

Operating Instructions

AXIS4000MB

Electronic Wheel Alignment

Camera Radio System

Electronic camera radio system for wheel alignment of commercial vehicles

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(Translation of the original manual)

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Release notes page 5

1 General Safety Instructions

1.1 Operator's duty of care



The wheel alignment device AXIS4000MB has been designed and constructed in accordance with a thorough selection of applicable harmonised standards. It therefore corresponds to the current state of the art and offers the highest degree of safety during operation.

The wheel alignment system may only be structurally modified with the written authorisation of the manufacturer!

Device safety can only be implemented during practical operation if all required applicable measures have been taken. The operator's duty of care includes planning such measures and checking their implementation.

In particular, the operator has to ensure that

- the device is only used for its intended purpose
- the device is only used in a fully functioning state and free from defects
- the complete operating instructions are permanently available in a readable condition at the operating location of the device
- only qualified and authorised personnel who are familiar with these operating instructions and can work in accordance with these instructions operate the device!
- personnel are regularly instructed in all relevant work safety issues and are familiar with the operating instructions, in particular the safety instructions.



Prior to each use of the wheel alignment system, the system must be checked for visible damage, and it must be ensured that the device is only operated free from defects! Any defects that are identified have to be reported to a superior immediately!



Note

The user is independently responsible for proper operation and compliance with safety regulations.

2 Transport of the wheel alignment system

2.1 Dimensions and weight

Length x width x height
120 cm × 80 cm × 125 cm

Transport weight
285 Kg gross



2.2 Information on general handling and storage



Severe shocks must be avoided during transport.



The system must be protected against moisture at all times. This applies in particular during transport and storage of the entire wheel alignment system. Care should be taken to ensure that the storage location is dry and dust-free.



Always store the cameras charged.

3 Product Description

Wheel alignment system **AXIS4000MB** Item No. 924 000 053



Version 4.6

Last updated: 12 / 2017

Subject to technical modifications.

Figures:
HAWEKA AG / D-30938 Burgwedel

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3.1 Authorised intended use

- The wheel alignment device AXIS4000MB was developed to carry out chassis measurements on commercial vehicles, trailers, semi-trailers and agricultural tractors.
- It is designed solely for rapid measurement of the chassis geometry.

For front axle and steered axles:	For rear axle/s
• Camber	• Camber
• Middle position of the steering gear	• Toe
• Camber and single toe	• Axle offset
• Castor	• Oblique position of axle
• King pin inclination	
• Toe difference angle	
• Maximum steering angle	

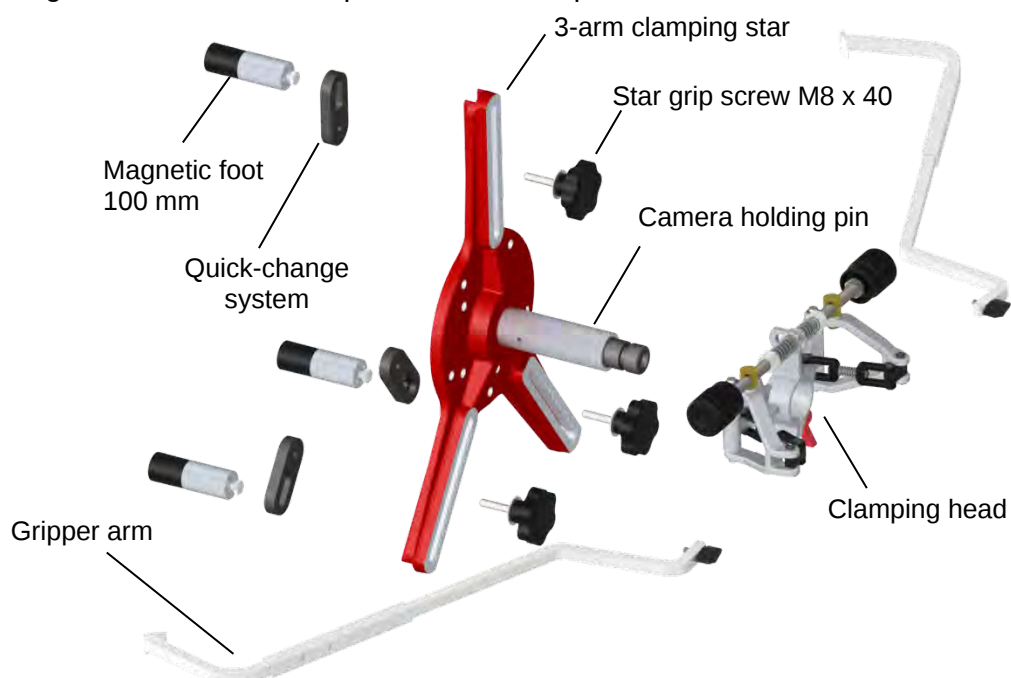
- The wheel measuring device AXIS4000MB allows you to measure in “drive position”, i.e. the vehicle does not have to be raised.
- Other vehicle types can be measured quickly and reliably (with the necessary accessories).



The operator of the wheel alignment device, and not the manufacturer, shall be liable for all damage to persons and property caused by incorrect use!

3.2 Structure of the wheel alignment clamp

Camera measuring head with its most important individual parts:



Never remove the camera holding pin from the 3-arm clamping star!

The camera holding pin is attached to the 3-arm clamping star and has been aligned and mounted

If you suspect that the camera holding pin is no longer perpendicular to the 3-arm clamping star, please contact your sales representative!

3.3 Technical Data

	Measuring range	Measuring accuracy:
Toe measurement	± 5 degrees	± 0°05'
Camber measurement	-15 degrees to +15 degree	± 0°05'
Castor measurement	5 degrees to +18 degree	± 0°05'
King pin inclination measurement	-10 degrees to +20 degree	± 0°10'
Maximum steering angle	± 70 degrees	± 0°10'
Axle offset	± 50 mm	± 0.5 mm
Oblique position of axle	± 15 degrees	± 0°05'
Toe difference angle	± 5 degrees	± 0°10'
Input mask for wheel base difference	[mm]	
Working temperature	+5 to +40 degrees Celsius	
Shock resistance of sensor	3500 g (inclination sensor) 2000 g (gyro)	
Radio module:		
Frequency range	2,4 GHz band (2405 – 2480 MHz) Automatic frequency correction	
Number of channels	10	
Transmission power	10 mW	
Camera:		
Electrical power supply:	Lithium ion battery pack: 18650 CF 2S1P 7,4 V/2250 mAh	
Operating time with fully charged battery	> 10 h	
Battery charger:		
Operating voltage	100 - 240 Volts	
Turning plates:		
Load capacity	6 to / pcs.	

3.4 PC system requirements for AXIS4000MB

Required operating system: Windows 7, 8.1, 10

Minimum hardware requirements:

Processor:	Pentium IV – AMD Athlon 1 GHz
RAM:	1024 MB
100 MB available hard disk space	
Graphics:	1024 x 768 pixel resolution / high colour
Sound card	
Port: USB 1.1	
Colour printer	

Recommended:

Processor:	Intel or AMD with 1.6 Ghz or better
RAM:	1024 MB
Graphic card with 16 MB AMD (ATI) or NVIDIA chipset or better	
Graphics	1280 x 1024 pixel resolution / True Colour
WLAN (Option for Portable Hand-held)	

4 Equipment

4.1 Parts List AXIS4000MB Basic Version

2 x axis measurement holder
Item No. 924 001 000

6 x magnetic feet (100mm)
Item No. 913 027 012

6 x quick-change systems
Item No. 913 027 006

2 x clamping heads complete
Item No. 912e008 140



4 x lorry gripper arm, or aluminium rims
Item No. 912e008 303



6 x special magnetic feet for rear axle alignment (315mm)
Item No. 913 030 012



4 x turning plates
Item No. 913 011 029



2 x electronic camera with transmission unit 1 x base plate for camera
Item No. 924 001 161 (left)
Item No. 924 001 162 (right)



Item No. 924 001 030

1. X base plate for reflector panel



Item No. 924 001 029

1 x transmission/receiving unit
Item No. 924 001 160

1 x USB cable
Item No. 924 001 067



2 x mounting aids for aluminium wheels

Item No. 913 027 017



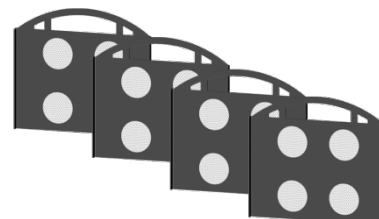
1 x camera charging station with EU power cable

Item No. 924 001 034



4 x reflector plates

Item No. 924 001 025



4 x tripods

Item No. 913 052 024

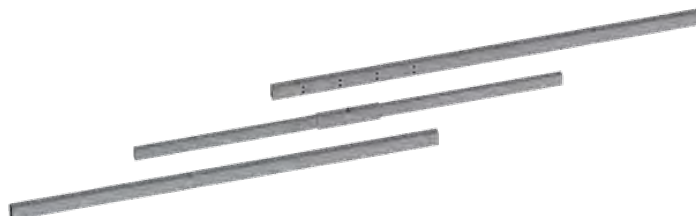


2 x reflector support

Item No. 913 052 081

1 x central part: 913 052 082

2 x exterior parts: 913 052 083



2 x magnetic scale holders

Item No. 913 052 077



4 x spacer plates

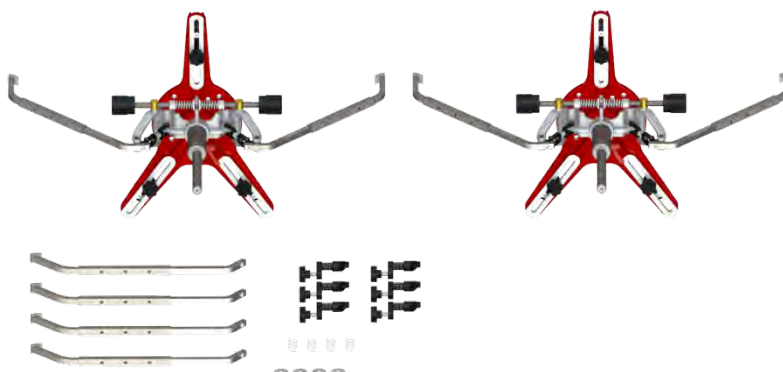
Item No. 913 011 043



1 x upgrade kit AXIS4000 for transporter:

Item No. 923 000 003

- 2 x car axis measurement holders
- 8 x telescopic gripper arms
- 12 x spring-loaded plastic holders
- 8 x small item (pens and communications)



1 x PC unit

Item No. 900 008 065 PC

Item No. 900 008 066 monitor

Item No. 900 008 067 printer

Item No. 900 008 068 keyboard

Item No. 900 008 069 mouse



1 x cabinet AXIS4000MB

Item No. 924 001 174



1x USB-Stick
AXIS4000MB
Item No. 924 001 194



operating instructions
Item No. GEB 001 212
handover report
Item No. DOK 000 008
Supplement functional
testing
Item No. DOK 000 009



5 Initial commissioning

On first use of the wheel alignment device, the following measures are necessary:



Mounting of the AXIS4000MB components

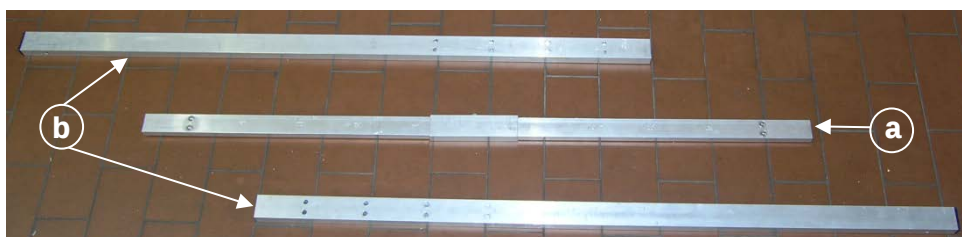


Installation of the software and the FM transmitter in Windows



Software set-up

5.1 Mounting of the reflector support



(Fig. 1)

A reflector support consists of the following components:

- a) 1 x **central part**
- b) 2 x **exterior parts** with hole for the reflector plates



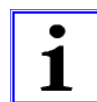
(Fig. 2)



(Fig. 3)

Join the two exterior parts to the central part.

Care should be taken to ensure that the left and right side is at the same distance from the central part.



Note

The number on the grid level must be the same on both sides.

The completely mounted reflector carrier is inserted for alignment in conjunction with 2 tripods.

5.2 Installing the software in Windows



(Fig. 4)

- Close all open applications on the computer
- Plug the USB stick into a free USB port from the PC
*If the installation wizard does not start automatically, click **Start** on the Windows task bar, then click **Run**. Enter `D:\axis4000msetup`, where **D** is the drive letter of the removable media.*



(Fig. 5)

- Confirm the Windows security warning if necessary and click **Run**.
- Read the licence agreement and follow the instructions of the installation wizard on screen. (Fig. 5)
- When the installation procedure has completed, the AXIS4000MB software and the driver for the FM transmitter have been installed on the computer.
- Remove the USB stick from the PC.

The driver for the FM transmitter is normally automatically installed on the system on your computer when the AXIS4000MB program is installed. When the FM transmitter is connected to a free USB port on the PC after installation, the new hardware is recognised and added to the system.

If this function not take place automatically, or if you uninstall and want to reinstall the driver manually, the driver can be added to your system again with the help of the AXIS4000MB USB stick.

5.3 Manual installation the FM transmitter (if necessary)



(Fig. 6)

- Connect the transmission and receiving unit (FM transmitter) (Fig. 6) to the free USB using the enclosed USB connection cable of the computer.
- The new hardware is recognised by Windows, and the installation wizard starts automatically.
- Select the destination drive: *Install* and select software from a specified source: *Browse removable media*, whereby the AXIS4000MB USB stick must be inserted in the PC.

6 The AXIS4000MB program

We have taken great care to ensure that the entire program is straightforward and clear so that the user can monitor and operate the device at all times with ease.

You will learn how to use this program to determine the rim and chassis geometry of a vehicle in a very short time.

In just a few steps, help texts and graphical illustrations guide you through the different parts of the program and provide sufficient information about the program at all times.

Before you begin with your first vehicle measurement, however, the most important program parameters have to be set up for individual use.

6.1 Setting up the software

- Start the program.



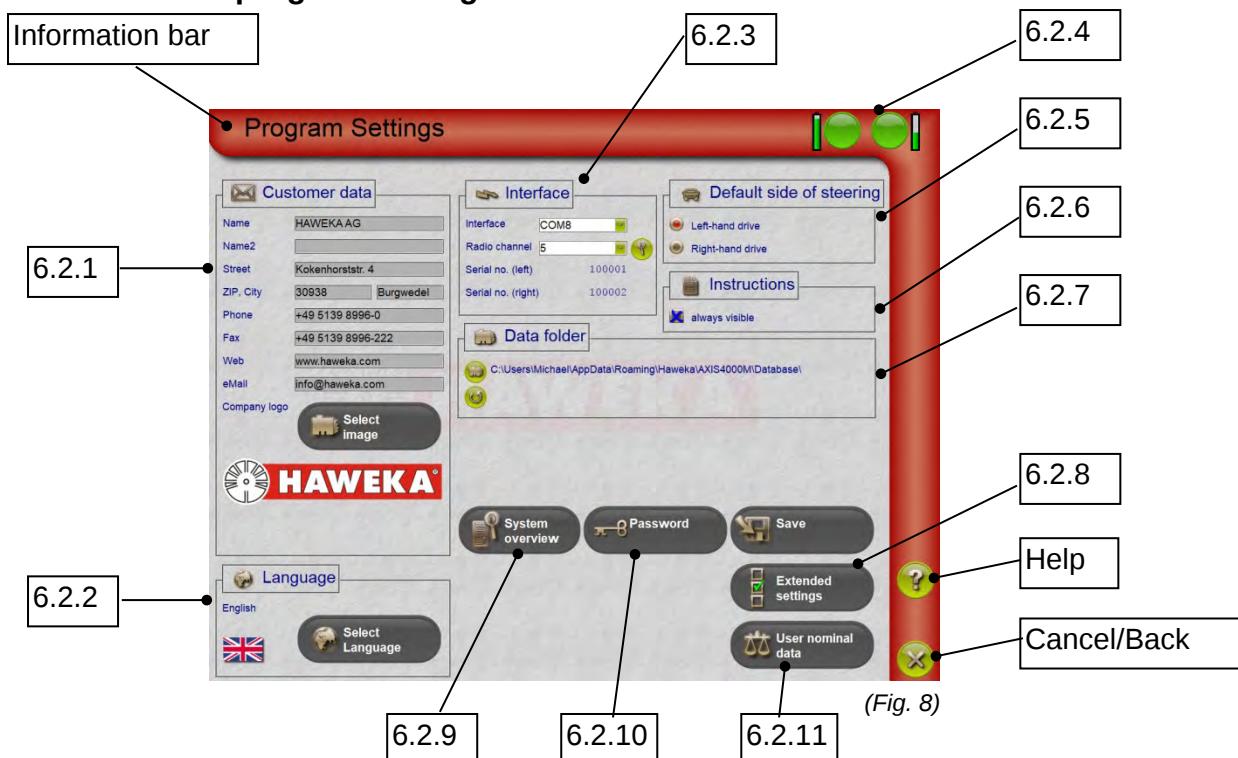
Click on the icon on the desktop or in Windows select: *START – PROGRAMS – HAWEKA – AXIS4000MB* and click on the *AXIS4000MB* link.



