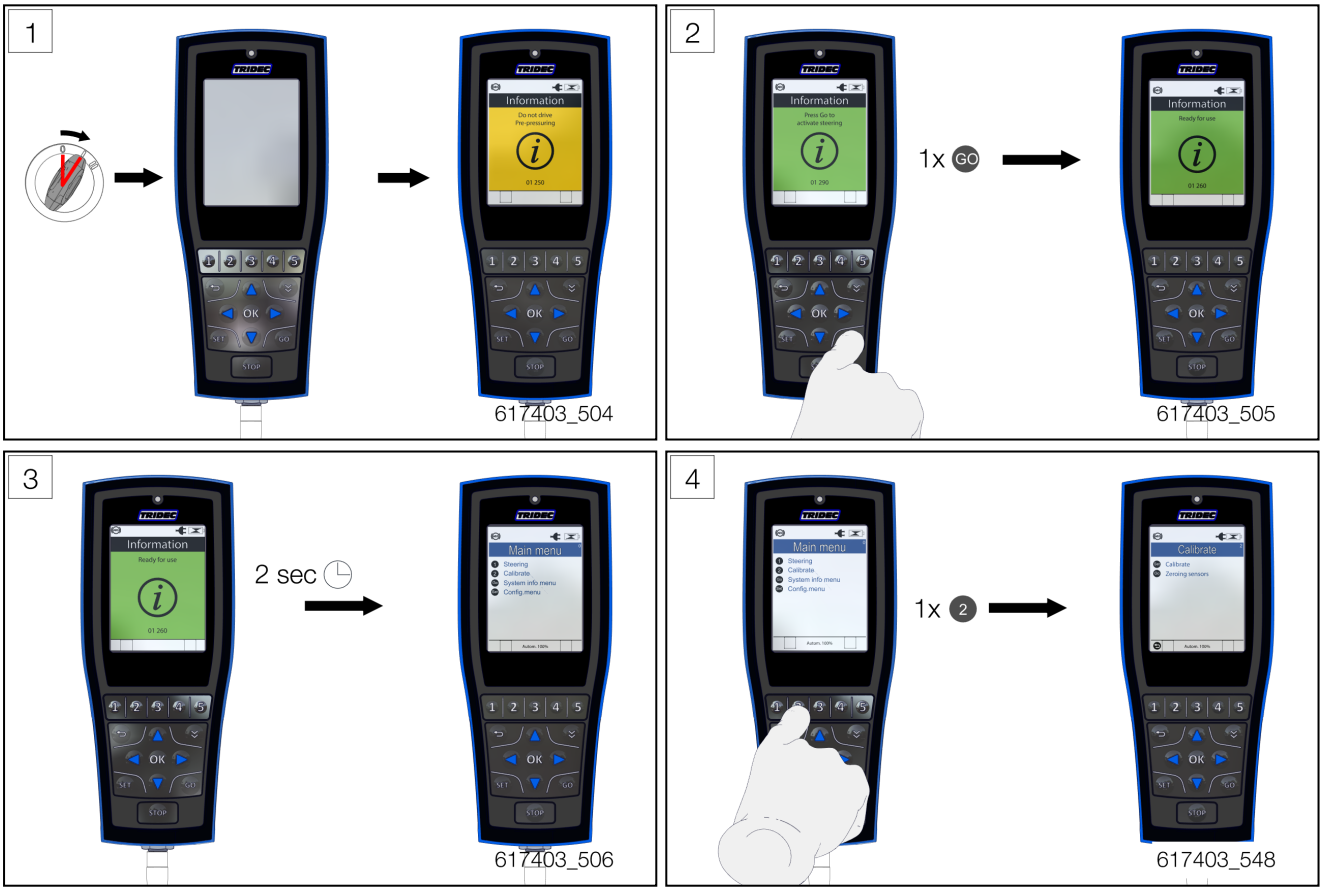
3.9 Calibrating

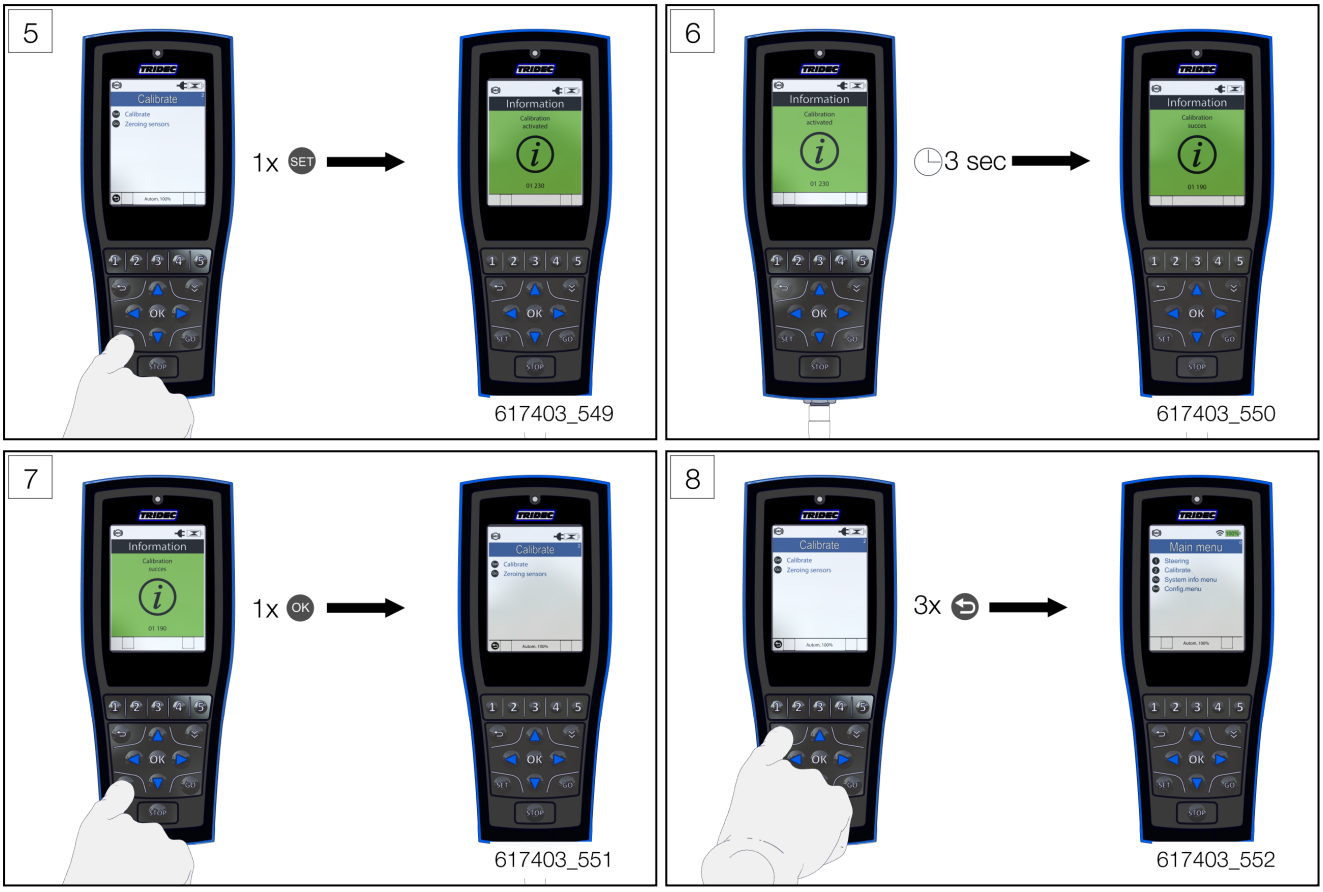
If the trailer/semi-trailer is not in a straight line with the tractor unit when driving, calibrate the trailer/semi-trailer using the “Calibrate” function. When the SET button is pressed, the wheels move to the straight-ahead position and the sensor values are zeroed.

The calibration can only be performed at a speed of less than 15 km/h. Choose a suitable location for the calibration. Choose a location where nobody is endangered or inconvenienced.

Procedure:

1. Make sure the trailer/semi-trailer and the tractor unit are in a straight line.
2. Follow the procedure given below.





Drive in a straight line at walking pace.

Calibration is not possible at speeds of more than 15 km/h. A message is displayed on the screen if the SET button in the “Calibration” menu is pressed at a speed of more than 15 km/h.