(Fig. 7)

After program start select the option “**Settings**” for the first basic setting.

6.2 Overview of the program settings



6.2.1 Customer data:

Enter your company name on the applicable lines so that the name can be included and printed on the measurement protocol. (Fig. 8)

Select image button:

Your company logo can be saved to be displayed later on the log.

Supported file types: BMP, JPG, GIF, PNG

The image size is scaled.



Image files that are too small are enlarged, reducing their quality. The smallest format chosen should be around 400 x 200 pixels at 72 dpi.

6.2.2 Language:

Click on the **Select Language** button to display menus and instructions in a different language. (Fig. 9)



All settings have to be confirmed by clicking "**Save**".



(Fig. 9)

6.2.3 Interface:

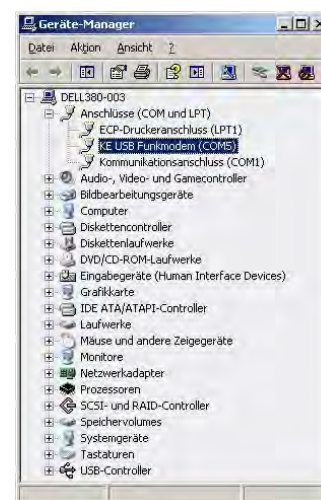
After successful installation, a new virtual COM interface has been added to the computer for communication with the FM transmitter.

The interface setting in the program should be set to “**AUTO**” for an automatic connection.

The interface may be changed manually to a specific port if required (no connection to the camera).



In the device manager in Windows, a new entry, “**KE USB wireless modem(COM x)**” is added to the new COM interface for the FM transmitter. (Fig. 10)



(Fig. 10)

Radio channel:

The radio channel set on the cameras for data transfer between the camera sensor and the program is displayed automatically.

The radio channel can be changed on the cameras if necessary and then has to be confirmed by clicking the **Magnify** button.



Magnify button

The dialogue window is divided into two columns. The left column displays the cameras that were found by the program but are not yet connected. The right column displays the camera(s) that are already connected to the program by radio.



The cameras and the FM transmitter have to be set to the same radio channel.

Serial number:

The serial numbers of the cameras are displayed as soon as the program has established a connection with the cameras.

6.2.4 Information about camera symbols:

The connection to the cameras and the battery charge status are constantly checked and displayed during the entire program sequence.

Description of symbols:

The program has not yet made a connection query to the cameras; status unknown. (Fig. 11)



(Fig. 11)

The display flashes yellow and red alternately. The program is attempting to establish a connection with the cameras. (Fig. 12)



(Fig. 12)

Display is green: Connection to the camera has been established. (Fig. 13)



(Fig. 13)

Display is green, with a red centre: Connection has been established, but no reflector panel has been found.
(Fig. 14)



(Fig. 14)

Display is green with a yellow centre: Connection is established and the reflector panel was detected.
(Fig. 15)



(Fig. 15)

Charge status of the camera battery:
100%, 75%, 50%, <25% capacity.
(Fig. 16)



(Fig. 16)

The camera symbol flashes at a battery charge below 25 %. (Fig. 17)



Caution

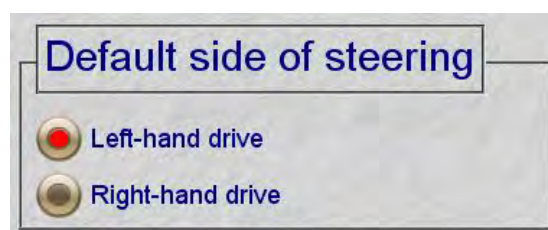
The camera has to be charged before carrying out any further measurements.



(Fig. 17)

6.2.5 Standard steering side

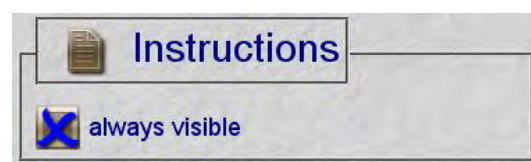
At this point, depending on country-specific use, a vehicle steering side can be determined as a standard steering side for checking the middle position of the steering gear. (Fig. 18)



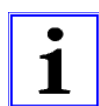
(Fig. 18)

6.2.6 Instructions

Specifying the default for displaying/hiding operating instructions during measurements.
(Fig. 19)



(Fig. 19)



Note

The instructions window can be displayed/hidden at any point in the program. Click on the **Instructions** button on the program page.



6.2.7 Data directory

All vehicle measurements are saved in a log file.
The pre-set file path is:

C:\user\username\AppData\Roaming\Haweke\AXIS4000MBM\Database\
(Fig. 20)



(Fig. 20)

To change the file location, click on „**Folder**“:



To reset the default path, click on "**back**“:



6.2.8 Advanced settings

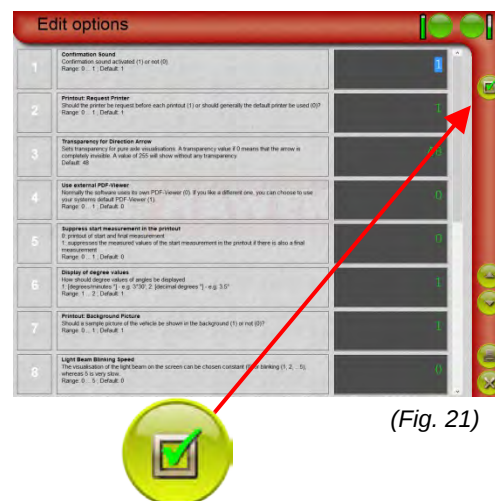
Under advanced settings, the user has the option of personalising the program. (Fig. 21)

To customise settings, select the applicable parameter in the table and change the value.



For an overview of the advanced setting, see Annex point 22.1 page 55

The modified entries have to be confirmed by clicking on the **“Accept values”** button.

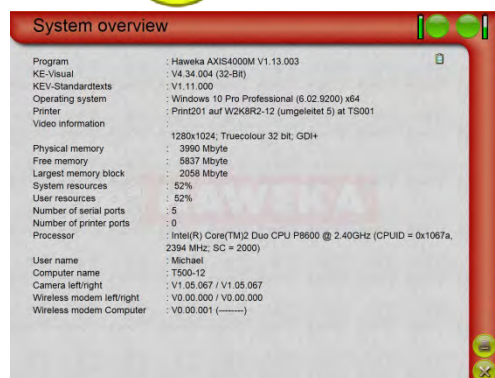


(Fig. 21)

6.2.9 System overview

The system overview provides a list of the PC components used, the cameras, the FM transmitter and the program versions.

This information is used by the service engineer to gain an overview of the system in case of malfunction. (Fig. 22)

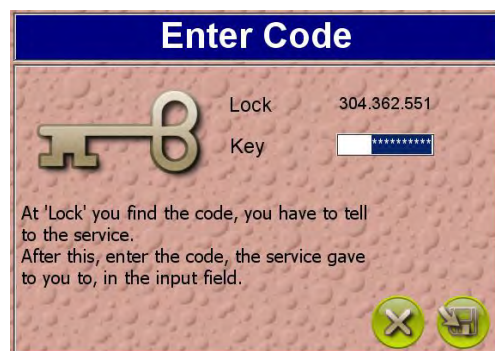


(Fig. 22)

6.2.10 Password

This function is used only by our service personnel to carry out system diagnostics on site.

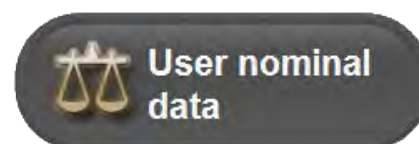
This option allows our service personnel to implement program-specific changes. (Fig. 23)



(Fig. 23)

6.2.11 User NOMINAL database

Vehicle data for nominal/actual comparison can be created with the help of the user NOMINAL database.



7 Preparing for measurement



Note

Before measurement can begin, preparatory work must be carried out in the measurement area and vehicle. This work can be different and is partially mandatorily required by the vehicle manufacturers.

The check list below shall help you comply with different condition:

- Check that the vehicle has rims and tyres of the same size
- Check that profile depth is sufficient
- Tyre wear!! Can unequal wear be detected?
- Check that the tyre pressure is correct
- Check play in steering and wheel bearings
- Check ball joints/king pins
- Check the condition of suspension and shock absorbers
- Note any stipulations for load cases to simulate driving conditions as provided by the manufacturer.
- Remove wheel nut protection and/or hub caps
- Clean between the wheel nuts on the rims so the magnetic feet can ensure safe seating of the camera holder on the rim.

8 Preparatory measures

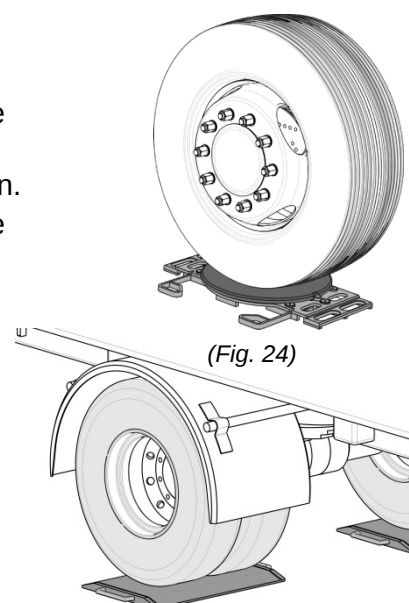
Drive vehicle onto the turning and compensating plates

- Lay the turning plates on the left and on the right in front of the front wheels.
- Using the safety catches, secure turning plates against rotation.
- Lay the turning plates on the left and on the right in front of the rear wheels.
- Drive vehicle onto the turning and compensating plates.



Note

The middle of the front wheel must stand above the middle of the turning plate. The rear wheels must be in the middle of the compensating plates. (Fig. 24)



(Fig. 24)

- If the vehicle has reached the position on the turning and compensating plates, the turning plates will be unlocked using the safety catches.

Mount wheel alignment clamp

- The magnetic holders on the 3-arm clamping star have to be adjusted to the required rim flange.
- The magnetic holders have to be turned to ensure full contact with the rim flange between the wheel nuts and to ensure that all 3 magnetic feet have the same distance to the centre of the wheel alignment clamp.



Caution

Check the contact surfaces of the magnets BEFORE you start! They have to be free from dirt and metal filings!

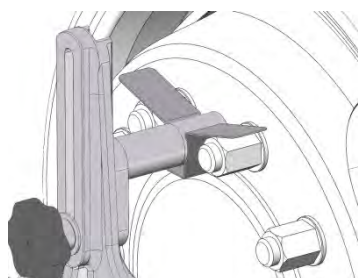
- Attach the wheel alignment clamps to the **cleaned rim flange** using the magnets.
- Two magnets should be located above the centre of the wheel and one magnet below. (Fig. 25)



Note

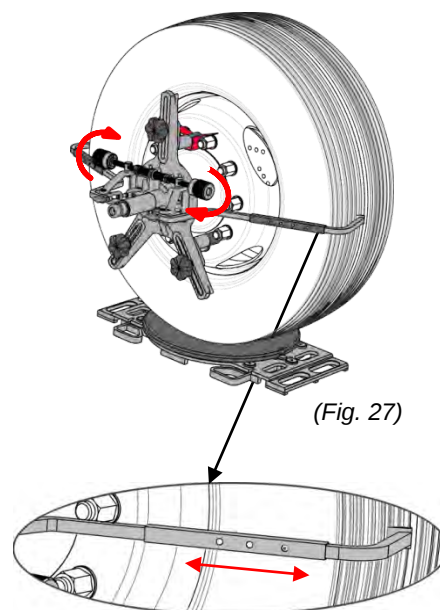
IT HAS TO BE ENSURED THAT THE WHEEL ALIGNMENT CLAMPS AND/OR CAMERA HOLDING PINS ARE ALIGNED WITH THE CENTRE HOLE OF THE RIM.

In the case of aluminium rims, two gripper arms (912e008 303) shall be additionally screwed on to each wheel alignment clamp. Together with the mounting aid for aluminium rims (Fig. 26), the wheel alignment clamp is stopped in the middle of the wheel, whereby a magnet foot is above the middle of the wheel and two are below it. Rest the magnetic feet on the rim flange and key the gripper arms into the tyre tread using the quick clamping test. (Fig. 27)



(Fig. 26)

Before tensioning in their length, the clamping arms have to be adjusted on both sides so that they rest just in front of the tyre profile without tension.

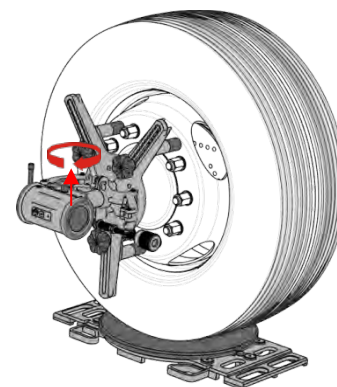


(Fig. 27)

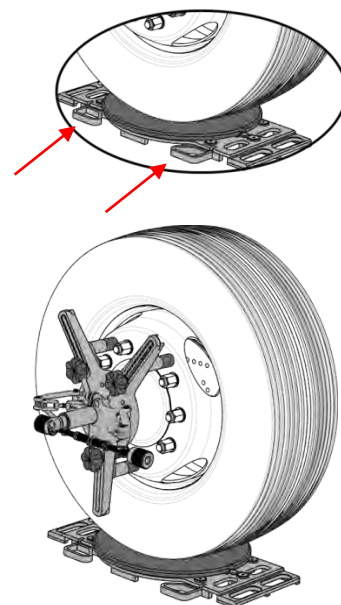
Attaching the camera

- Pull the camera mounting bolt gently upwards and slide the camera onto the camera holding pin until the mounting bolt locks into the groove on the holding pin.
- Then, by slightly tightening, lock the camera to the pin using the camera locking bolts.

(Fig. 28)



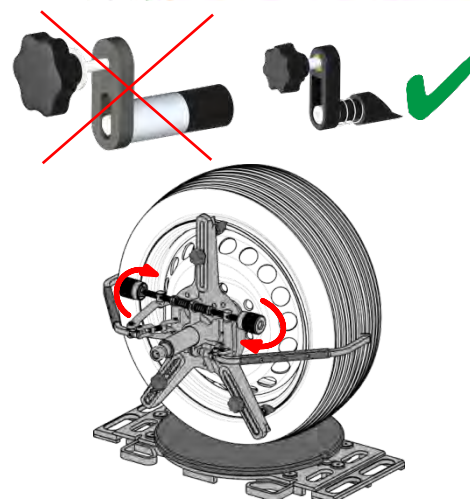
(Fig. 28)



(Fig. 25)

Mount wheel alignment clamp to transporter rims

- The magnetic feet must be replaced by the spring-loaded plastic holders on the 3-arm clamping star.
- The wheel alignment clamp is first placed on the rim flange with the two lower plastic holders.
- When all three plastic holders are properly fitted on the rim flange, press the wheel alignment clamp against the rim and firmly clamp on the with the help of the spindle. (Fig. 29)
- The 2 wheel alignment clamps with the scale holder are mounted on the rear axle in the same way



(Fig. 29)

8.1 Defining vehicle data in the AXIS4000MB program

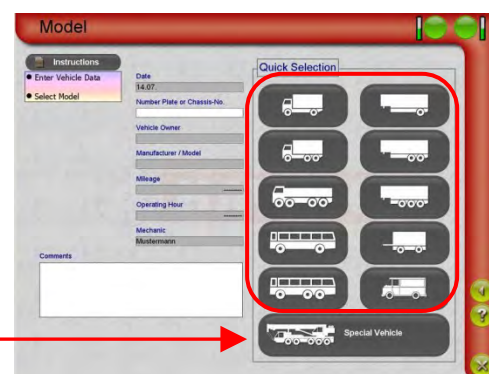
The transmitting/receiving unit is connected to the PC and the PC is switched on. The AXIS4000MB program is running and is on the start page.

- Click on the **“Start measurement”** button.
- Enter vehicle data and select vehicle type via fast selection. (Fig. 30)

**Note**

With the help of fast selection, the user has the option to take over the preset vehicle values directly or to make changes depending on vehicle type and kind.

- An individual vehicle of up to 5 axles is set up for alignment by selecting **“Special vehicle”**.
- The rim size is to be defined on the following program page **“Vehicle data”** and determined depending on vehicle and the type of axles. (Fig. 32)
- Then, accept the vehicle data using the **“Continue”** button.



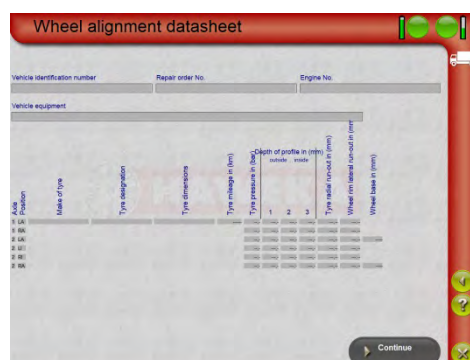
(Fig. 30)

The following 2 program pages **“Wheel alignment data sheet”** and **“Nominal data”** are optional and have no effect on the recording of the measurement value. (Fig. 33 + 34)

The values from the wheel alignment data sheet appear later in the protocol printout.

If target values are entered, the measurement values are displayed in **red** or **green**.

(See page 27)



(Fig. 33)



(Fig. 34)

9 Selecting the measurement method

After vehicle selection - depending on the programm parameter setting (see Appendix point 22.1 Advanced Settings, page 55) - a query appears for the measurement method. (Fig. 35)

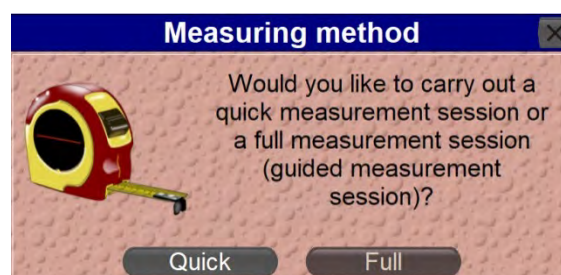
The **quick alignment** allows you to skip a few program steps and to perform the desired measurement procedures.

Continue with quick alignment:

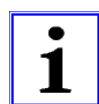
See point 10 onwards (page 22)

The **complete alignment** works through all the work steps in order to carry out complete vehicle alignment.

Continue with complete alignment: See point 12(page 36)

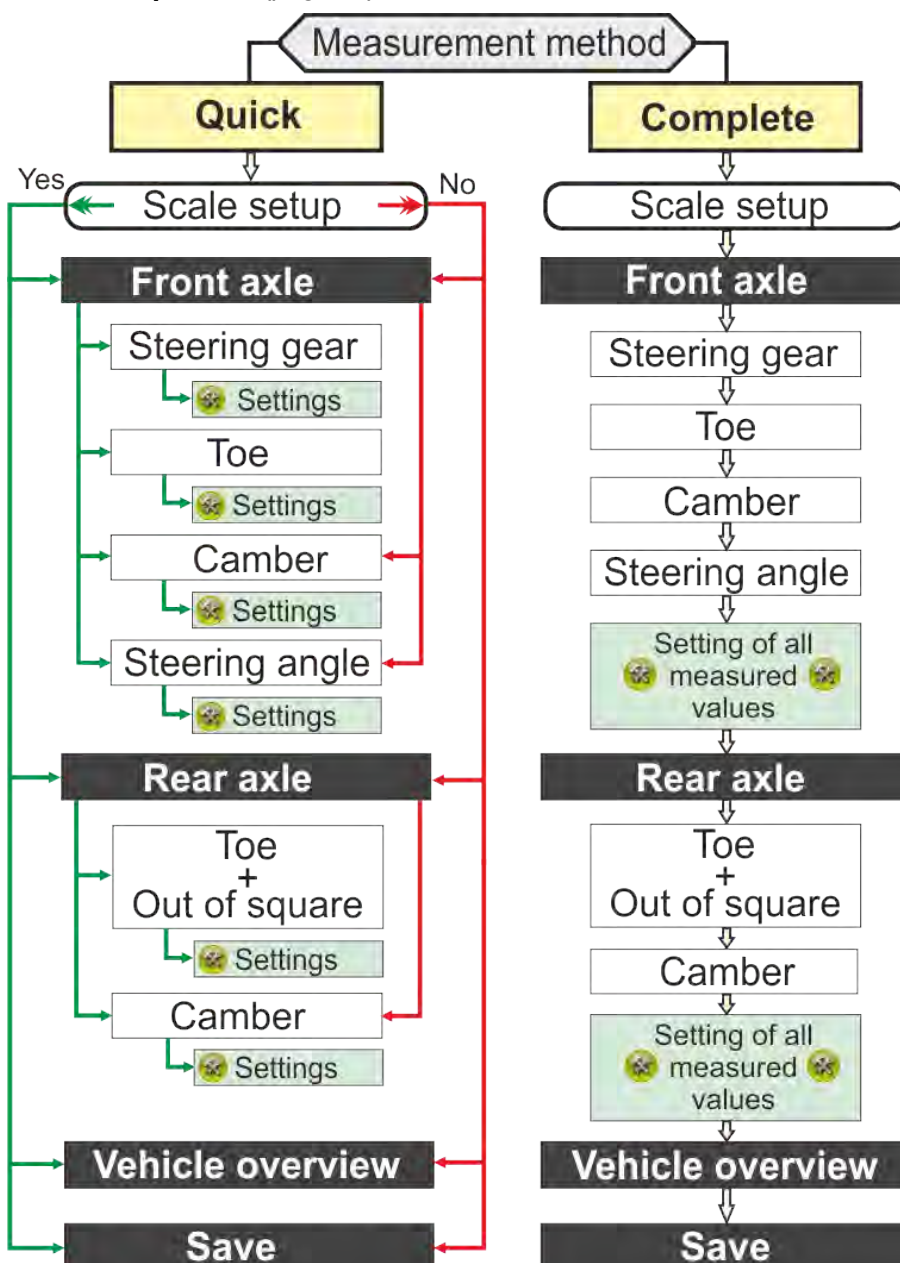


(Fig. 35)



Note

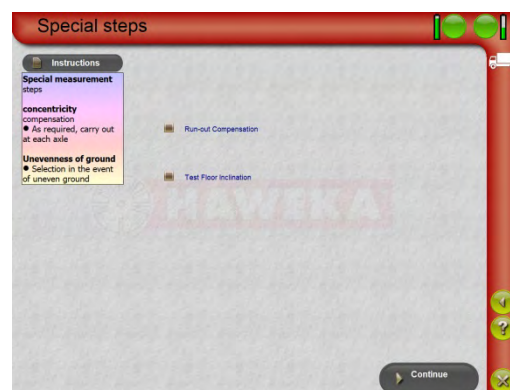
If a scale set-up is carried out when selecting **Quick alignment**, all measurements for a complete vehicle alignment can also be carried out. But in any order!



10 Quick alignment (front axle)

Compared to the complete alignment, the quick alignment allows you to skip a few program steps and to perform the desired measurement procedures. Thus, for example, the scale set-up can be skipped when only the camber and/or the steering angle should be entered.

After quick selection has been selected, the program automatically changes to the “**Special measurement steps**” page (Fig. 36)



(Fig. 36)

Select **run-out compensation**

In a few rare cases, it may occur that the wheel alignment clamp for the camera cannot be properly positioned on the rim.



Caution

The wheel alignment clamp must always be parallel to the wheel hub.

For example, in the case of Trilex rims, no proper fitting of the wheel alignment clamp is guaranteed due to the condition of the 3-part rim. Here, an inspection of the individual wheel alignment clamps must be carried out per vehicle wheel using the **run-out compensation button**.
(See point 18 onward, page 50)

Select **Floor test**

Vehicle alignment must be carried out on level floor. If there is a suspicion that the selected work place is not at a horizontal level between left and right vehicle side, then this situation should be checked and taken into account for further measurements. **This step is not absolutely necessary, but it is to be recommended if it is suspected that the ground is uneven.**

See point 17 onward, page 49.

Click on the “**Continue**” button to get to the scale set-up.
(Fig. 37)

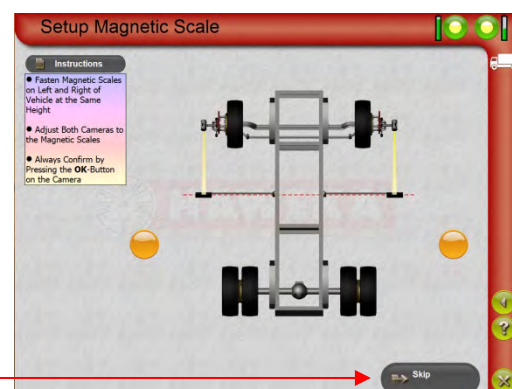
Here, you have the option to avoid scale set-up by clicking the “**Skip**” button and you immediately get to the selection of the measurement procedures.

(from page 25)



Note

This option serves only as a quick measurement for castor, king pin angle, toe-out and maximum steering angle.



(Fig. 37)

For complete vehicle alignment, continue with point 10.1.

Front Axle Alignment

10.1 Setting up reflector panel (scale set-up)

10.1.1 Attaching magnetic feet to the vehicle

- Fix the magnetic feet to the vehicle frame on the left and right, at least 1 metre from the front axle, at the same distance.
- Ensure that the reflector panels are attached to both magnetic feet in the same position. (Fig. 38)



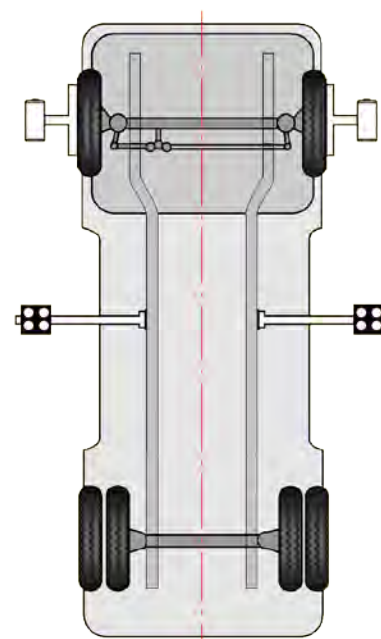
The magnetic feet should be attached to the vehicle frame as far as possible from the camera. Thus, there is a larger rectangle ruler.

Note

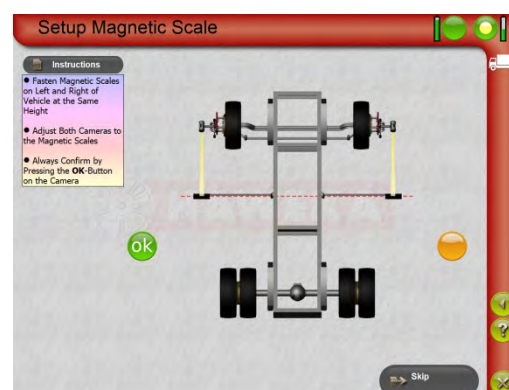
If the magnetic feet are attached to the vehicle with the magnetic feet, the cameras have to be directed at the reflector panels on the left and the right.

If the camera detects the reflector panels, then the symbol changes top right in the program and the procedure is confirmed by the **OK button** on the respective camera.

- The program indicates the measured values obtained both optically by a green OK symbol and acoustically by a signal tone.
- It does not matter in which order (left/right) the reflector panels have been detected and confirmed using the **OK button** of the respective camera. (Fig. 39)
- If both reflector panels are detected and measured, the program automatically changes to setting up the reflector support.



(Fig. 38)



(Fig. 39)

10.1.2 Set up reflector support (toe scales) and align on the vehicle

There are 2 reflector supports with 2 reflectors each.



To set up the REFLECTION SUPPORTS, the REFLECTOR PANELS are removed from the magnetic feet.

Note

- Assembly is done by assembling the reflector support, the tripods and the reflector panels. (Fig. 40)

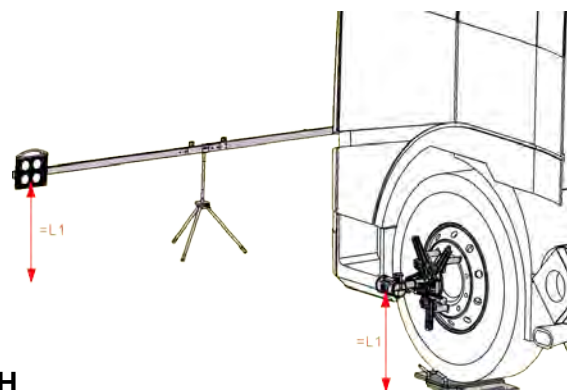
Front Axle Alignment

- A reflector support is set up in front of and behind the vehicle and optically aligned.
- Ensure that the reflector supports are placed close enough to the vehicle, but at least 1 metre from the camera and parallel to the vehicle rear.
- If the reflection supports are positioned, the reflector panels are attached in the same position on the carrier on the left and right. (Take note of the position hole on the support)



Note

THE REFLECTOR PANELS HAVE TO BE ALIGNED ALONG A HORIZONTAL LINE WITH THE CAMERAS. (Fig. 41) The height can be adapted using the adjustable tripods.



(Fig. 41)

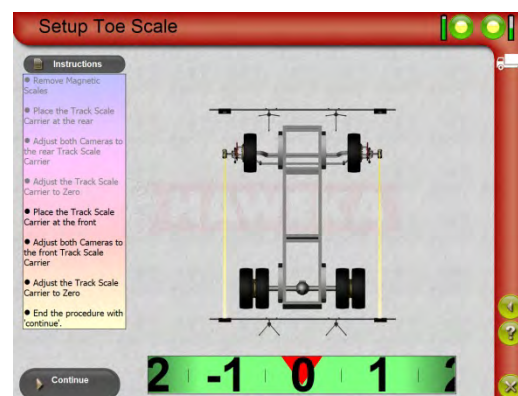
- Point the cameras to the rear camera panels.
- Move the rear reflector supports sideways so that the progress bar on the screen moves from red to yellow and green and nearly reaches the value "0". (Fig. 42)



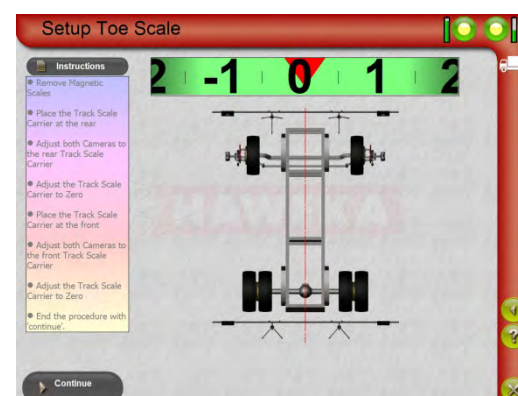
Note

THE TRIPODS REMAIN IN PLACE! ONLY THE REFLECTOR SUPPORT IS MOVED.