Figure 3-7

3.10 Turning off the EF-S system

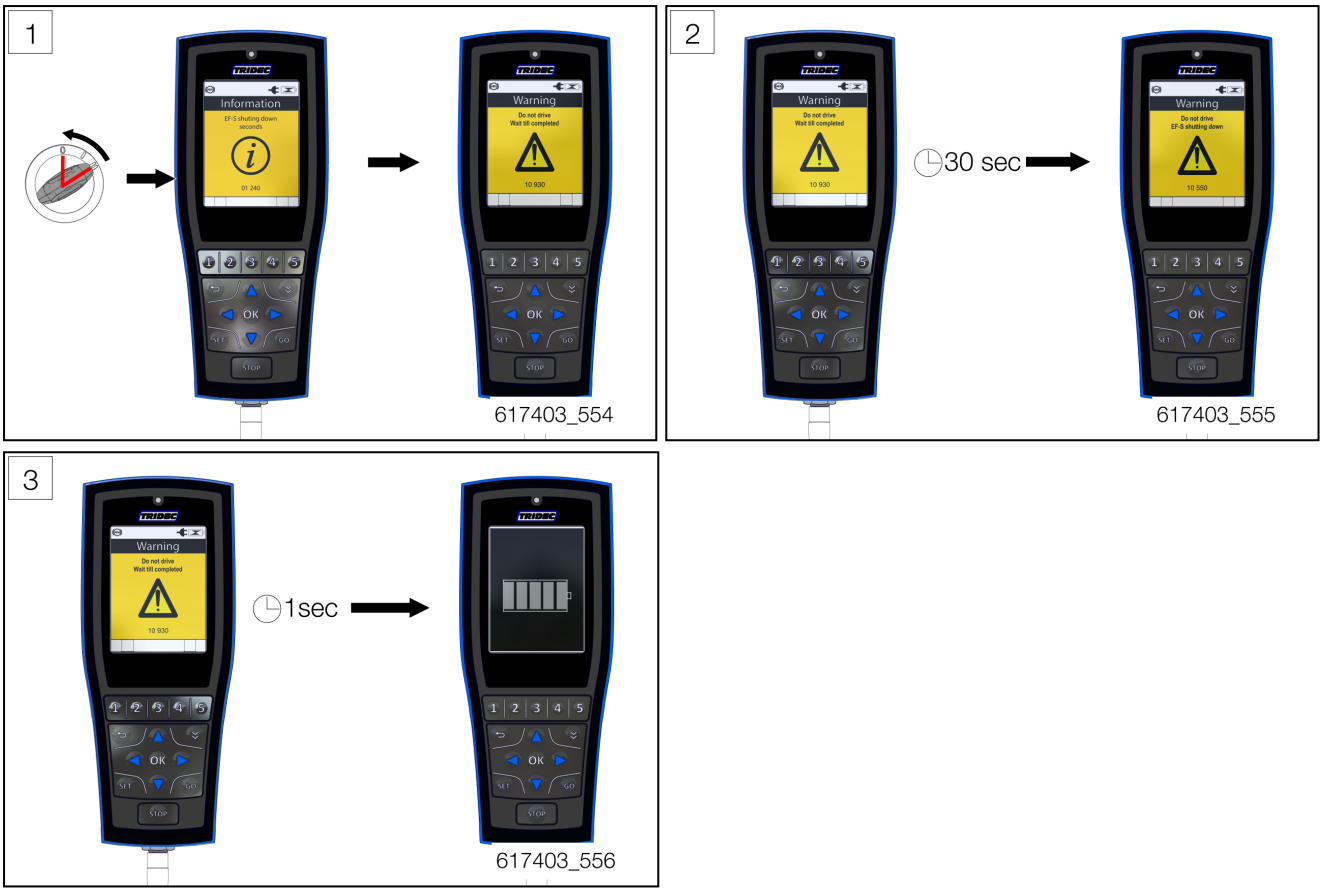
During normal use, the EF-S system is turned off when the tractor unit's ignition switch is turned to position "0". A message is displayed on the screen *(see Figure 3-8)*. The warning light is lit during the EF-S system's shutdown procedure. The warning light is lit during the EF-S system's shutdown procedure. A timer determines when the shutdown procedure starts. This timer can be set to prevent the EF-S system from being depressurized during a short stop.

Figure 3-8

The EF-S system cannot be turned off using the remote control.

Procedure:

1. *Carry out the following.*



The remote control is turned off whether it is used wirelessly or with a cable.

It can take some time for the EF-S system to be turned off. Wait until the warning light is no longer lit.

3.11 Message history

The warning messages and error messages that have been active during operation of the EF-S system as a result of system errors can be read via the remote control. To do so, use the ▼ button and the ▲ button.

> The message history can only be read when an error message is displayed on the remote control's screen.

1. *Carry out the following.*

Figure 3-9

4 Messages

An explanation of the messages that may be displayed on the remote control's screen is given below.

4.1 Types of messages

The messages that can be displayed on the screen during operation can be divided into three different categories.

■ Information messages:	These messages indicate which processes are running.
■ Warning messages:	These messages indicate problems in the EF-S system which must be rectified as quickly as possible by the service workshop. They can be deleted from the screen by pressing the OK button. The orange warning light is lit until the problem has been rectified.
■ Error messages:	These messages indicate problems in the EF-S system which must be rectified immediately by the service workshop. These messages *(see Figure 4-1)* cannot be deleted from the screen.

Figure 4-1

If an error message is displayed on the screen, restart the system. Doing so sometimes deletes the message. The EF-S system can be restarted in three different ways:

- Using the GO button on the remote control. The GO button is only active if an error message *(see Figure 4-1)* is displayed on the screen.
- Using the main switch on the generator box. This turns off the power supply.
- By rotating the ignition switch to the "0" position. Allow the system to shut down and then restart it.

Restarting the system using the GO button on the remote control

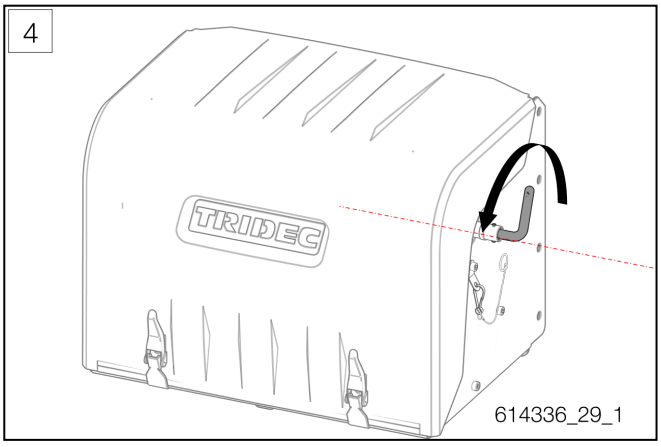
Note: The EF-S system can only be restarted using the GO button when an error message is displayed.

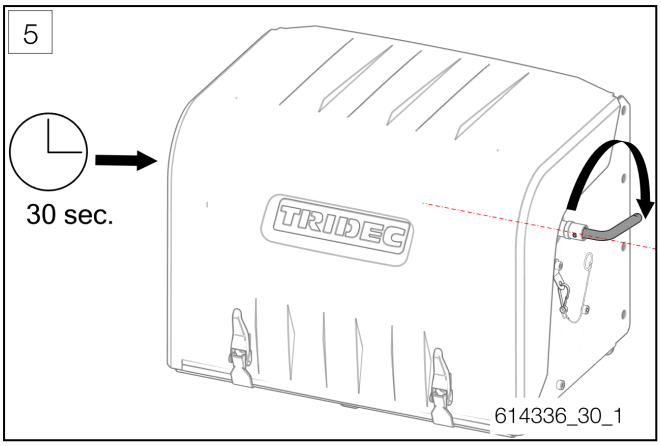
1. *Follow the procedure given below.*

Figure 4-2

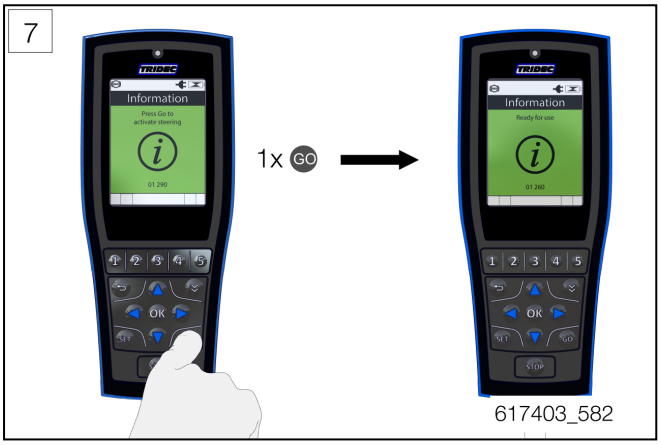
Restarting the system using the main switch on the generator box

1. *Follow the procedure given below.*




5
30 sec.
TRIDEC
614336_30_1


6
TRIDEC
Information
Do not drive
Pre-pressuring
01 250
1 2 3 4 5
OK
SET
GO
STOP
617403_581


7
TRIDEC
Information
Press Go to activate steering
01 290
1x GO
Information
Ready for use
01 260
617403_582


8
TRIDEC
Information
Ready for use
01 260
2 sec
Main menu
Steering
Calibrate
System info menu
Config.menu
617403_583

4.2 Information messages

The information messages explained in this section provide information about the processes that are performed and the status of these processes, i.e. whether the processes are active or have been completed.

	TRIDEC
Code:	**01190**
Message:	Calibration successful
Description:	This message is displayed after the EF-S system has been calibrated successfully.
Colour:	Green

Information messages

	TRIDEC
Code:	**01200**
Message:	Centring activated
Description:	This message is displayed when the wheels of the trailer/semi-trailer are rotated to the straight-ahead position by the EF-S system.
Colour:	White

Information messages

	TRIDEC
Code:	**01210**
Message:	Steering activated
Description:	This message is displayed after the “Automatic steering” function has been activated on the remote control (see “Automatic steering” on page 1)
Colour:	Green

Information messages

	TRIDEC
Code :	**01220**
Description:	Pressure release active
Solution:	This message is displayed after the “Release pressure” function has been activated in the service program (see "System pressure" on page 1)..