- As soon as the reflector support is aligned, a red centre line is displayed in the area of the vehicle and the program now awaits the reflector panels of the reflector support.
- Pan both cameras to the front reflector panels.
- The progress bar on the screen shows a value again.
- Move the front reflector supports sideways so that the progress bar on the screen moves from red to green and nearly reaches the value "0".
- If this process is completed, a red centre line also appears for this area. (A line occurs through the complete vehicle) (Fig. 43).
- The vehicle centre line is defined for the following measurements and the alignment of the reflector supports is finished by clicking the "Continue" button.



(Fig. 42)



(Fig. 43)



Note

DURING THE ENTIRE MEASUREMENT, BOTH REFLECTOR SUPPORTS MAY NO LONGER BE CHANGED IN THEIR POSITION.

If the positions of the reflector supports are changed during alignment, then these must be realigned. Alignment can be then continued at the last measurement point.

Front Axle Alignment

10.2 Middle position of the steering gear

- The menu item “**Middle position of the steering gear**” is to be selected on the overview page for the selection of measurement procedures. (Fig. 44)

The centre position of the steering gear is recorded one-sided on the steering gear side of the vehicle.

- If required, the selection of the steering side can be changed by clicking the **left-hand drive/right-hand drive** button. (Fig. 45)

- Before the measurement, the steering gear must be brought into the central position.

- The relevant camera is to be pointed at the front reflector panels. (Fig. 46)

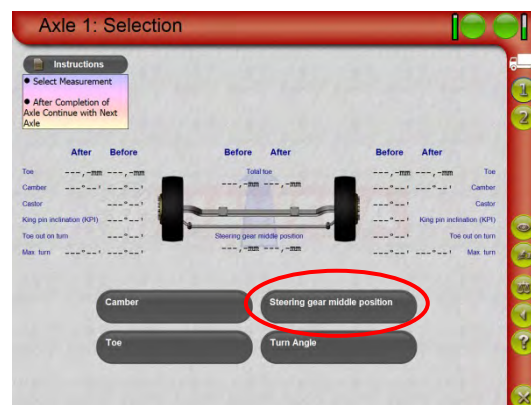
- If the reflector panel has been detected, confirm the procedure with the **OK button** on the camera.

- The camera is now rotated by 180 degrees and pointed at the rear reflector panels. (Fig. 47)

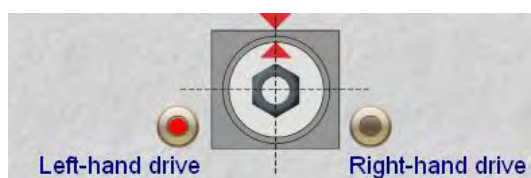
- After detecting the second reflector panel, confirm the procedure again with the **OK button** on the camera.

- If the work steps are carried out, the determined measurement value is immediately displayed.

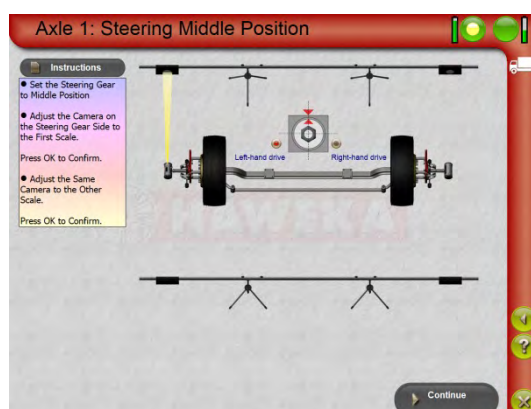
- Clicking on the “**Continue**” button changes the program again on the overview page of the selected axle and shows the actual data determined.



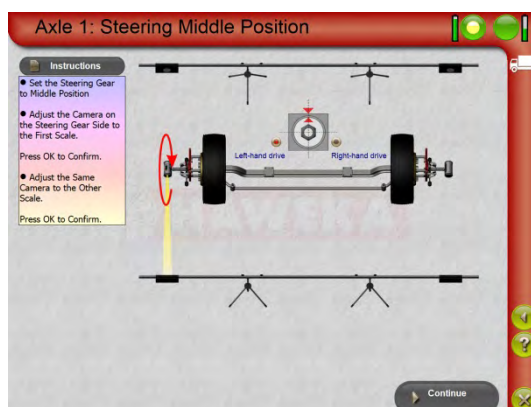
(Fig. 44)



(Fig. 45)



(Fig. 46)



(Fig. 47)

Front Axle Alignment

Setting the steering gear.



In the **Quick alignment** mode, the settings symbol appears immediately after recording the actual value.

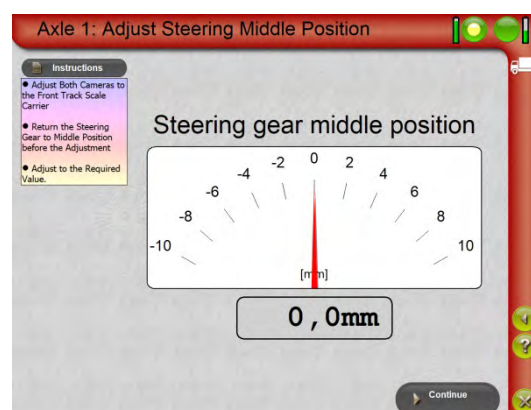
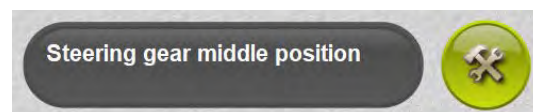
In the **Complete alignment** mode, adjustment is possible only after the measurement of the respective axle.

- If the settings button is selected for the steering gear, the display for the setting appears. (Fig. 48)
- The middle position of steering is to be controlled on the steering gear. (Fig. 49)
- The adjustment is made on the thrust rod until the desired value is shown on the display.

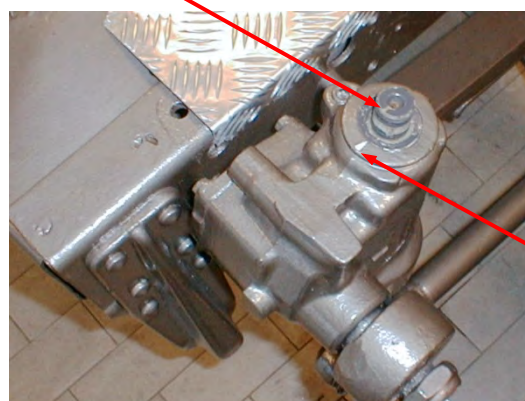
For the target value, the current value is displayed continually in analogue and digital format during the adjustment task. (Fig. 48)

- After completing the adjustment, the adjustment is completed with the **"Continue"** button and the program returns to the overview page of the selected axle.

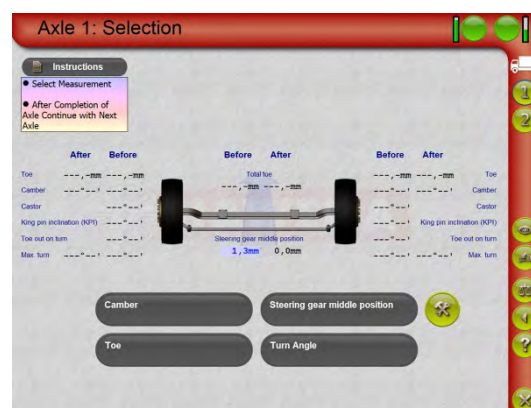
The reset value appears in the **"After"** column. (Fig. 50)



(Fig. 48)



(Fig. 49)



(Fig. 50)

Front Axle Alignment

10.3 Total toe, single toe measurement

- The menu item **Toe** is to be selected on the overview page. (Fig. 51)
- For the nominal value, the cameras are panned to the front and then to the rear reflector panels and recorded with the **OK button**. (Fig. 52)

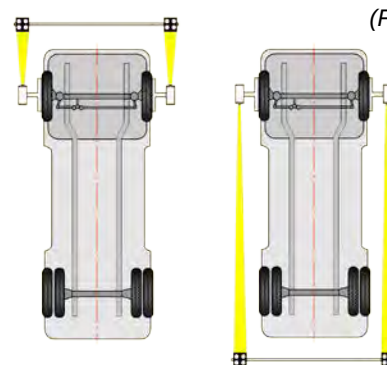
The individual work steps are described via the notification window in the program.



The process for recording measurement values is displayed by yellow light rays in the program. (Fig. 52) The recording of values can be begun on the left or right side of the vehicle and does not change the measurement result.



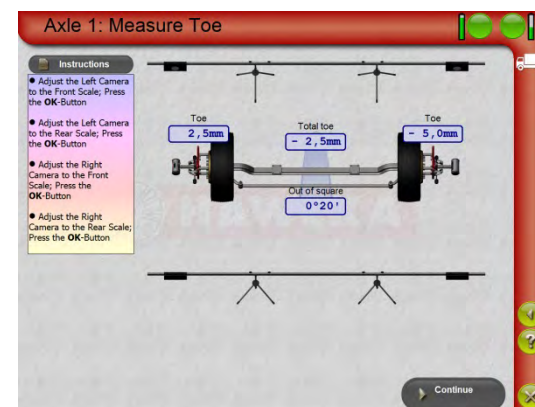
(Fig. 51)



(Fig. 52)

After recording the measurement values, the single toe values, per vehicle side, and the total toe are immediately displayed. (Fig. 53)

- Clicking on the **"Continue"** button changes the program again on the overview page of the selected axle and shows the actual values determined for the toe. (Fig. 54)
- The actual values determined are to be compared with the required nominal values of the vehicle manufacturer.



(Fig. 53)

10.3.1 Working with the nominal data

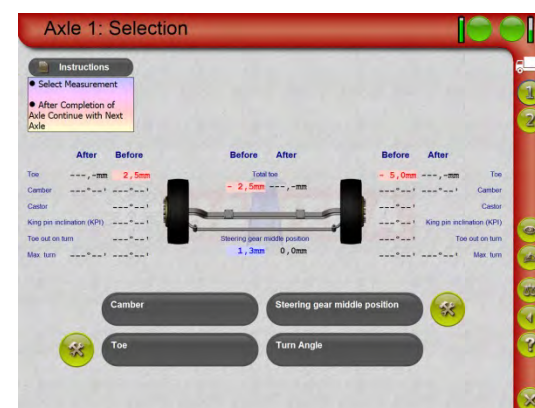


The measurement values (actual values) are displayed in different colours. Depending on whether the nominal data was activated before measurement.

Measurement value in **blue**:→ no comparison of nominal data

Measurement value in **green**:→ Actual value lies in the area of the nominal data entered

Measurement value in **red**:→ Actual value lies outside the area of the nominal data entered (Fig. 54)



(Fig. 54)

Front Axle Alignment

10.3.1 Adjustment to the toe

If the toe values determined lie outside the permitted tolerance of the nominal values, then the vehicle geometry has to be adjusted. The following items apply to adjustment:



Note

IF THE CAMBER IS ADJUSTABLE ON THE VEHICLE, IT WILL ALWAYS BE ADJUSTED FIRST. IN THIS CASE, PLEASE PERFORM THE CAMBER MEASUREMENT AND THEN ADJUST THE TOE.

- Click on the adjustment symbol to adjust the toe. (Fig. 55)



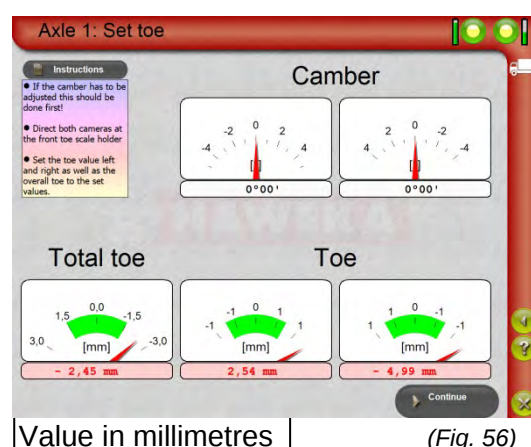
(Fig. 55)



Note

In the **Quick alignment** mode, the adjustment symbol appears immediately after recording the actual value.
In the **Complete alignment** mode, adjustment is possible only after the measurement of the respective axle.

- The displays for castor, single toe and total toe appear for the adjustment of the nominal value. They always display the current analogue and digital values during the entire adjustment work. (Fig. 56)



(Fig. 56)

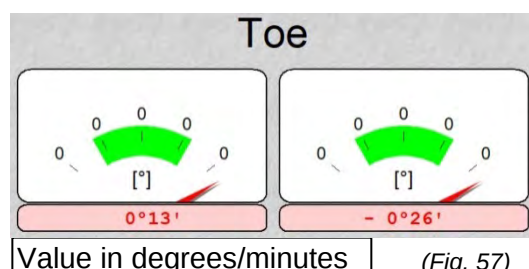


Note

If the toe value is required in degrees, then the display can be changed from [mm] to [degrees]. (Fig. 57)

See point 6.2.8 Advanced setting.

For a description of the extended setting, see Appendix point 21.1 page 55



(Fig. 57)

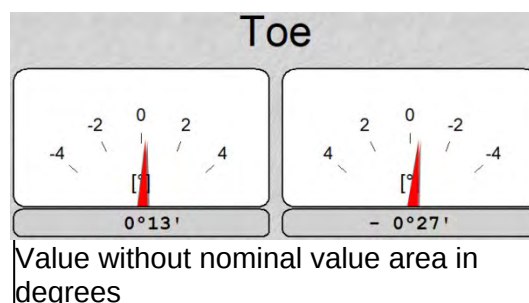
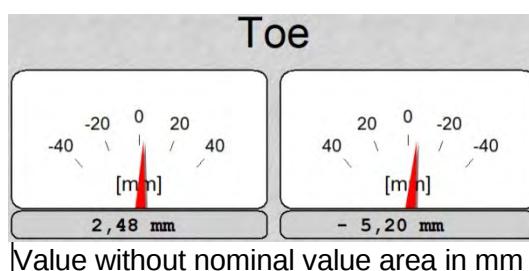
Working with or without nominal data



If nominal data is entered for the vehicle and the nominal data has been loaded with these data, the scale show a green areas where the target value is located. (Fig. 56 + 57)

If the desired nominal value is adjusted, the procedure is completed with the **"Continue"** button.

The program returned to the overview page of the selected axles and shows the recently adjusted values (AFTER column) in addition to the toe values determined (BEFORE column).



Front Axle Alignment

10.4 Camber measurement

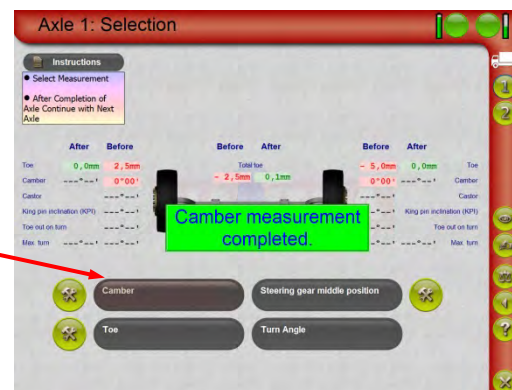
- The cameras must be aligned horizontally before measurement with the aid of the level indicator. (Fig. 58)



(Fig. 58)

- The “Camber” button is selected on the “Select measurement procedure” page in order to record the actual value. The camber values are recorded and immediately displayed. A notification window appears when the measurement is successful. (Fig. 59)

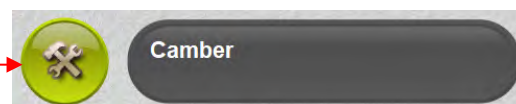
If the actual values lie outside the tolerance of the nominal values, then, if it is possible on the vehicle, the camber must be adjusted.



(Fig. 59)

10.4.1 Adjustment to the camber

- Click on the adjustment symbol to adjust the camber. (Fig. 60)



(Fig. 60)



Note

In the **Quick alignment** mode, the adjustment symbol appears immediately after recording the actual value.

In the **Complete alignment** mode, adjustment is possible only after the entire measurement of the respective axle.

Working with or without nominal data

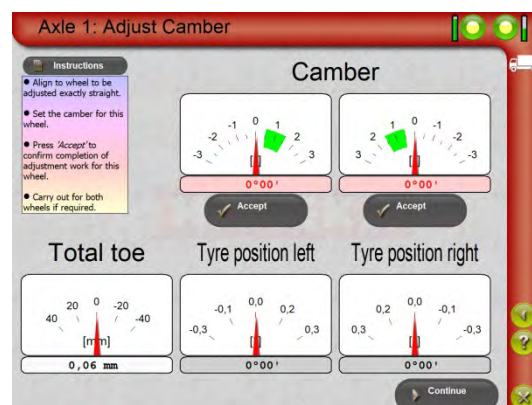


Depending on whether the nominal data has been activated, the scales for the camber value are displayed in different ways.

During the adjustment work, the current value for the left and right vehicle side is displayed in analogue and digital format for the nominal value adjustment. (Fig. 61)

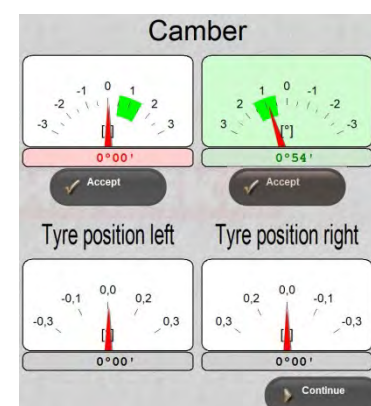
If nominal data is entered for the vehicle, the scales display a green area where the nominal value is located. (Fig. 62)

- Click the “**Accept**” button to accept the adjusted camber value in the program for every vehicle. (Fig. 62)
- Clicking on the “**Continue**” button (Fig. 62) changes the program again on the overview page of the selected axle and shows the recently adjusted value in the AFTER column,



With nominal value data

(Fig. 61)



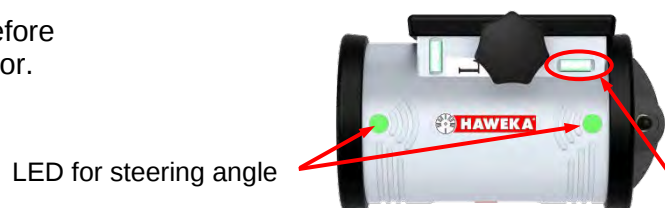
(Fig. 62)

Front Axle Alignment

10.5 Castor, king pin angle, toe-out and maximum steering angle

The castor, king pin angle, toe-out and maximum steering angle are measured in one work step. The cameras must be switched on and point to the front reflector panel. If this is not the case, a relevant notification window will draw your attention to aligning the required camber position before measurement.

- Each cameras must be aligned horizontally before measurement with the help of the level indicator.
(Fig. 63)



(Fig. 63)

- The menu item "**steering angle**" is selected on the overview page in the measurement report. (Fig. 64)

The following work steps are described in the instructions in the program window and are simultaneously displayed on the screen.

Two green LEDs are also shown on the camera when the measurement is performed and when the direction has to be chosen. (Fig. 63)



(Fig. 64)

You are asked to carry out individual steering movements via the symbols in the program window.
(Fig. 65)



(Fig. 65)

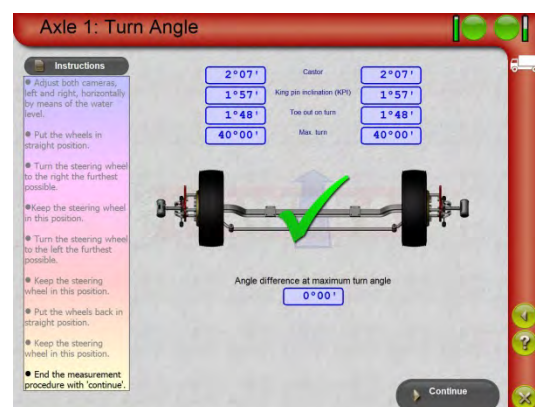


PAY ATTENTION TO A UNIFORM, QUICK STEERING MOVEMENT DURING THE STEERING ANGLE.

Note

If the procedure is completed, the measurement values determines appear after a short while. (Fig. 66)

- Clicking on the "**Continue**" button changes the program again on the overview page of the selected axle and shows the actual values.



(Fig. 66)

Front Axle Alignment

10.5.1 Adjusting the maximum steering angle

If the angle difference determined between the maximum steering angle on the left/right is outside the permitted tolerance, the maximum steering angle can, via the adjustment button, be carried out with the help of the analogue and digital display.

- Select the adjustment button next to the select steering angle



In the **Quick alignment** mode, the adjustment symbol appears immediately after recording the actual value.

In the **Complete alignment** mode, adjustment is possible only after the entire measurement of the respective axle.

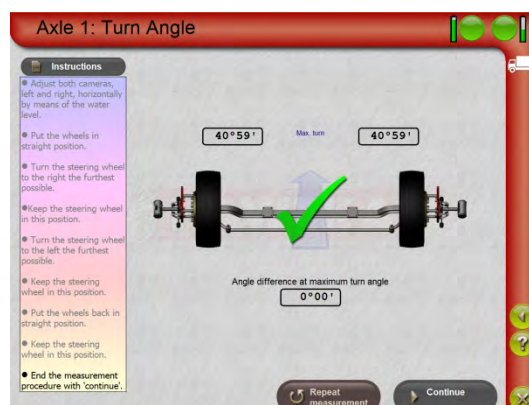


Each cameras must be aligned horizontally before measurement with the help of the level indicator.

- The steering angle can be adjusted on the vehicle. (Fig. 67)

As a rule, the left steering angle on the left side of the vehicle and the right steering angle on the right side of the vehicle are adjusted.

Click on the **"Repeat measurement"** button to repeat this program section until the desired steering angle is adjusted.



(Fig. 67)

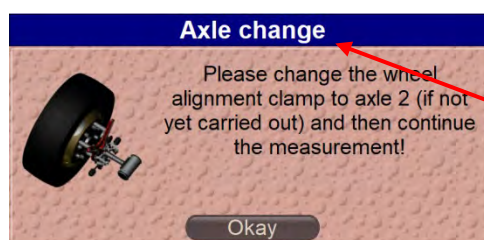
Clicking on the **"Continue"** button changes the program again on the overview page of the selected axle and shows the recently adjusted value in the AFTER column, (Fig. 68)



(Fig. 68)

If the wheel alignment on the axle is completed, another vehicle axle is selected for alignment via the selection 1, 2, 3... (Fig. 69)

The notification appears: mount the wheel alignment clamps on the newly selected axle before commencing with recording the measurement values.



(Fig. 69)

11 Quick alignment (rear axle)



The wheel alignment clamps have to be converted for the rear wheels using the long magnetic feet (length 315 mm).

- Attach wheel alignment clamps with the magnets to the **clean rim flange** and align the cameras horizontally with the help of the level indicator.
(Fig. 70)



Check the contact surfaces of the magnets! They have to be free from dirt and metal filings!

- A new vehicle is selected on the right side on the program page "Measuring process". (Fig. 71).
Example: Axle 2 (rear axle) selection



Each time the axle is changed, the notification appears: mount the wheel alignment clamp on the newly selected axle before commencing with recording the measurement values.
(Fig. 72).

The program then changes to the selection page of the newly selected vehicle axle.

Example: Overview for vehicle axle 2 (Fig. 73).

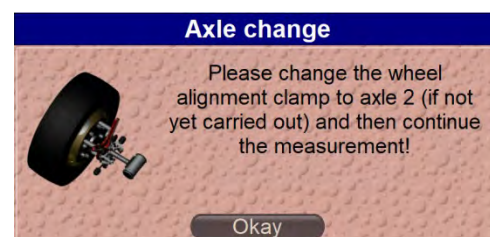


(Fig. 70)

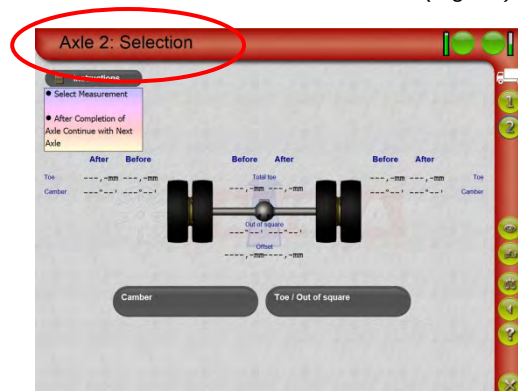
Axle 2 (rear axle) selection



(Fig. 71)



(Fig. 72)

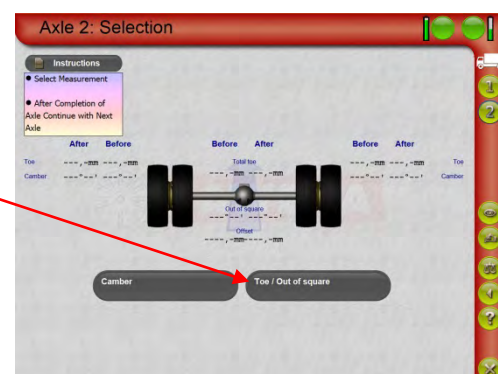


(Fig. 73)

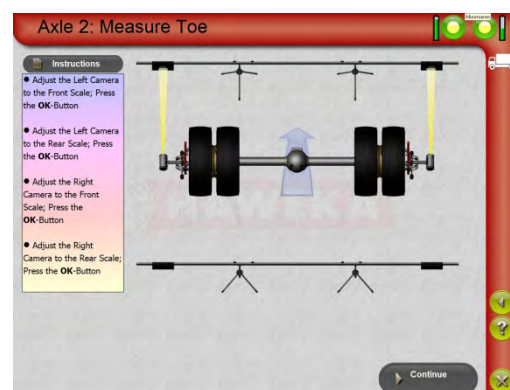
Rear wheel alignment

11.1 Toe/inclination

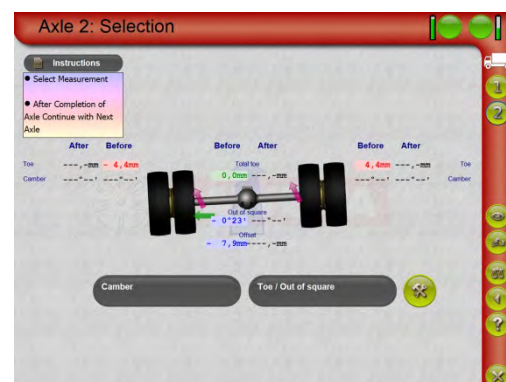
- The **"Toe/Inclination"** button is selected on the **"Measuring process selection"** page to record the actual value of the toe values.
- For the nominal value, the cameras are panned to the front and then to the rear reflector panels and the measurement values are recorded with the **OK button**. The individual working steps are described in the instructions in the program window. (Fig. 75)
- Clicking on the **"Continue"** button changes the program again on the overview page of the selected axle and shows the determined value in the BEFORE column (Fig. 76).
- Working with or without nominal data
- The measurement values (actual values) are displayed in different colours. Depending on whether the nominal data was activated before measurement.
- Measurement value in **blue**:→ no comparison of nominal data
- Measurement value in **green**:→ Actual value lies in the area of the nominal data entered
- Measurement value in **red**:→ Actual value lies outside the area of the nominal data entered



(Fig. 74)



(Fig. 75)



(Fig. 76)

If, during the measurement, axle inclination and/or an offset has been detected, the result will be displayed graphically. (Fig. 76)



The axle inclination is first displayed graphically in the program from the value $> 0^{\circ}12'$ and an offset is displayed with a **green arrow** from > 1 mm and from 10 mm with a **red arrow**.

Note

Rear wheel alignment

Click on the adjustment symbol next to the selection button for the adjustment of the inclination.



In the **Quick alignment** mode, the adjustment symbol appears immediately after recording the actual value.

In the **Complete alignment** mode, adjustment is possible only after the entire measurement of the respective axle.

- Depending on the measurement result, the relevant selection for the necessary adjustment task is to be selected. (Fig. 78)

11.1.1 Adjustment to the toe

Both single toe values on the left and right and the current camber values are displayed for the target value adjustment.

- If the toe value of the vehicle changes, then the current values will be displayed in analogue and digital format in [mm] during the entire adjustment task. (Fig. 79)

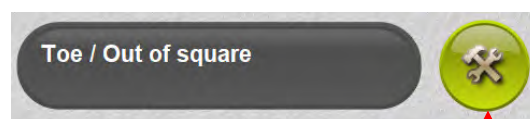


If the toe value is required in degrees, then the display can be changed from [mm] to [degrees]. See point 6.2.8 Advanced settings page 17.

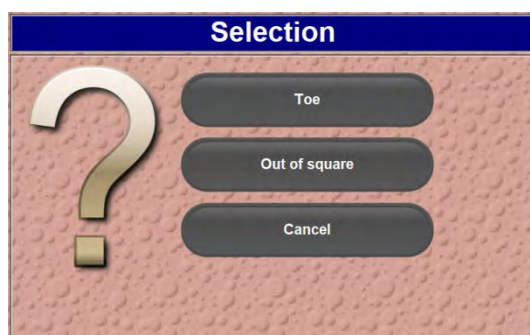
- Clicking on the **"Continue"** button changes the program again on the overview page of the selected axle and shows the adjusted value in the AFTER column.

11.1.2 Adjustment of the inclination

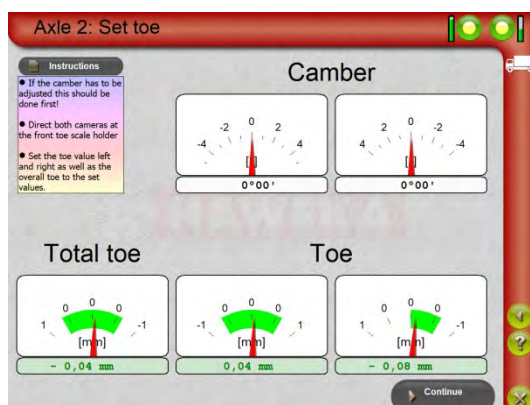
- The **Inclination button** is selected in the selection window. (Fig. 78)
- Both cameras point to the front reflector panels and are aligned horizontally with the aid of the level indicator.
- The inclination of the rear axle is displayed in analogue and digital format for the adjustment tasks during the entire adjustment task. (Fig. 80)
- Clicking on the **"Continue"** button changes the program again on the overview page of the selected axle and shows the adjusted value in the AFTER column.



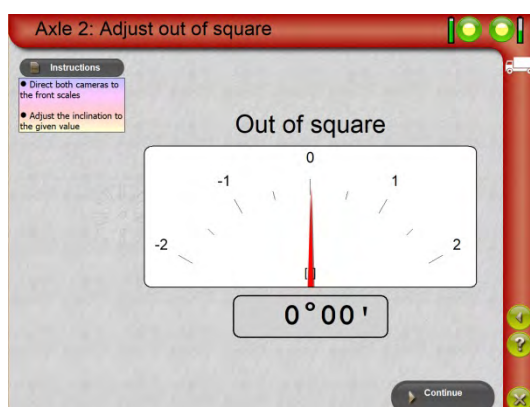
(Fig. 77)



(Fig. 78)



(Fig. 79)



(Fig. 80)

Rear wheel alignment

11.2 Camber measurement

- The **"Camber"** button is selected on the "Measuring process selection" page in order to record the actual value. Then, the camber value appears immediately in degrees and minutes. (Fig. 81)
- The actual values determined are to be compared with the required target values.
- If the actual values lie outside the tolerance of the nominal values, then, if it is possible on the vehicle, the camber must be adjusted.

Click on the adjustment symbol next to the selection button for the adjustment of the inclination. (Fig. 82)



The following items apply to adjustment:
IF THE CAMBER IS ADJUSTABLE ON THE VEHICLE, IT WILL ALWAYS BE ADJUSTED FIRST.

Note

The single camber value for left and right, as well as the related toe values, are displayed for the nominal value adjustment.

During the entire adjustment task, the current values are displayed in degrees in analogue and digital format.

Working with or without nominal data

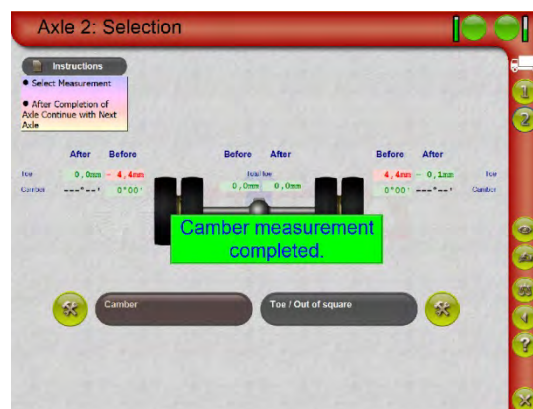
If nominal data is entered for the vehicle and the nominal data has been loaded with these data, the scale shows a green area where the nominal value is located.