Tabel-2 Information messages

	TRIDEC
Code :	**01230**
Message:	Calibration activated
Description:	This message is displayed after the “Zero” function has been activated on the remote control (zie "Calibrating" on page 49).

	TRIDEC
Code :	**01230**
Colour:	Orange

Tabel-3 Information messages

	TRIDEC
Code:	**01240**
Message:	EF-S system is turning off
Description:	This message is displayed on the remote control after the tractor unit's ignition switch has been turned to the "0" position.
Colour:	White

Information messages

	TRIDEC
Code:	**01250**
Message:	Do not drive. Not pressurized.
Description:	This message is displayed on the remote control if the required minimum system pressure is not reached.
Colour:	Orange

Information messages

	TRIDEC
Code:	**01260**
Message:	EF-S system pressurized.
Description:	This message is displayed on the remote control when the required minimum system pressure is reached.
Colour:	Green

Information messages

	TRIDEC
Code:	**01270**
Message:	Light test started. Check colours.
Description:	This message is displayed on the remote control during start-up of the EF-S system, when the LED test for the warning light is started. After a couple of seconds, the colours red, orange and white are lit one after the other.
Colour:	White

Information messages

	TRIDEC
Code:	**01280**
Message:	Light test completed.
Description:	This message is displayed on the remote control after the light test has been completed.

	TRIDEC
Code:	**01280**
Colour:	Green

Information messages

	TRIDEC
Code:	**01290**
Message:	Press GO to activate steering.
Description:	This message is displayed on the remote control after the start-up procedure has been completed.
Colour:	Green

Information messages

	TRIDEC
Code:	**01300**
Message:	Wheels not aligned. Press GO.
Description:	This message is displayed on the remote control after the start-up procedure has been completed. The angles of the kingpin and the wheels are not the same as the calculated values.
Colour:	Red

Information messages

	TRIDEC
Code:	**01310**
Message:	Zero calibration successful.
Description:	This message is displayed on the remote control after the calibration procedure has been successfully completed.
Colour:	Green

Information messages

	TRIDEC
Code:	**01320**
Message:	Zero calibration activated.
Description:	This message is displayed on the remote control while the calibration procedure is active.
Colour:	White

Information messages

	TRIDEC
Code:	**10020**
Message:	Speed too high.
Description:	It is not possible to manually steer the trailer/semi-trailer. Reduce the speed of the articulated vehicle to 15 km/h or less so that the trailer/semi-trailer can be steered manually.
Colour:	Green

Information messages

	TRIDEC
Code:	**10021**
Message:	Speed too high. Calibration is not possible.
Description:	The sensors must be calibrated when the trailer/semi-trailer does not follow in line with the tractor unit. Drive in a straight line at a speed of less than 20 km/h (make sure the tractor unit and trailer/semi-trailer are aligned as much as possible) and activate the "Calibration" function on the remote control (see "Calibration" on page 1). This message is usually displayed when a different tractor unit pulls the trailer/semi-trailer with the EF-S system.
Colour:	White

Information messages

4.3 Warning messages

Warning messages are activated if there is a problem in the EF-S system that must be rectified as quickly as possible by the service workshop.

	TRIDEC
Code:	**10010**
Message:	No data transfer
Description:	1. The distance between the Bluetooth module and the remote control is too great. Range: 50 m when there are no obstacles between the Bluetooth module and the remote control. 2. The EF-S system has not been started.
Colour:	Orange
Delete:	Reduce the distance

Warning message

	TRIDEC
Code:	**10040**
Message:	No data.
Description:	The Bluetooth module does not transmit a signal. Contact the service workshop.
Colour:	Orange
Delete	Press OK

Warning message

	TRIDEC
Code:	**10400**
Message:	Do not drive.
Description:	Stop the articulated vehicle and turn the ignition switch to the “0” position.* Start the tractor unit and perform the start-up procedure.
Colour:	Red

Error message

	TRIDEC
Code:	**10510 - 10520 - 10530**
Message:	Call the Service department.
Description:	The EF-S system must be serviced. The articulated vehicle can still be driven.
Colour:	Orange
Delete	Press OK

Warning message

	TRIDEC
Code:	**10550 - 10660**
Description:	Do not drive. The EF-S system turns itself off.
Description:	The EF-S system is turned off. Follow the instructions given on the remote control.
Colour:	Red

Warning message

	TRIDEC
Code:	**10560**
Message:	Towing angle too large.
Description:	The angle between the tractor unit and the trailer/semi-trailer is too large. Manoeuvre the tractor unit until the white warning light is lit.
Colour:	Orange
Delete	Press OK

Warning

	TRIDEC
Code:	**10561**
Message:	Towing angle too large.
Description:	The signal from the kingpin is interrupted.
Colour:	Orange
Delete	Press OK

Warning message

	TRIDEC
Code:	**10570**
Message:	Oil temperature too low. Steer to the left and the right.
Description:	Increase the oil temperature by steering the articulated vehicle to the left and right. ⚠Note! Do this in a suitable location. Do not swerve on a public road.
Colour:	Orange
Delete	Press OK

Warning message

	TRIDEC
Code:	**10580**
Message:	Oil temperature too high. Cool the oil.
Description:	Allow the oil to cool. This message is displayed if the temperature has been more than 60 °C for at least 10 seconds.
Colour:	Orange
Delete	Press OK

Warning message

	TRIDEC
Code:	**10620 - 10621 - 10622 - 10623 - 10624 - 10625**
Message:	No steering. Call the Service department.
Description:	Contact the service workshop. The wheels of the trailer/semi-trailer cannot be steered. The articulated vehicle can still be driven.
Colour:	Orange
Delete	Press OK

Warning message

	TRIDEC
Code:	**10770 - 10800 -10830 - 10860**
Message:	Call the Service department.
Description:	Contact the Service department. The wheels of the trailer/semi-trailer cannot be steered. The articulated vehicle can still be driven.
Colour:	Orange
Delete	Press OK

Warning message

	TRIDEC
Code:	**10910**
Message:	Do not drive. Start the EF-S system.
Description:	Start the EF-S system.
Colour:	Orange
Delete	Press OK

Warning message

	TRIDEC
Code:	**10930**
Message:	Do not drive. Wait until completion.
Description:	The EF-S system is being depressurized.
Colour:	Orange
Delete	Press OK

Warning message

	TRIDEC
Code:	**10940**
Message:	Do not drive. Start the EF-S system.
Description:	The EF-S system is starting up. The message is displayed if the vehicle pulls away while the EF-S system has not yet been fully pressurized.
Colour:	Orange
Delete	Wait until the EF-S system has started up before driving. Press OK

Warning message

	TRIDEC
Code:	**20370**
Message:	No steering.
Description:	The batteries do not provide a sufficient voltage. Charge the batteries. The articulated vehicle can still be driven.
Colour:	Orange
Delete	Press OK

Warning message

	TRIDEC
Code:	**30680**
Description:	No steering. Call the Service department.
Description:	The articulated vehicle can still be driven.
Colour:	Orange
Delete	Press OK

Warning message

	TRIDEC
Code:	**30980**
Description:	Rotate the wheels to the straight-ahead position. Shut down the program.
Description:	- Rotate the wheels to the straight-ahead position. - Turn the ignition switch to the “0” position to start the EF-S system’s shutdown procedure.
Colour:	Orange
Delete	Press OK

Warning message

4.4 Error messages

An error message is activated when there is a problem in the EF-S system that must be rectified IMMEDIATELY in a service workshop.

The message remains active until the problem has been rectified and the EF-S has been restarted.

	TRIDEC
Code:	**30030**
Message:	Do not drive. Calibrate.
Description:	The EF-S system must be calibrated before it is used. This message can be displayed after the operating system has been deleted and reinstalled or if the system has not been calibrated.
Colour:	Red
Delete:	Calibrate via the service program.

Error message

	TRIDEC
Code:	**30050**
Message:	Do not drive. Call the Service department.
Description:	Contact the service workshop. The wheels of the trailer/semi-trailer cannot be steered. The articulated vehicle can still be driven. The cause of the problem must be rectified as quickly as possible.
Colour:	Red
Delete:	After repair, press OK until code 10400 is displayed.