- Click the **"Accept"** button to accept the adjusted camber value in the program for every vehicle. (Fig. 83)
- Clicking on the **"Continue"** button (Fig. 83) changes the program again on the overview page of the selected axle and shows the recently adjusted value in the AFTER column, (Fig. 84)

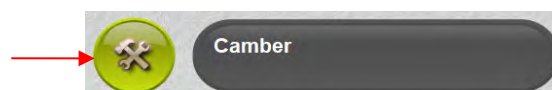
The next axle is to be selected now on the overview page.

Example: Axle 3 (rear axle) selection (Fig. 84)

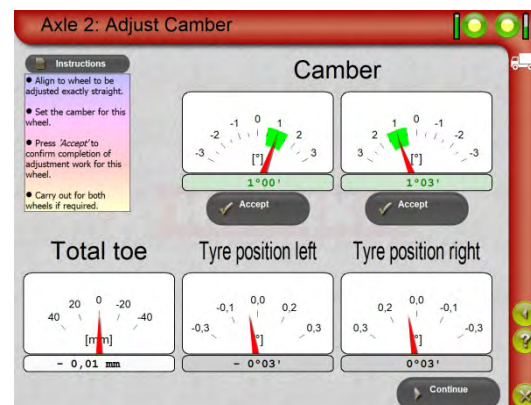
The procure of all additional axles depends on the kind of axle and corresponds to the work flow described in the case of axle 1 (steering axle) or axle 2 (rigid axle).



(Fig. 81)



(Fig. 82)



(Fig. 83)



(Fig. 84)

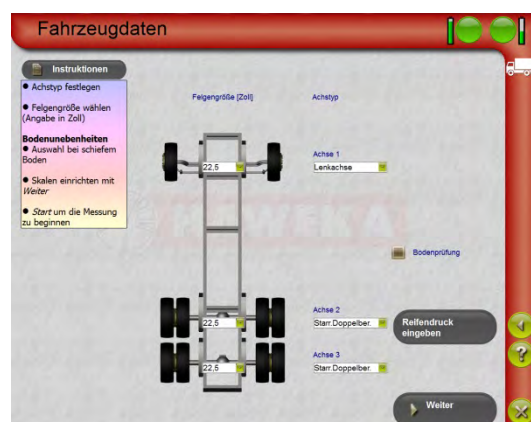
12 Complete alignment

In complete alignment, the individual work steps are, program-guided, carried out for a complete vehicle alignment

(See overview diagram point 9 page 21)

It is no longer possible to skip individual program sections and direct selection of the individual vehicle axles is also not applicable.

After the **Complete alignment** selection has been selected, the program automatically changes to the **"Special measurement steps"** page (Fig. 86)

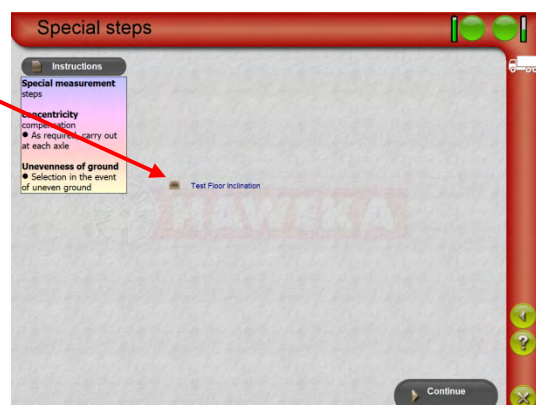


(Fig. 85)

Selection: **Ground test**

The complete alignment works through all the work steps in order to carry out complete vehicle alignment. See point 16 onward, page 49.

Click on the **"Continue"** button, scale set-up occur. For the procedure, see point 10.1 Set up reflector panels (scale set up).



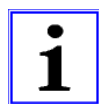
(Fig. 86)

Query: **Run-out compensation** (Fig. 87)

In a few rare cases, it may occur that the wheel alignment clamps for the camera cannot be properly positioned on the rim.

For example, in the case of Trilex rims, no proper fitting of the wheel alignment clamp is guaranteed due to the condition of the 3-part rim. Here, a run-out compensation of the individual camera heads must be carried out per vehicle wheel.

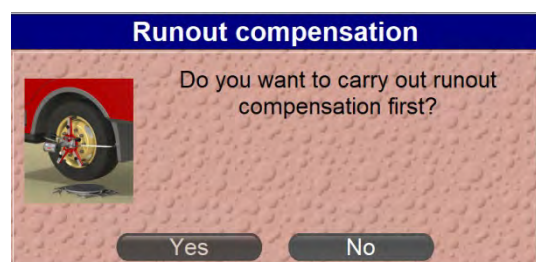
(See point 17 onward page 50)



Note

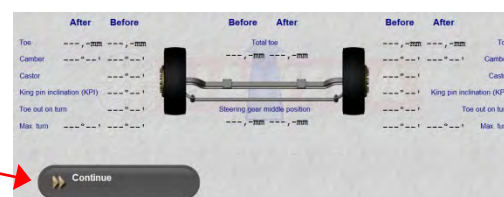
The query of the run-out compensation can be switched on and off via the **"Extended settings"** function.

(See point 6.2.8. page 17)



(Fig. 87)

If the scale set up has been carried out, vehicle alignment can begin through the “Continue” button.
(Fig. 88)



(Fig. 88)



Working with or without nominal data!

The measurement values (actual values) are displayed in different colours. Depending on whether the nominal data was activated before measurement.

Measurement value in **blue**: → no nominal data comparison is entered

Measurement value in **green**: → value lies in the area of the nominal data entered

Measurement value in **red**: → Actual value lies outside the area of the target data entered.

Measurements are performed in a fixed order.

Central position of the steering gear

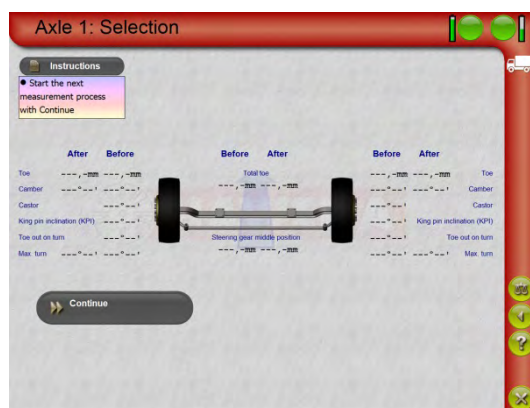
-> toe -> camber

castor -> king pin angle -> toe out ->

maximum steering angle

The next recording of the measurement value starts with the “Continue” button. (Fig. 89)

As soon as a measurement is completed, the actual values are displayed. (Fig. 90)



(Fig. 89)



The adjustment symbols only first appear after the recording of the actual value of the complete axle.

The adjustment tasks can only be carried out at the end of the recorded measurement values of the respective vehicle axle.



The following items apply to adjustment:

IF THE CAMBER IS ADJUSTABLE ON THE VEHICLE, IT WILL ALWAYS BE ADJUSTED FIRST.

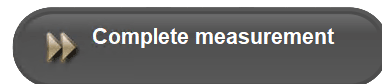
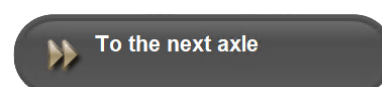


(Fig. 90)

All working steps occur according to the same principle as the quick alignment. For the description of all measurements, see point 10.2 onward page 25.

If all measurements have been performed on the first vehicle axle, the “To the next axle” button appears. Depending on the selected vehicle type, all available axles are thus automatically selected one by one for the measuring process.

If all measurement values are recorded, the measurement is completed (Fig. 91) and the vehicle overview appears automatically. (Fig. 90)



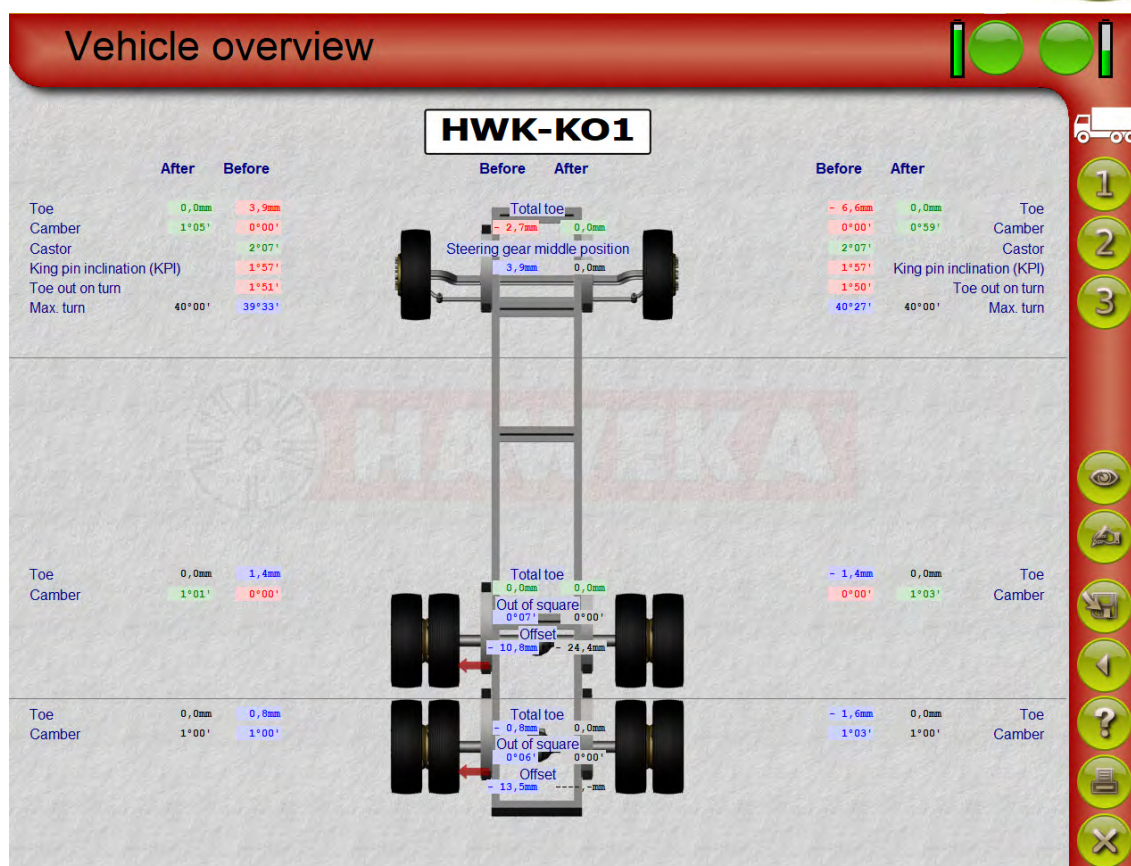
(Fig. 91)

13 Protocol & vehicle overview

The entire protocol can be immediately called up with the **Overview button** (Fig. 92) on the selection pages of the respective vehicle axles. This view allows a comparison of the determined data of all vehicle axles. (Fig. 93)



(Fig. 92)



(Fig. 93)

When the **comment button** (Fig. 94) is selected, special comments on the vehicle can be entered which later appear in the protocol printout (standard).



(Fig. 94)

Click on the **Save button** (Fig. 95) to save the entire measurement process after completing the task.



(Fig. 95)

The **Print button** (Fig. 96) allows the recorded data to be printed on an installed printer as log.



(Fig. 96)

Protocol & vehicle overview

Click the "**Show protocol**" button on the start page of the program to reopen a saved measurement session at any time. (Fig. 97)



(Fig. 97)

A list of all saved measurement sessions with basic information is displayed when you select "**Show protocol**". (Fig. 98)

Use the "**Display**" button to display the selected dataset of a measurement session with all axles on the vehicle overview list.

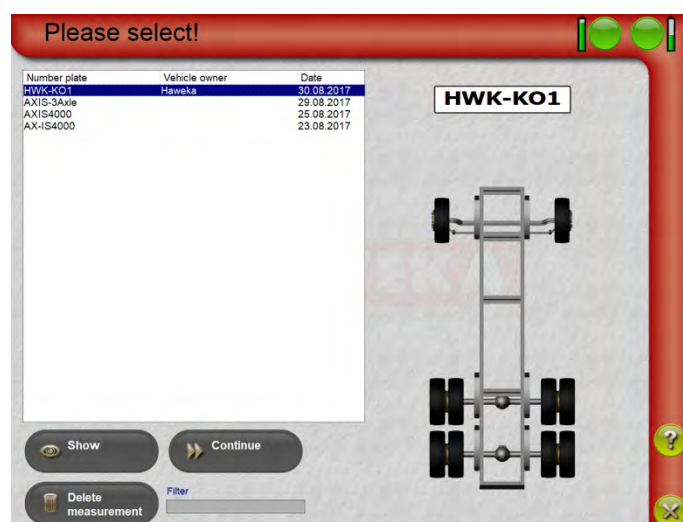
Over time, a number of measurement protocols accumulates in the overview list.



Note

There is no limit to the maximum number of saved measurement protocols.

In the input field "**Filter**", specific search criteria are entered so as to find quickly a desired measurement protocol.



(Fig. 98)



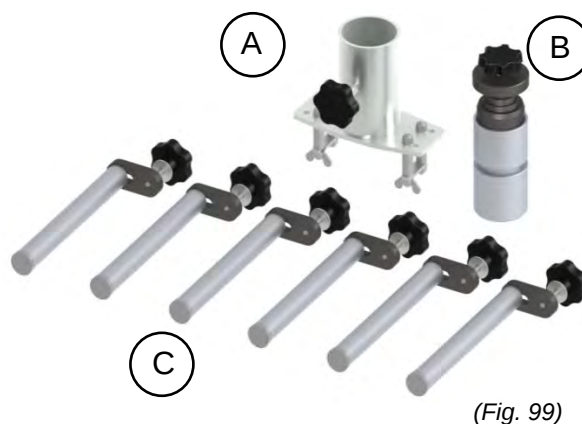
Note

When the dataset for a measurement session has been saved further measurements can later be carried out on this vehicle. Select the "**Continue**" button to do this.

14 Trailers and semi-trailers



If AXIS4000MB is available in the basic version, an upgrade kit is necessary for the measurement of lorry trailers and semi-trailers. (Fig. 99)



(Fig. 99)

The update kit for the measurement of trailers and semi trailers, item No. 923 000 001, consists of:

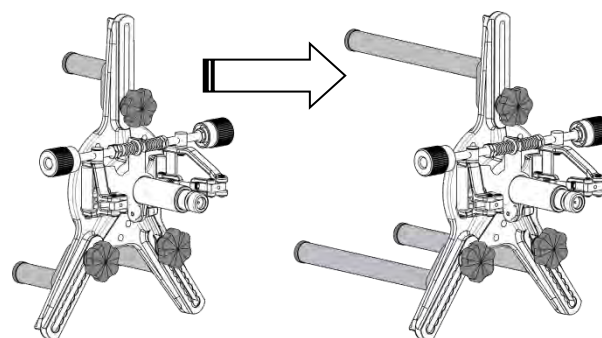
- | | |
|--|----------------------|
| A.) 1 x King pin adapter Ø 2" | Item No. 923 001 041 |
| B.) 1 x Coupling/trailer drawbar adapter | Item No. 913 024 001 |
| C.) 6 x Magnetic feet, length 265 mm (1pc) | Item No. 913 029 003 |

The extension serves exclusively for the measurement of total toe, single toe on the left and right, as well as for determining the axle angular tilt and the offset for semi-trailers and trailer in connection with the basic version AXIS4000MB.

14.1 Preparatory measures for the measurement of semi-trailers

In order to be able to position the wheel alignment clamps on the vehicle wheels of the trailer, the magnetic feet on the 3-arm clamping stars of the wheel alignment clamp may have to be changed.

- Replace the 100 mm magnetic feet with the 265 mm long magnetic feet. (Fig. 100)
- Mount the wheel alignment clamps as usual on the vehicle wheel of the trailer axle to be aligned.