Error message

	TRIDEC
Code:	**30060 - 30061 - 30080 - 30081 - 30100 - 30101 - 30120 - 30121 - 30130 - 30131 - 30140 - 30141 - 30142 - 30143 - 30144 - 30145 - 30150 - 30151 - 30160 - 30161 - 30170 - 30171 - 30180 - 30181 - 30190 - 30191 - 30200 - 30201 - 30210 - 30211 - 30220 - 30221 - 30230 - 30231 - 30240 - 30250 - 30251 - 30270 - 30271 - 30290 - 30291 - 30211 - 30320 - 30310 - 30311 - 30312 - 30330 - 30340 - 30360 - 30371 - 30390 - 30430 - 30431 - 30432 - 30440 - 30441 - 30442 - 30450 - 30500 - 30501 - 30502 - 30600 - 30610 - 30630 - 30631 - 30640 - 30641 - 30650 - 30651 - 30690 - 30700 - 30710 - 30720 - 30730 - 30740 - 30750 - 30760 - 30780 - 30790 - 30810 - 30820 - 30840 - 30850 - 30870 - 30880 - 30890 - 30900 - 30920 - 31010 - 31011 - 31020 - 31090 - 31100 - 31110 - 31120 - 31130 - 31340 - 40070 - 40071 - 40410 - 40411 - 40412 - 40413 - 40414 - 40420 - 40421 - 40422 - 40423 - 40424 - 40460 - 40470 - 40480 - 40490 -**
Message:	No steering.
Description:	Contact the service workshop. The wheels of the trailer/semi-trailer cannot be steered. The articulated vehicle can still be driven.
Colour:	Red
Delete:	After repair, press GO until code 10400 is displayed.

Error message

	TRIDEC
Code:	**30340 - 30350 - 30950 - 30960 - 30970 - 31030 - 31040 - 31050 - 31060 - 31070 - 31080 - 31090 - 31100 - 31110 - 31120 - 31130 - 31140 - 31150 - 31160 - 31170 - 31180 -**
Message:	Do not drive.
Description:	Contact the service workshop. The wheels of the trailer/semi-trailer cannot be steered. It is **NOT** permitted to drive the articulated vehicle.
Colour:	Red

Error message

	TRIDEC
Code:	**30371**
Message:	No steering. Charge the batteries.
Description:	The batteries do not provide a sufficient current or voltage. Try to charge the batteries. The articulated vehicle can still be driven.
Colour:	Red
Delete:	Charge the batteries and restart the system.

Error message

	TRIDEC
Code:	**30590**
Message:	The oil temperature is too high.
Description:	Allow the oil to cool. The trailer/semi-trailer cannot be steered.
Colour:	Red
Delete:	After repair, press GO until code 10400 is displayed.

Error message

5 Putting into service

The following paragraphs contain information regarding putting the EF-S system into service.

5.1 Vehicle registration and delivery

All associated documentation (vehicle registration certificate, CE declaration, user guide, service manual) for the relevant Tritronic system should be handed to the client upon delivery of a trailer with a EF-S system.

The vehicle may not be used until compliance with the applicable national road traffic regulations has been established for the trailer on which theEF-S system is installed.

The national road traffic regulations are specific to each country. Contact the national inspection authority in the relevant country for the necessary information.

Subject	Action
Vehicle Registration Certificate,	Submit the vehicle registration certificate to the national inspection authority of the country in which the trailer will be registered. The specifications and approval numbers necessary can be found on the vehicle registration certificate.
CE sticker	Ensure that the CE sticker has been placed in a clearly visible position on the EF-S system.
Warning sticker	Ensure that the warning sticker has been placed in such a way that it is clearly visible to the driver.
CE declaration of compliance	Store the CE declaration with the vehicle documents in accordance with applicable guidelines.
User guide	Provide the client with the EF-S system user guide. Instruct the client to keep the user guide with the trailer.
Maintenance and repair manual	Provide the client with the EF-S system maintenance and repair manual. This manual contains the necessary information needed for the workshop to maintain the system.

Table-4 Client documents

The guarantee registration form must be completed and returned to TRIDEC. The sales conditions for the guarantee period stipulated enter into effect upon receipt. The buyer will not be covered by the guarantee for the supplied products if the registration form is not returned to TRIDEC.

6 Safety & environment

The following paragraphs contain information regarding safe use of the EF-S system. It also describes what should be done when the EF-S system reaches the end of its lifespan.

6.1 Safety while operating

Operating a trailer with a EF-S system installed may involve some possible risks. Consult the relevant regulations (for example: road traffic regulations, company procedures, health and safety regulations) which are applicable to the country where the trailer will be used.

General instructions for operating a trailer with a EF-S system:

- **NEVER** use or put a trailer with an installed EF-S system on public roads until compliance with the national road traffic regulations has been established for the entire trailer.
- Read the user guide **BEFORE** coupling and using a trailer with a EF-S system.
- Execute the daily inspection **BEFORE** coupling and using a trailer with a EF-S system.
- The truck driver is **ALWAYS** responsible for the use of a trailer.
- **NEVER** drive with a trailer if a signal lamp is lit.
- Only steer the trailer using the EF-S system if there are **NO** people in the immediate vicinity of the trailer's moving parts.

The nature of possible dangers and restrictions during use are depicted below in the pictograms.

6.2 Environment

The EF-S system must be dismantled and disposed of in accordance with local and national regulations once it has reached the end of its lifespan, regardless of the cause.

Contact your local or national public services, waste management authority or the supplier you purchased the product from for more information regarding locations where the materials can be collected for recycling.

7 General information

The following paragraphs contain information regarding the delivery, storage and guarantee of the EF-S system .

Read the following paragraphs when products are delivered!

7.1 Pictograms

The following pictograms are used in this user guide:

	Description		Description		Description
	Important message!		Read this information before you start!t!		Delivery information.
	Important restriction!		Mounting information		Parts information.
	Requirements set by TRIDEC.		Information about storage		Information about daily use!
	Tip		Activates selected functions		Activates selected functions
	Activates selected functions		Activates selected functions		Selection of menu "System info" or activation of functions
	Button on remote control with multiple functions.		Button on remote control with multiple functions.		Next page in the menu
	Connected to power source		Bluetooth connection active		Go back to previous page

Tabel-5 Pictogrammen

7.2 Cleaning

All the components of the EF-S system meet standard IP65 and are dustproof and water-tight.

TRIDEC strongly advises against cleaning the electrical components using a high-pressure hose.

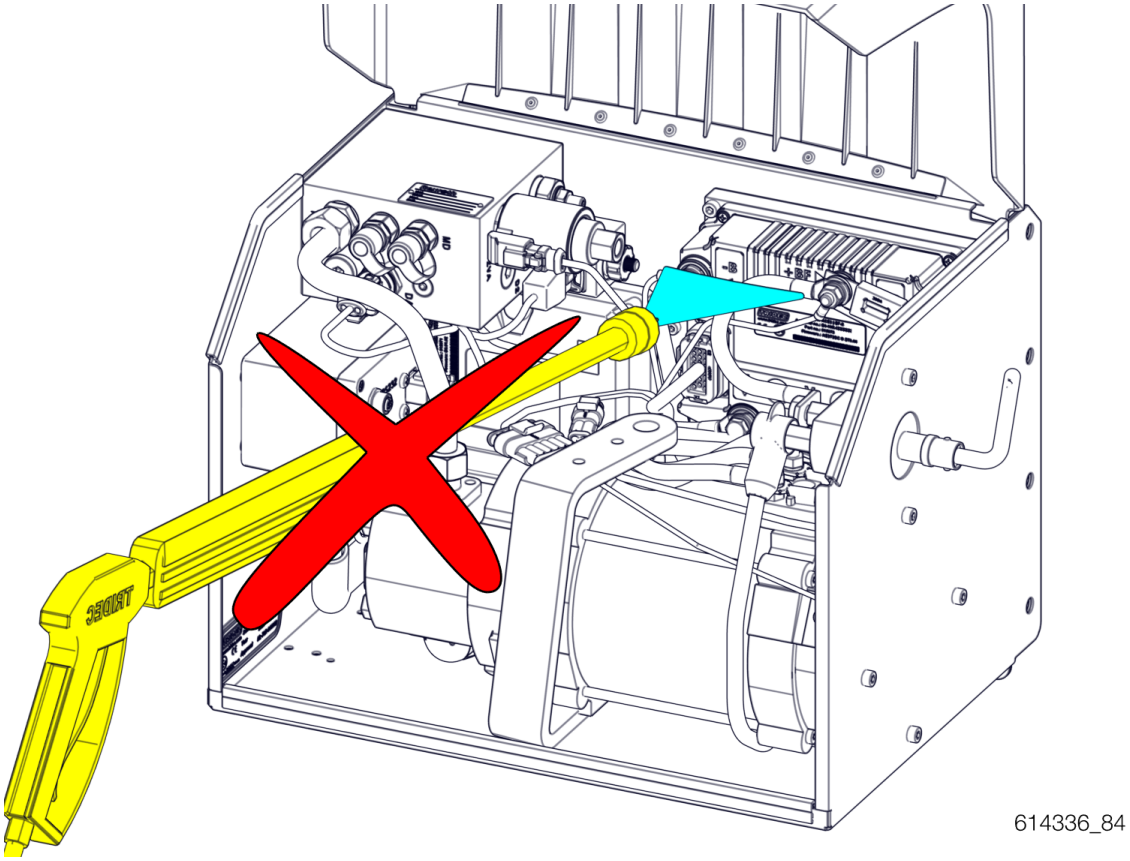


Figure 7-1

7.3 System info

The “System info” menu contains information about the following:

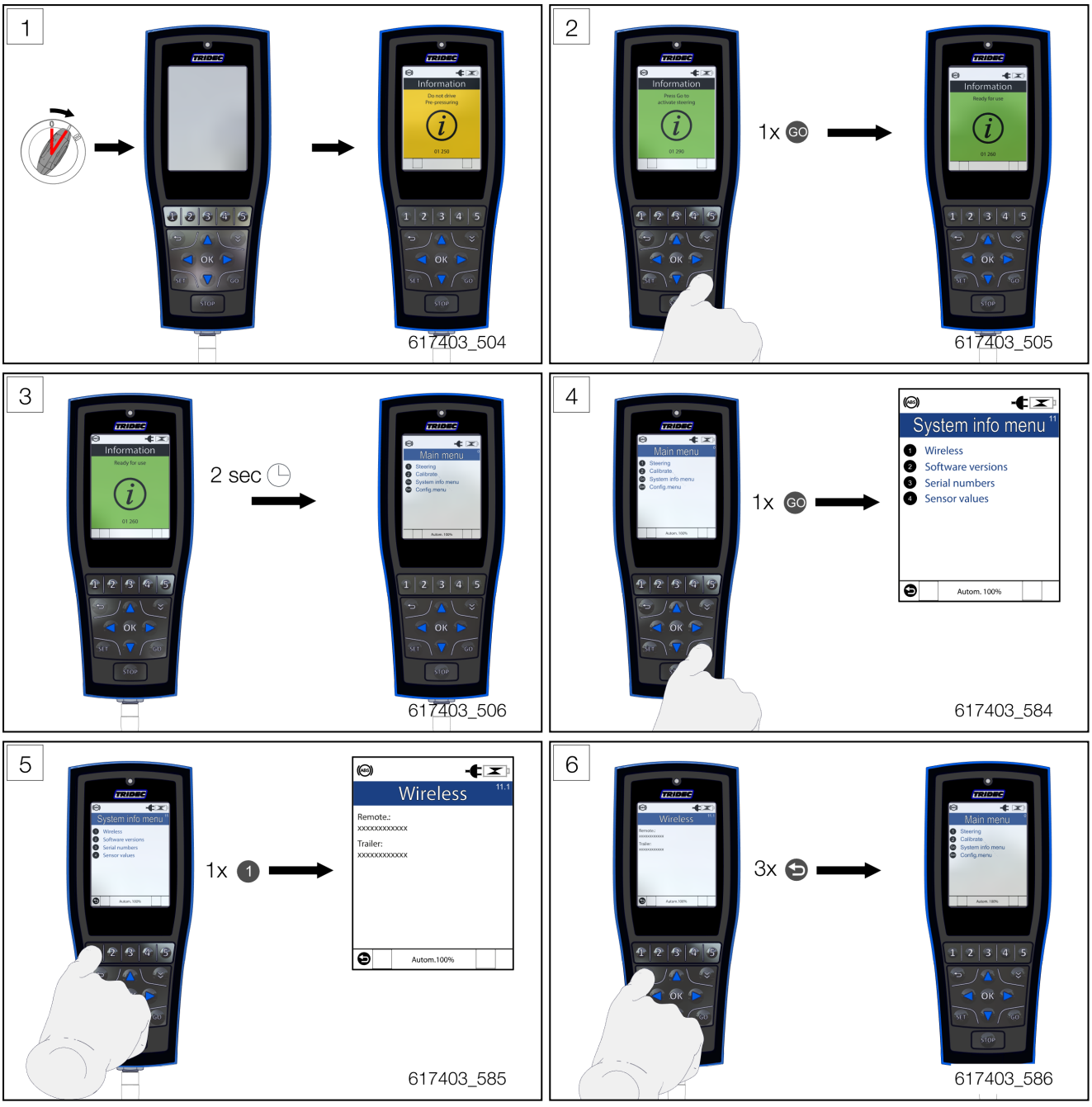
- The wireless system
- The installed programs
- The sensors
- The serial number

7.3.1 Wireless

The “Wireless” menu contains information about the Bluetooth connection between the remote control and the module on the trailer/semi-trailer. Only devices with the specified code can exchange data with each other.

Procedure:

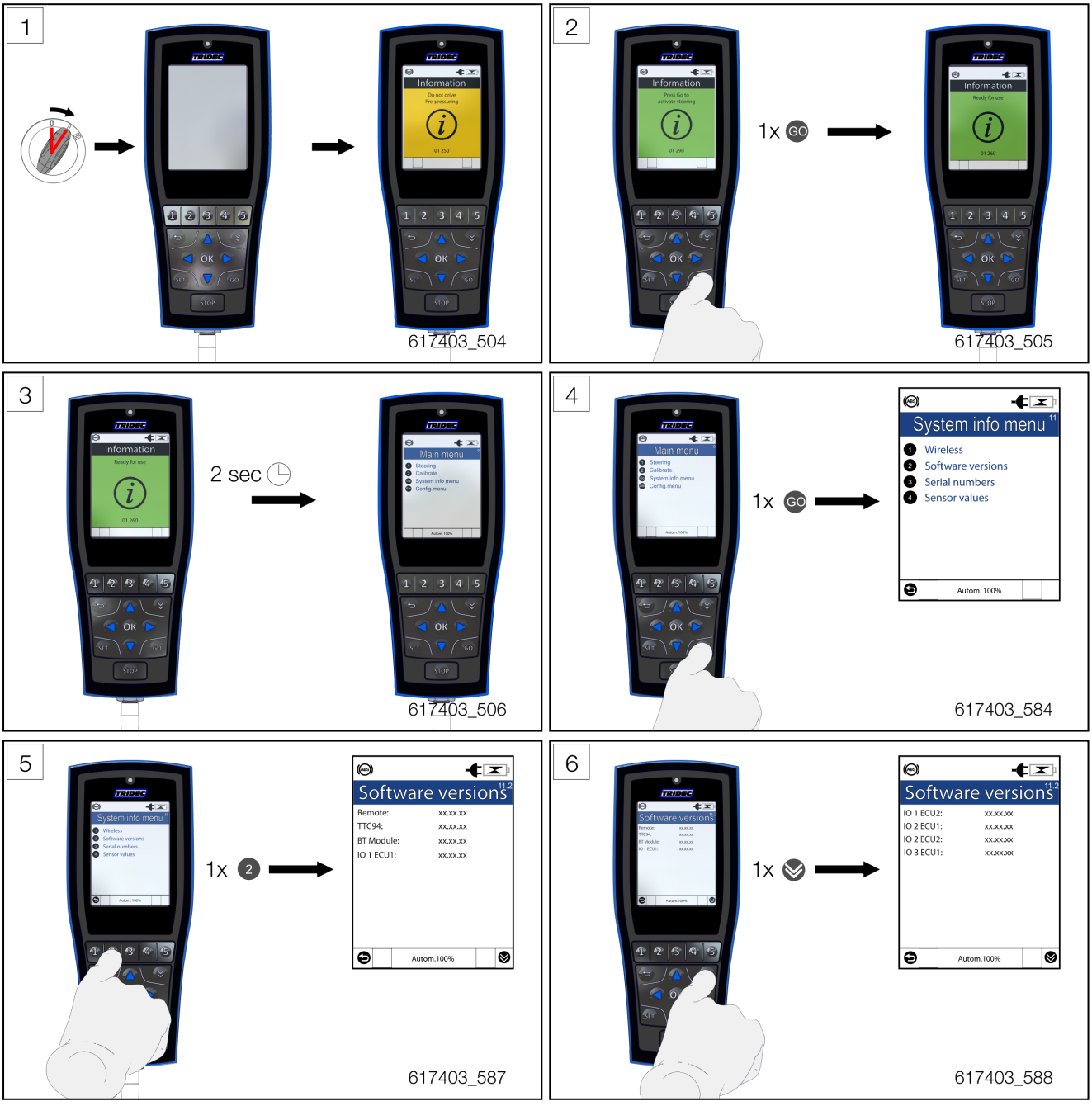
1. *Carry out the following.*

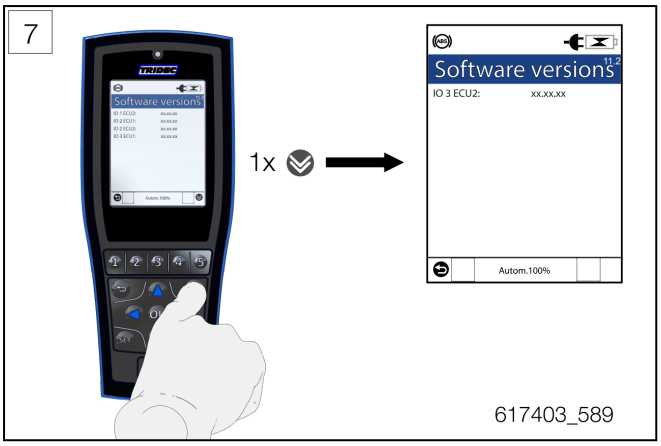


7.3.2 Programs

The “Programs” menu gives information about the program versions of the various components. The menu consists of a number of pages. The ⌄ button can be used to scroll through the various pages.