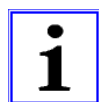


(Fig. 100)

Semi-trailer

14.2 Assembly of the reflector support for the semi-trailer

- Assemble the reflector support and mount the king pin adapter in the middle of the reflector support



Note

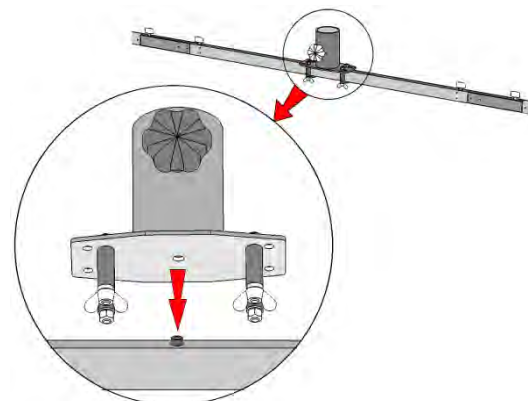
A cylinder screw is on the reflector support in the middle. Place the king pin adapter with the hole on the screw head in the middle of the holder.

(Fig. 101)

- Now push the toe scale holder onto the trailer's king pin using the king pin adapter and secure it using the star grip screw. (Fig. 102)
- Secure as usual the two reflector panels on the left and right to the reflector support.
- The second reflector support is set up behind the trailer using the two tripods and optically aligned. (Fig. 103)

The procedure corresponds to the description in point 10.1.2 page 23.

- Both scale holders must be optically aligned in such a way that they stand at a right angle to the long axle of the vehicle.



(Fig. 101)



(Fig. 102)



(Fig. 103)

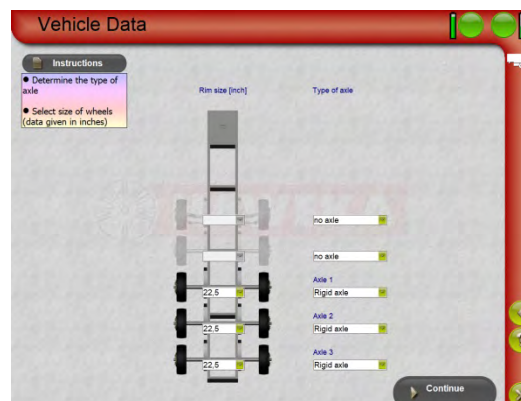
Semi-trailer

14.2.1 Set up reflector support

- In the AXIS4000MBA program, a trailer with the relevant number of axles is selected via quick selection.

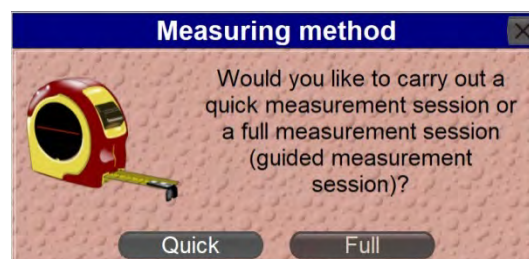
The program changes to the input of the vehicle data. (Fig. 104)

- Select the respective axle type and the relevant rim size here.



(Fig. 104)

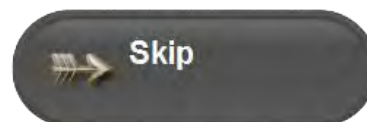
After selection - depending on the program parameter setting (see Appendix point 21.1 Advanced Settings, page 55) - a query appears for the measurement method. (Fig. 105)



(Fig. 105)

Describe the measurement method "**Fast**" with setting up the scales.

In this measurement method you have the option to skip set up. (Fig. 106)



(Fig. 106)



Bear in mind that not all measurements can be performed!

Note

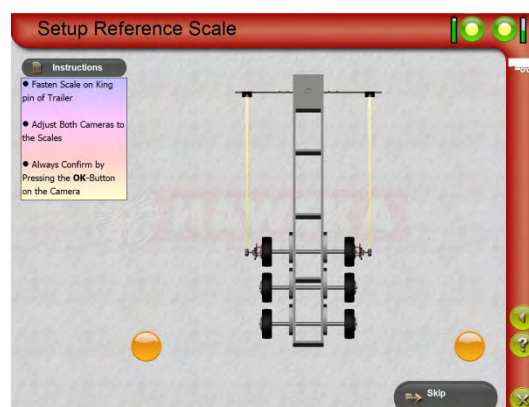
- Follow the instructions on the screen for setting up the scales. (Fig. 107)



No magnetic feet are required because the measuring rectangle is defined via the reflector panels on the king pins.

Note

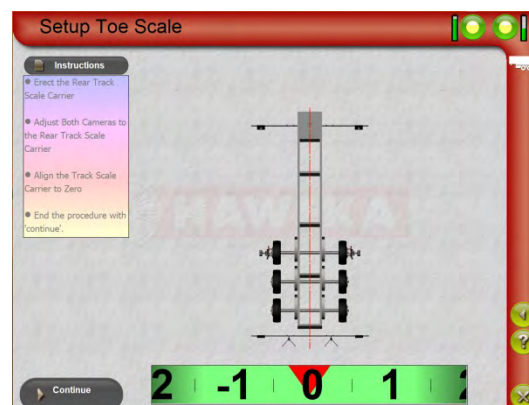
- Point the cameras left and right to the reflector panels on the king pins.
- Confirm the position with the **OK button** on both camera housings.



(Fig. 107)

If these reflector panels were recorded, the program page automatically changes and you will be asked to point the two cameras to the rear reflector panels.

- Now shift the reflector support sideways until the value reaches the value “0” in the display. (Fig. 108)

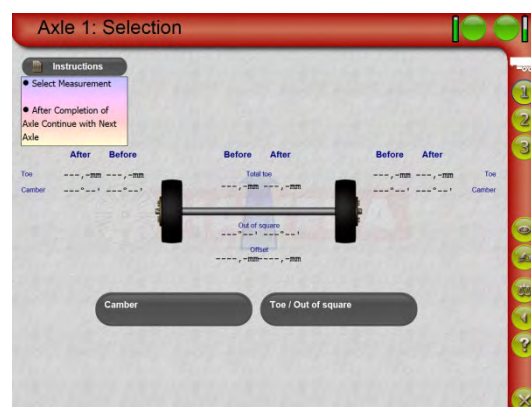


(Fig. 108)

Start measurements

All the following measurements corresponds to that of a rear wheel alignment of the work flow. (Fig. 109)

For the measurement of camber, toe, offset and inclination, see from point 11, page 32 *quick alignment (rear axle)*.



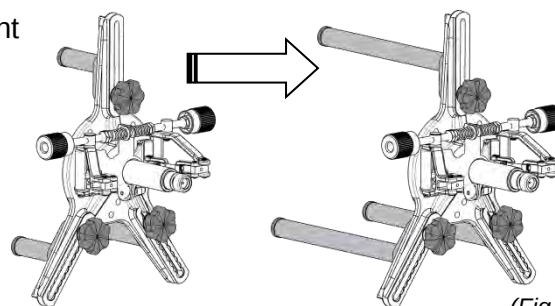
(Fig. 109)

Trailer

Preparations for measuring semi-trailers

Similarly to the trailer alignment, the wheel alignment clamps have to be converted to the 265 mm long magnetic feet, depending on the rim type.

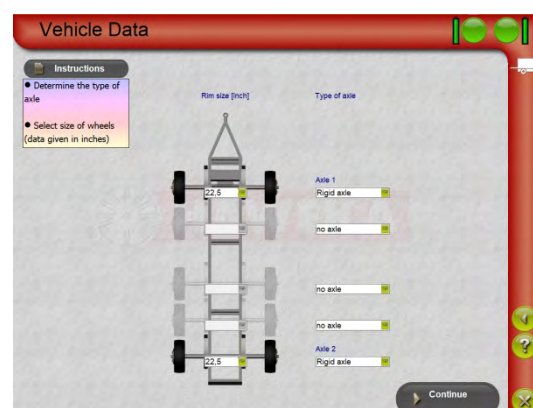
(Fig. 110)



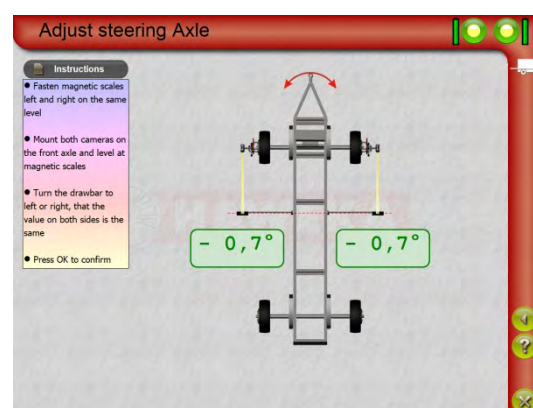
(Fig. 110)

14.3 Aligning the vehicle axle on the drawbar

- Check the drawbar for visual defects.
- The wheel alignment clamps are mounted on the vehicle wheel of the rotation axis.
- Attach the magnetic feet on both sides of the vehicle to the same position on the frame.
- Mount the reflector panels to the right and left.
- Mount the cameras per side of the vehicle on the wheel alignment clamps and fix the reflector panels on the magnetic feet.
- Prepare computer and select **Trailer** in the vehicle type program.
- Enter rim size. (Fig. 111)
- Select “**Continue**”
- Now the vehicle axle on the drawbar is aligned so that the displayed values are the same on both sides. (Fig. 112)
- Use the parking brake to lock the vehicle wheels on the axle.
- End this procedure with the **OK button** on the camera.



(Fig. 111)

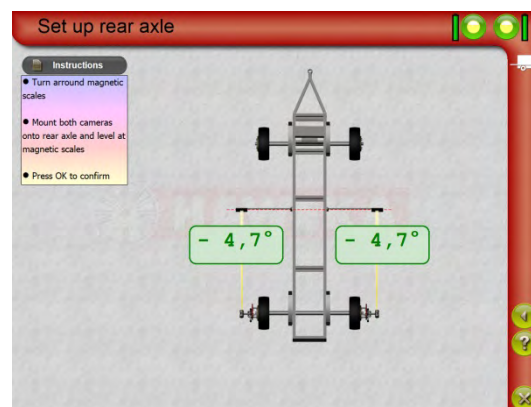


(Fig. 112)

Trailer

14.4 Check the drawbar eye for the centre line of the vehicle

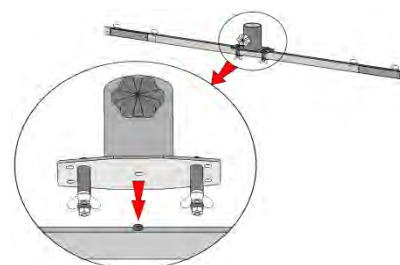
- Mount wheel alignment clamp on the rear vehicle axle on the left and right.
- The magnetic medium remains on the vehicle frame and the reflector panels are attached again and rotated by 180 degrees.
- Mount the cameras per side of the vehicle on the wheel alignment clamps and fix the reflector panels on the magnetic feet.
(Fig. 113)
- If the reflector panels have been detected, confirm the procedure with the **OK button** on the camera.
- The program then automatically changes the overview and the reflector support now has to be attached to the drawbar with the adapter.
- Remove the magnetic material from the frame.



(Fig. 113)

14.4.1 Assembly of the reflector support on the drawbar eye

- Plug the reflector support to king pin adapter and semi-trailer as described in point 14.2.
(Fig. 114)
- The coupling adapter is unscrewed (Fig. 225) and pulled up from below into the trailer coupling of the drawbar.
- Now push the star grip screw with fitting plate from above through the trailer coupling and screw the coupling adapter securely to the drawbar.
(Fig. 116)
- Now the king pin adapter with the reflector material is pushed onto the coupling adapter and screwed with the star grip screw.
(Fig. 117)
- The reflector panels are attached to the reflector support on the left and right.



(Fig. 114)



(Fig. 115)



(Fig. 116)



(Fig. 117)

Trailer

Now point both cameras to the reflectors on the draw bar eye.

As soon as the cameras have detected the reflectors, the value determined for the draw bar eye is displayed in relation to the centre of the vehicle in [mm]. (Fig. 118)

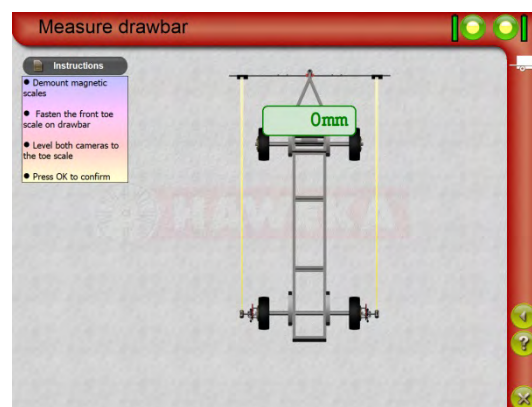


Caution

If the value is greater than **3 mm** to the left or right and thus outside the tolerance for the centre of the vehicle, further measurement should be continued only after overhauling the drawbar.

If the vehicle geometry at the drawbar is without error, the value is displayed in green.

By clicking the OK button on the camera, the program changes to set up toe scales and a red vehicle centre line is displayed in the upper part of the trailer.



(Fig. 118)

14.4.2 Setting up rear reflector support

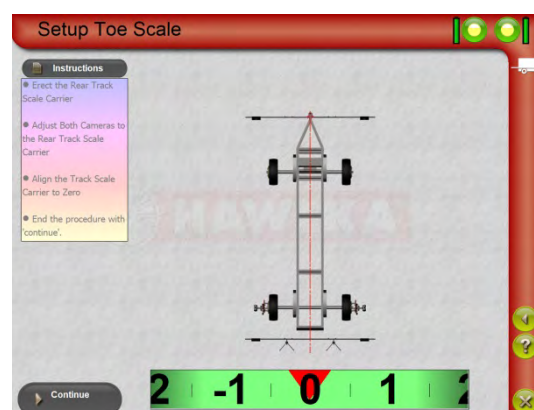
- The reflector support with the reflector panels is set up behind the trailer and aligned optically.
- Point both cameras to the rear reflector panels.
- Move the rear reflector supports sideways so that the progress bar on the screen moves from red to green and nearly reaches the value "0". (Fig. 119)



Note

THE TRIPODS REMAIN IN PLACE! ONLY THE REFLECTOR SUPPORT IS MOVED.

- As soon as the reflector support is aligned with the reflector panels, an additional red centre line is displayed in the lower part of the trailer.
- The vehicle centre line is defined for the following measurements and the alignment of the reflector supports is finished by clicking the "**Continue**" button.



(Fig. 119)

Trailer

Firstly, the rear axle (axle 2) is measured

Start measurement

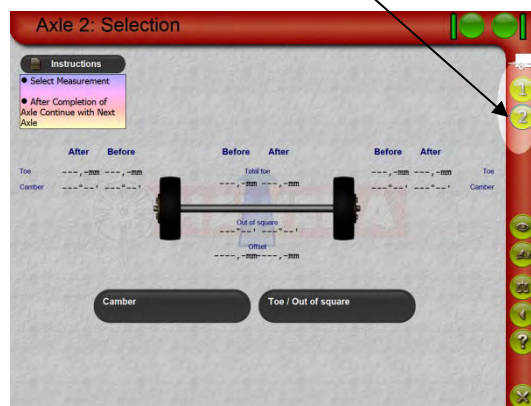
All the following measurements correspond to that of a rear wheel alignment of the work flow.

(Fig. 120)

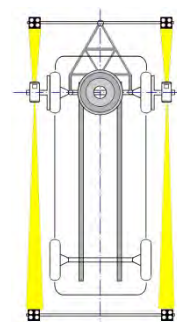
For the measurement of camber, toe, offset and inclination, see from point 11 page 32 *Rear wheel alignment*.

If the measurements at the rear vehicle axle are completed, the wheel alignment clamps are mounted on the front axle of the trailer.