Procedure:




7
Software versions
1x
Software versions
IO 3 ECU2: xx.xx.xx
Autom.100%
617403_589


8
Wireless
3x
Main menu
Steering
Calibrate
System info menu
Config.menu
617403_590

7.3.3 Sensors

This menu shows the various sensor values, such as:

- The "towing angle" and the "steering angle".
- The oil pressure in the centring circuit(s) and steering circuit(s).
- The temperature of the various components.

Towing angle and steering angle

The angle sensor (WS) transmits two signals: the WSA steering signal and the WSB control signal. The value of the WSA signal is a measure of the angular rotation of the wheel or the kingpin. The numbers 0, 1, 2 and 3 before the abbreviation WS indicate where the angle sensor is located.

0WS = angle sensor on the kingpin
1WS = angle sensor on axle 1
2WS = angle sensor on axle 2
3WS = angle sensor on axle 3

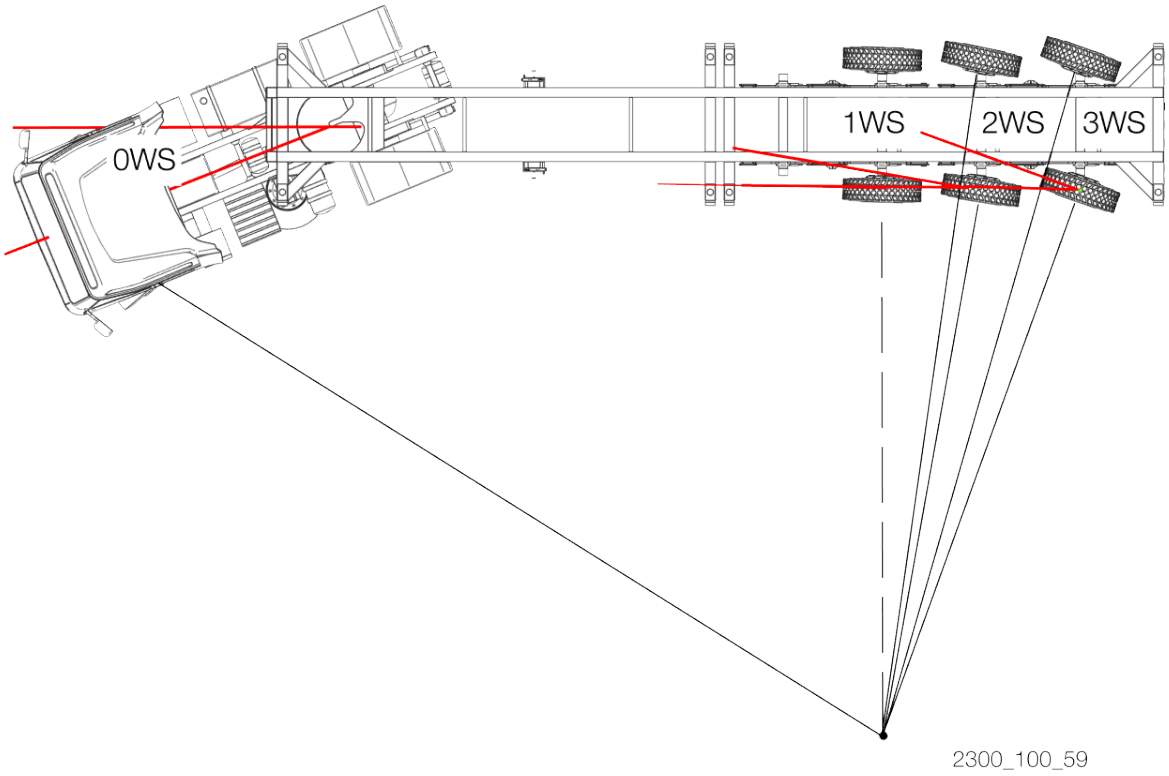
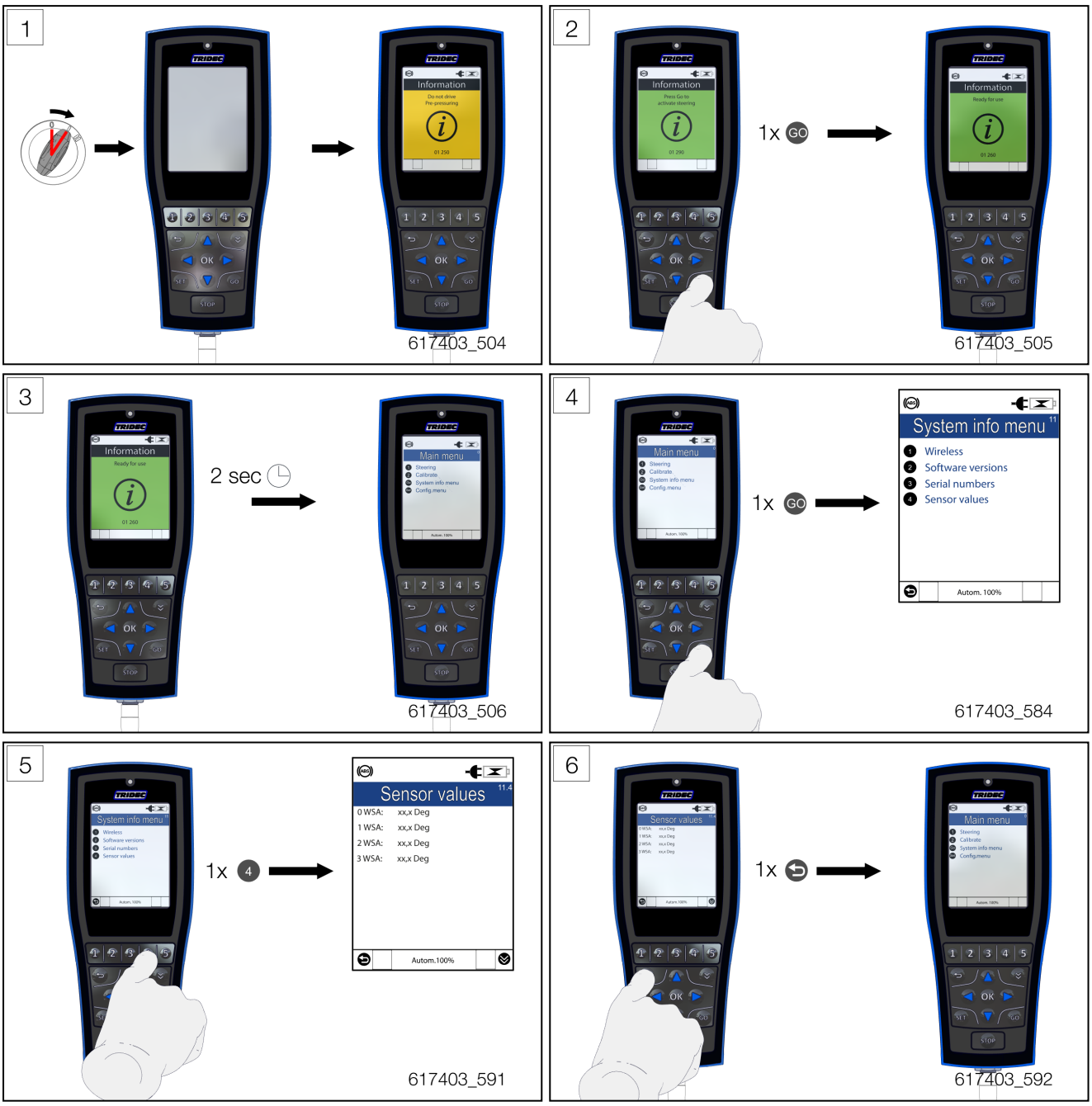


Figure 7-2

Procedure:

1. *Carry out this procedure to read the various angles:*



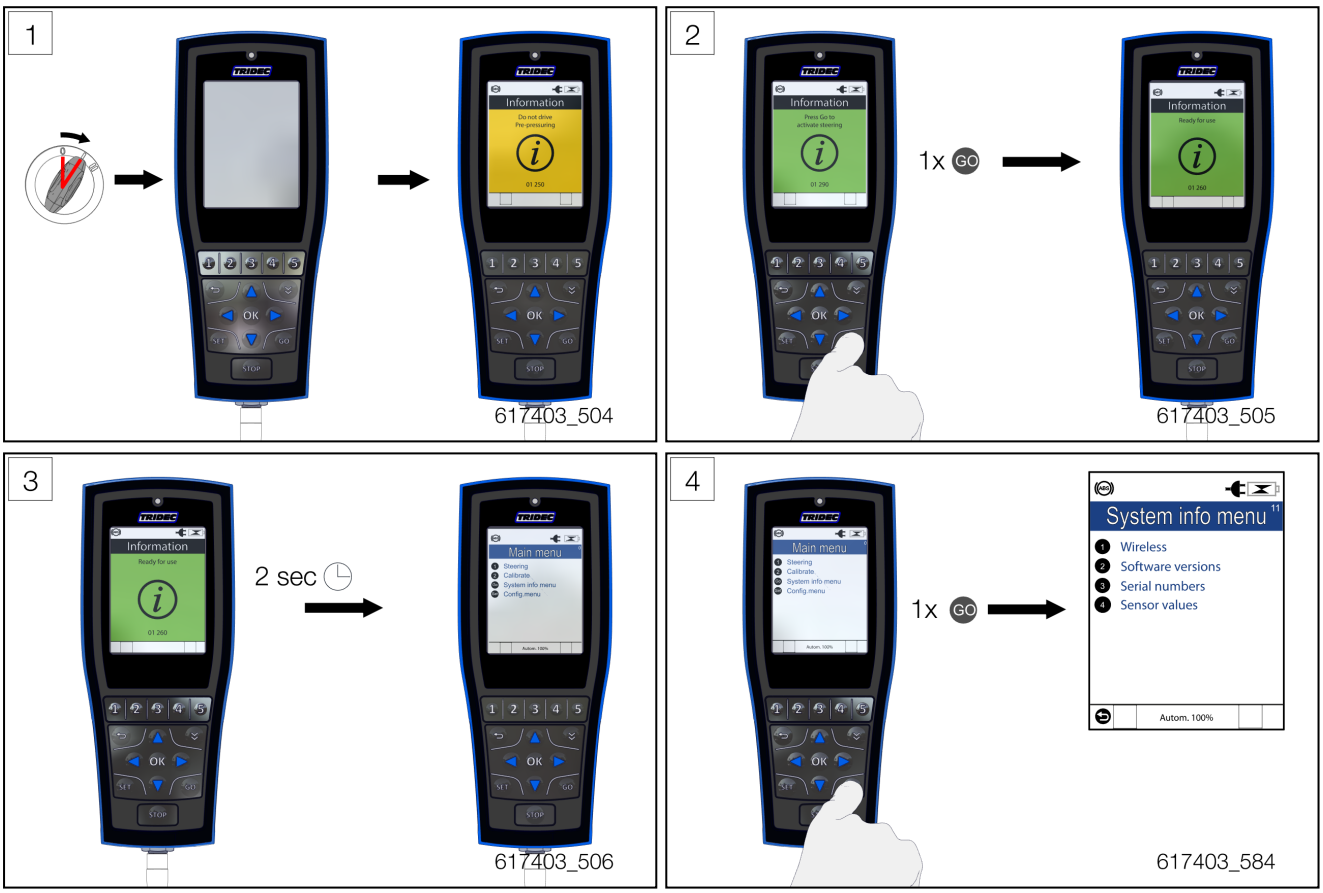
- 0WSA = towing angle measured by angle sensor WS on the kingpin
- 1WSA = average steering angle measured by angle sensor WS on axle 1
- 2WSA = average steering angle measured by angle sensor WS on axle 2
- 3WSA = average steering angle measured by angle sensor WS on axle 3

Pressure sensors

The pressures in the centring circuit(s) and the steering circuit(s) can be read on both the remote control and in the service program.

Procedure:

1. *Follow the procedure given below.*



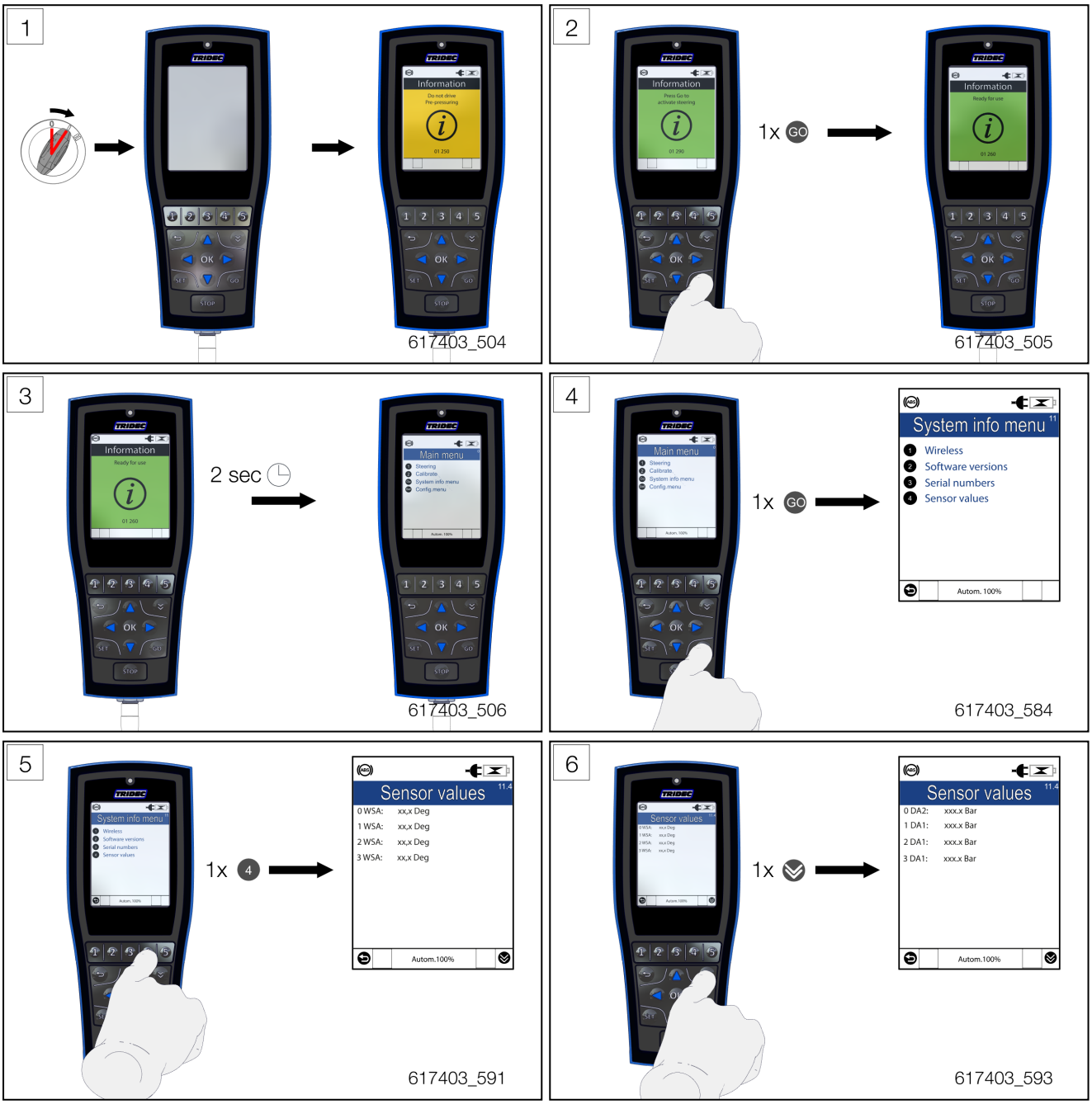
- 0DA2 = oil pressure in the hydraulic centring circuit.
- 1DA1 = oil pressure in the hydraulic circuit of axle 1
- 2DA1 = oil pressure in the hydraulic circuit of axle 2
- 3DA1 = oil pressure in the hydraulic circuit of axle 3

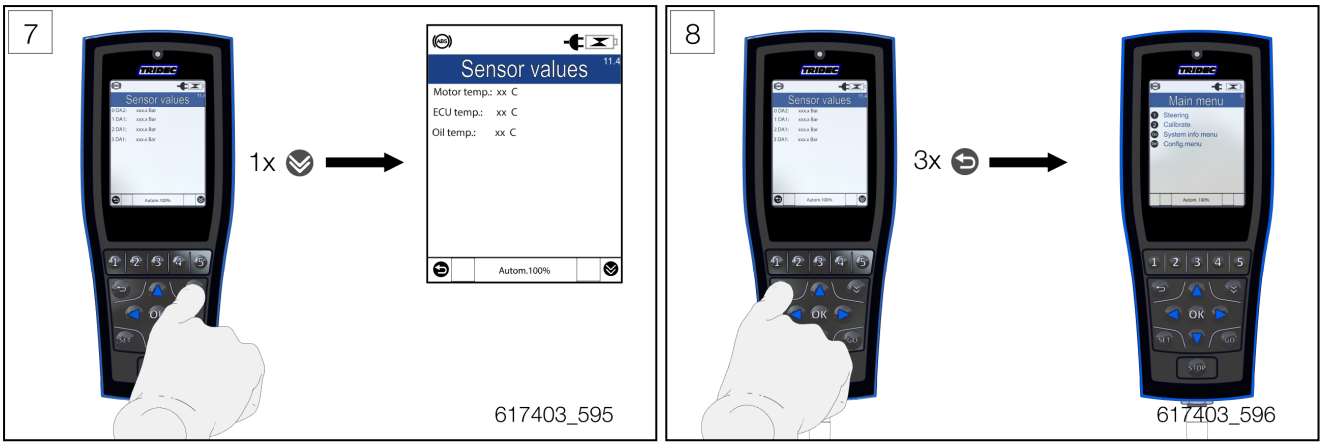
Temperature sensors

The EF-S system has a number of temperature sensors. The values can be read on both the remote control and in the service program.

Procedure:

1. *Follow the procedure given below.*





- Oil temp.:= temperature of the hydraulic oil
- Motor temp.: = temperature of the pump
- ECUtemp.: = temperature of the pump's ECU

7.3.4 Serial number

The "Serial number" menu provides the following information:

- Vehicle set: xxxx-xx-xxx_x
- Date: dd-mm-yy
- Serial number: xxxx-xx-xxx_x

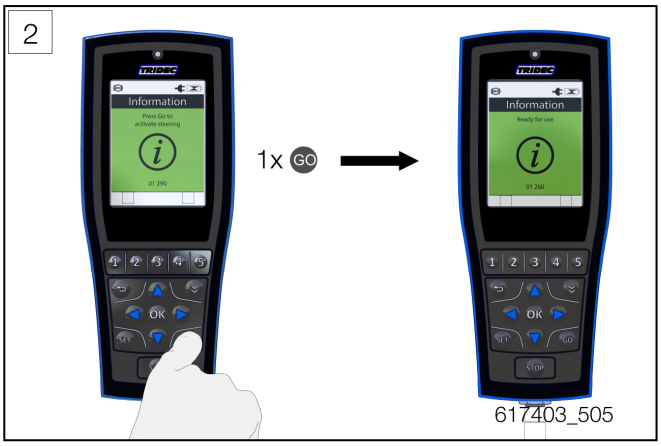
During manufacture, TRIDEC enters the vehicle details in the operating system of the EF-S system. These details are saved in a file. The file name is the same as the order number of the order you placed with TRIDEC. The final digit(s) of this number specify the version number. The vehicle details are saved by TRIDEC.
The date specifies when the operating system of the EF-S system was configured.
The serial number corresponds with the order number. The final digit(s) of this number specify the version number.

The version number of the vehicle details may differ from the version number in the serial number.

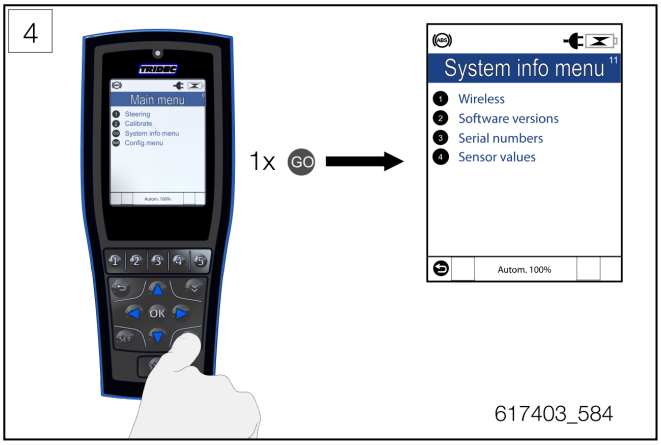
The order number is essential when ordering parts from TRIDEC. Have the order number available when ordering parts.

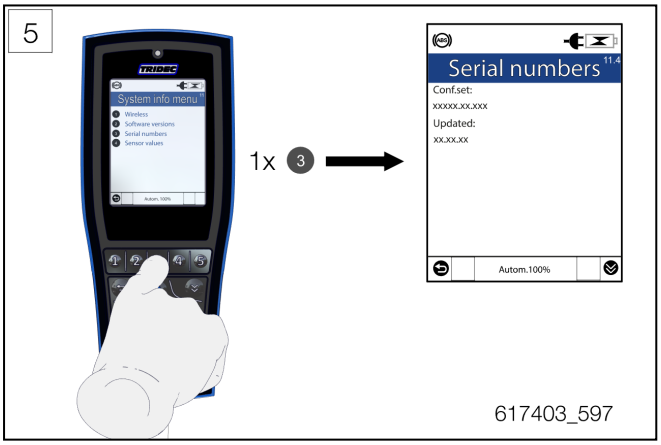
1. *Follow the procedure given below.*

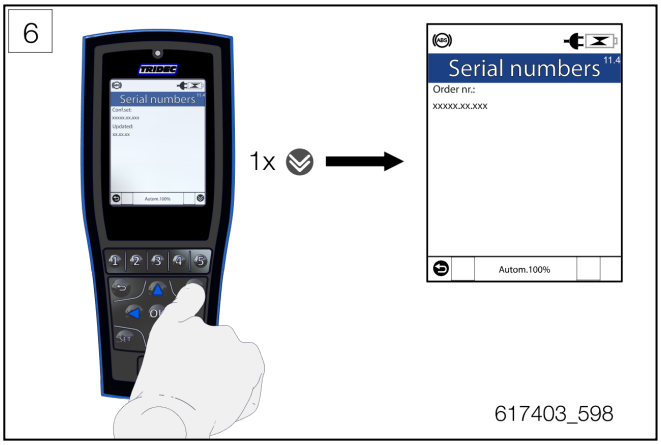

1
Information
617403_504


2
1x GO
Information
617403_505


3
Information
2 sec
Main menu
617403_506


4
Main menu
1x GO
System info menu
1 Wireless
2 Software versions
3 Serial numbers
4 Sensor values
Autom. 100%
617403_584


5
System info menu
1x 3
Serial numbers
Conf.set:
xxxxx.xx.xxx
Updated:
xx.xx.xx
Autom.100%
617403_597


6
Serial numbers
1x
Serial numbers
Order nr.:
xxxxx.xx.xxx
Autom.100%
617403_598


7
Serial numbers
2x
Main menu
617403_599

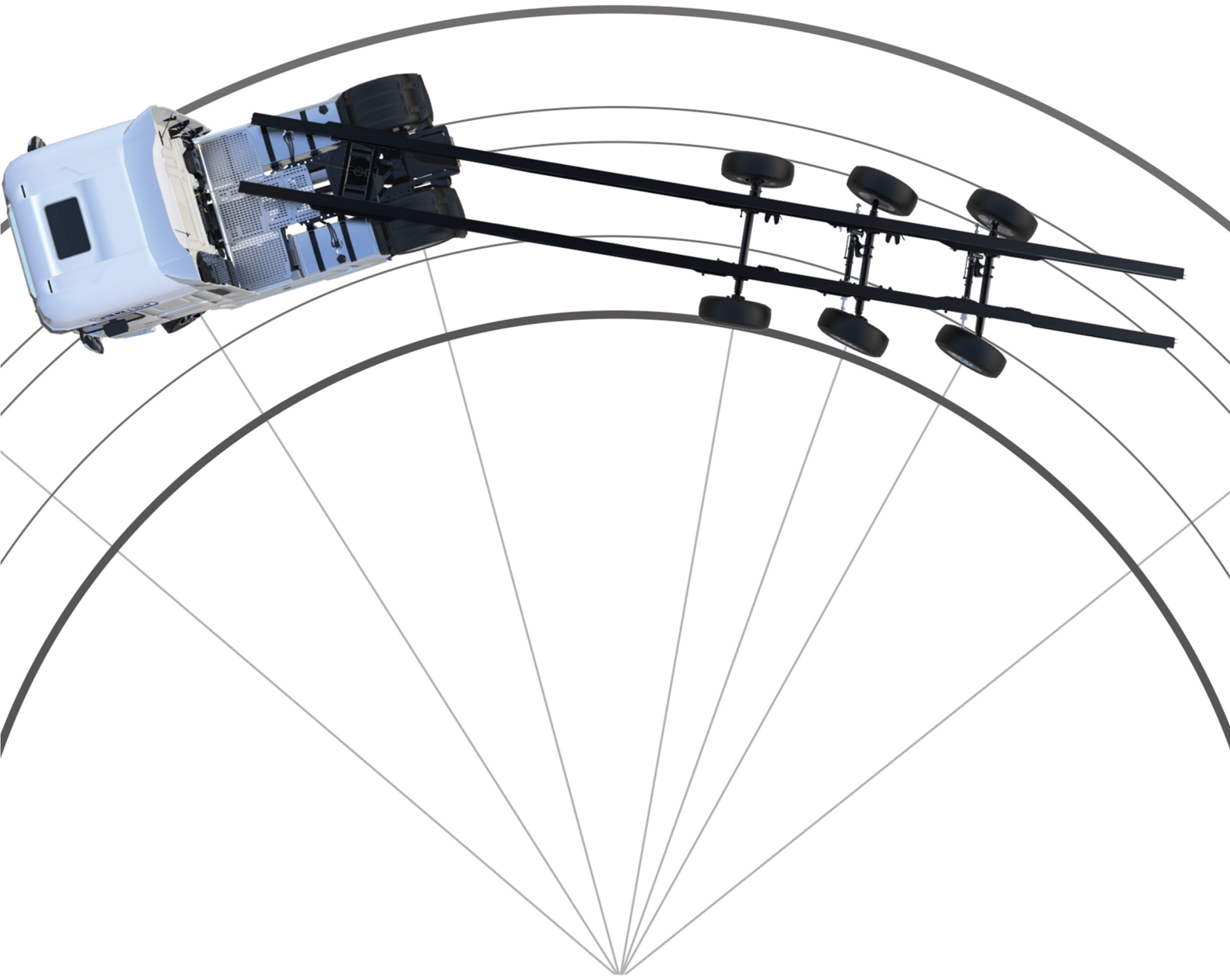
Notes

Notes

Notes

Notes

Excellent manoeuverability



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