Axle 1 (front axle) is then selected and the measurement is performed. (Fig. 121)



(Fig. 120)



(Fig. 121)

A special feature of a tandem trailer with a rigid draw bar

The measurement approach for the special construction of a tandem trailer with a rigid draw bar is to be performed as in the case of a semi-trailer. (Fig. 122)

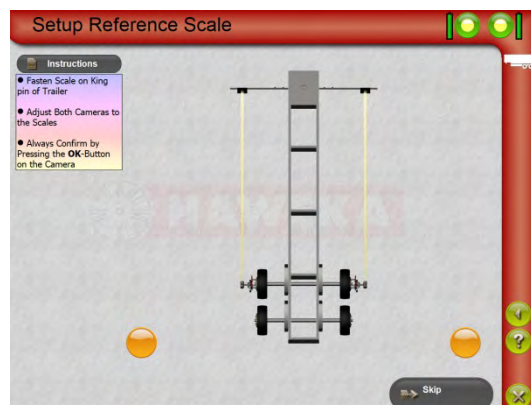
Here, the rigid draw bar of the tandem trailer is handled like the king pin of the semi-trailer.



(Fig. 122)

The reflector support is described like a trailer, monitored and a 2-axle semi-trailer in the program is selected with the help of the king pin adaptor and the coupling adaptor (Fig. 123)

All further work is described is point 14.2.1 page 42.



(Fig. 123)

15 Vehicles with two steered front axles

For checking the parallelism of the two steered front axles, the first and second steering axle must be already completely measured and, if necessary, adjusted beforehand.



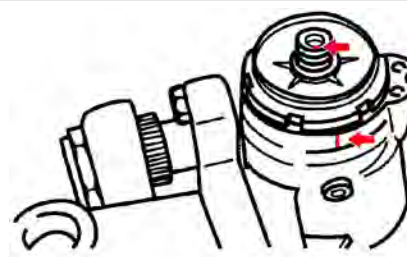
Note

Only when the centre position of the steering gear in axle 1 is correctly adjusted, the parallelism of the steering axle is checked. (Fig. 124)

- For the preparation of the measurement, the wheel alignment clamps are attached to the first axle on the left side of the vehicle and on the second axle on the right side of the vehicle.
- Both cameras are focused on the rear reflector panels.
- The wheels on the first steering axle are in "Drive straight", and move the steering gear in the centre position.
- Then, the "**Steering axle parallelism**" button is selected. (Fig. 125)

The program immediately records the angular position of the axles to one another and the value determined is displayed. (Fig. 126)

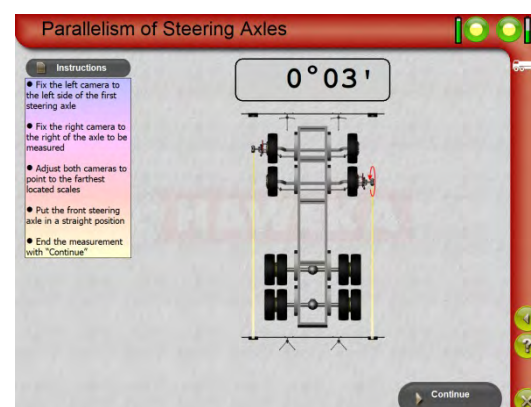
- Click on the "**Continue**" button to return to the axle overview.
- If no parallelism ($0^{\circ} 00'$) exists, the newly added adjustment button is selected to correct the position of the vehicle axles to each other.
- The axles can be adjusted to the required value with the help of the displays. (Fig. 127)
- Then, click on the "**Continue**" button to return to the overview of the second axle.



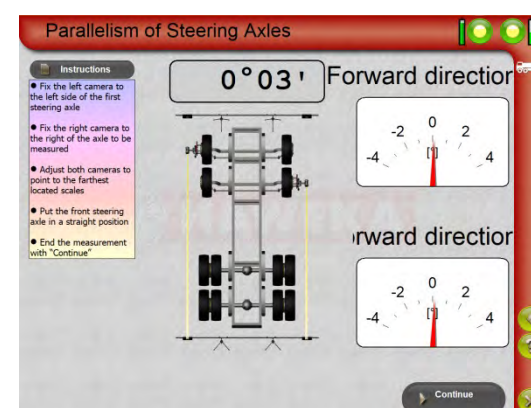
(Fig. 124)



(Fig. 125)



(Fig. 126)

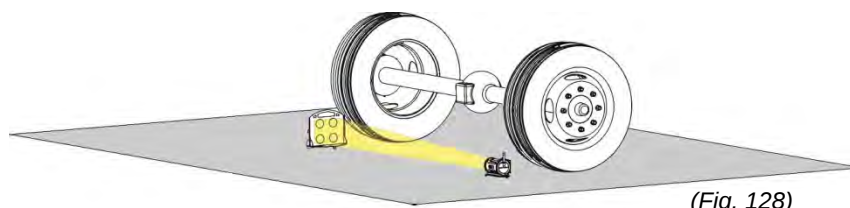


(Fig. 127)

16 Taking into account uneven ground

AXIS4000MB has the ability of taking into account different types of ground unevenness per axle in the measurement.

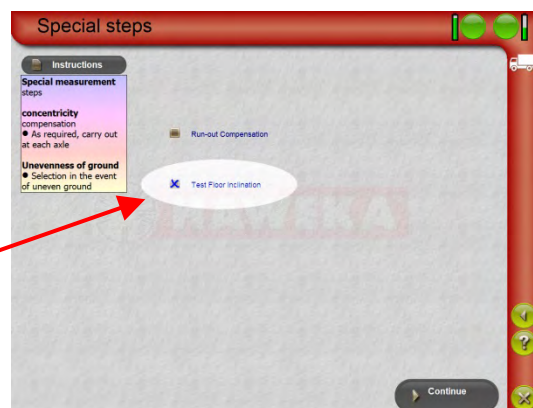
(Fig. 128)



(Fig. 128)

The following steps shall be taken into account:

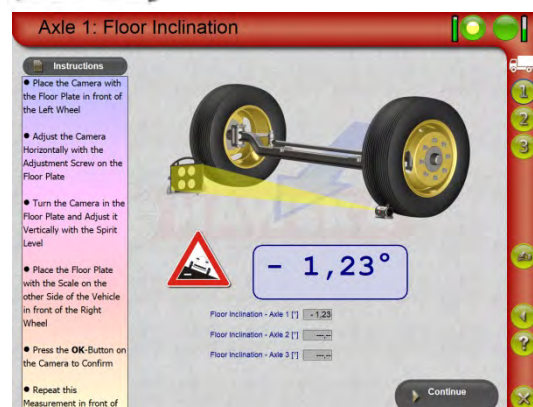
- After selecting the measurement method, tick **“Ground unevenness”** on the overview page for special measure steps and select the **“Continue”** button (Fig. 129)
- A reflector panel is inserted into the mounting plate (Fig. 130) and set up in front of the right wheel of the axle to be aligned. (Fig. 129)
- The camera is adequately placed into the base plate (Fig. 130) and pointed towards the reflector panels.
- Turn the camera in the plate until the camera is aligned vertically with the help of the level indicator.
- The camera is to be aligned horizontally via the water scale with the help of the base plate adjustment screw.
- Select the axle to be aligned in the program window on the right. The program always begins with axle 1.
- Now press the **OK button** on the camera to record the value.
- The unevenness for this axle position is displayed. This value is immediately taken into account automatically for the following axle measurements. (Fig. 131)



(Fig. 129)



(Fig. 130)



(Fig. 131)

Depending on the circumstances, a positive or negative amount for ground unevenness can be displayed. (Fig. 132)



(Fig. 132)

Positive value: In the driving direction, the right wheel is higher than the left one.

Negative value: In the driving direction, the left wheel is higher than the right one.

If the ground unevenness is known, since measurements are performed in the same place, the values can be immediately entered for each axle. (Fig. 131)

17 Special rims - run-out compensation

If no correct position of the wheel alignment clamp is guaranteed, a run-out compensation of the individual wheel alignment clamps must be carried out per vehicle axle via the **"Run-out compensation"** selection.

- Position the wheel alignment clamps on the rim flange of the first vehicle axle.

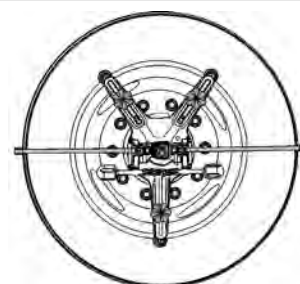


Note

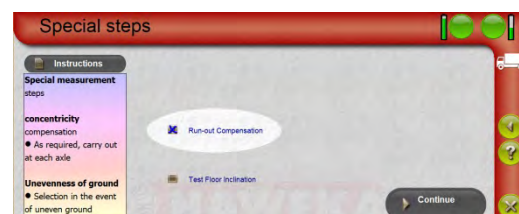
In the case of vehicles with Trilex rims, the magnetic feet are replaced by a special adapter due to the 3-part rim and mounted on the wheel using the gripper arms. (Fig. 133)

Item No.

924 000 004

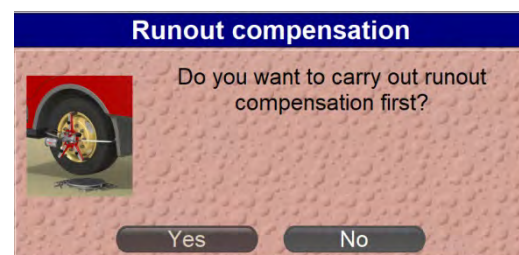


(Fig. 133)



(Fig. 134)

- In the measurement method **"Schnell"**, tick on **"Run-out compensation"** on the overview page **"Special measures"** and select the **"Continue"** button (Fig. 134). In complete alignment, confirm the query with **"Yes"** (Fig. 135).
- A run-out compensation is implemented for the first wheel on the following program page.
- Compensation is carried out in three steps and is graphically presented. Follow the instructions on the left edge of the screen. (Fig. 136)
- Lower vehicle on turning plate.
- A run-out compensation must then be implemented on the same axle.
- After the completion of this procedure, the alignment of this one vehicle axle can begin by clicking on the **"Set up scales"** button. (Fig. 137)
- For each vehicle axle to be aligned, a run-out compensation is to be implemented again per wheel before beginning the measurement.



(Fig. 135)

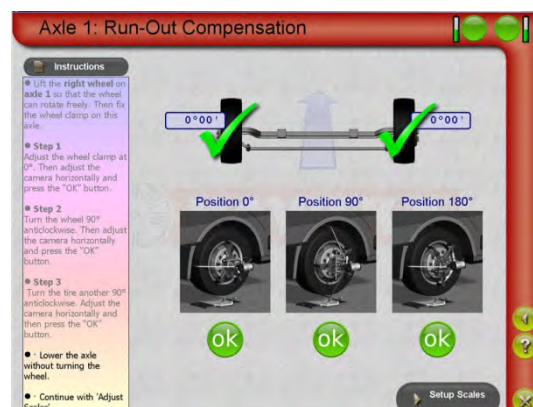


(Fig. 136)



Note

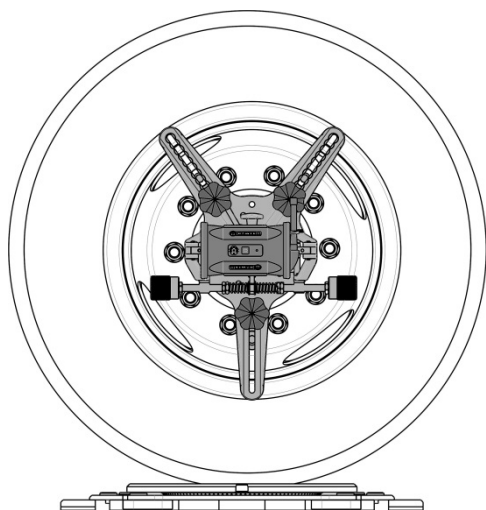
IF YOU CHANGE BETWEEN THE VEHICLE AXLES DURING THE MEASUREMENTS, A RUN-OUT COMPENSATION WILL BE REQUIRED AGAIN.



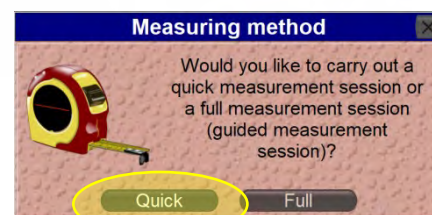
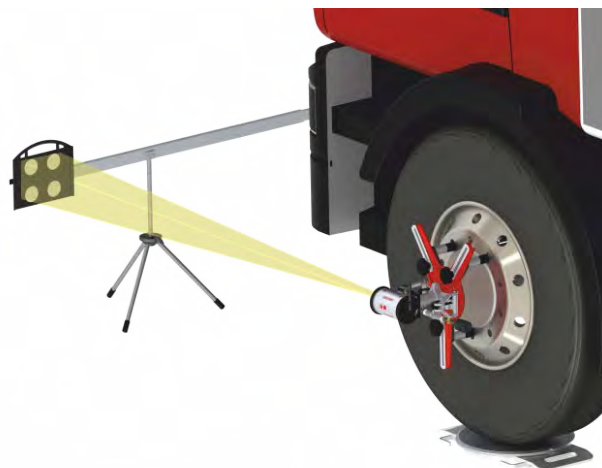
(Fig. 137)

18 Handling test of the wheel alignment clamps

In order to implement a handling test, the wheel alignment clamps are mounted as usual on the vehicle rims on the left and right. Inspection takes place in connection with the AXIS4000MB and a scale set up must be implemented.

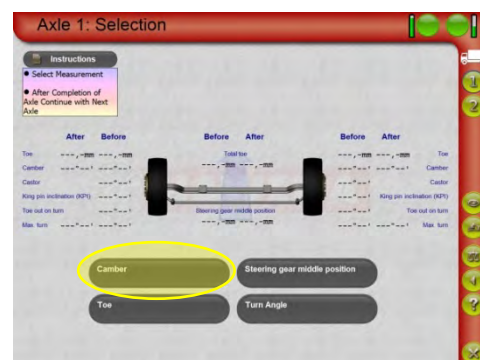


1. Position of the wheel alignment clamp

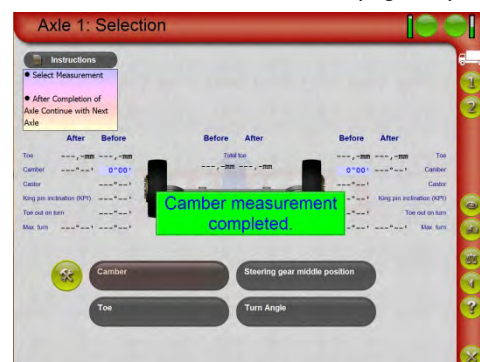


(Fig. 138)

- Start AXIS4000MB program and select a new alignment via the vehicle quick selection.
- The *wheel alignment data sheet* and the *nominal data* display can be skipped by clicking on the **“Continue”** button.
- The **“Quick”** measurement method is selected for data checking. (Fig. 138)
- Carry out the scale set up completely as required in the program.
Also see from point 10.1 page 23 Set up reflector panels.
- The camera is aligned horizontally with the help of the level indicator. (*in the example, the camera is on the left side of the vehicle*)
- Select the **“Camber”** button for the first recording of the measurement values.

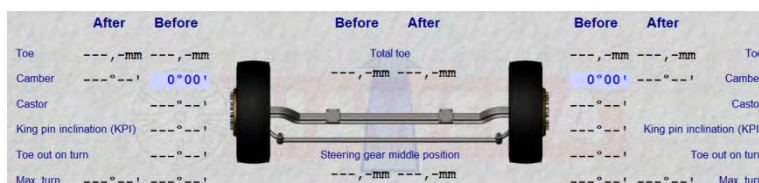


(Fig. 139)



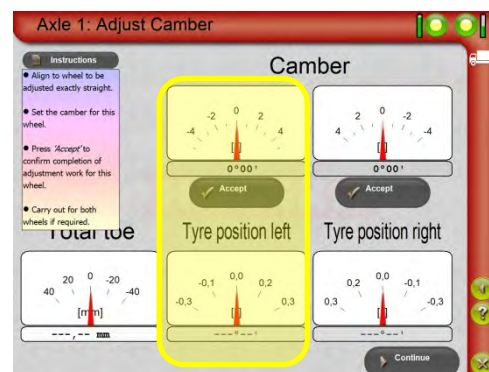
(Fig. 140)

The values determined are displayed in the overview window. (Fig. 141)

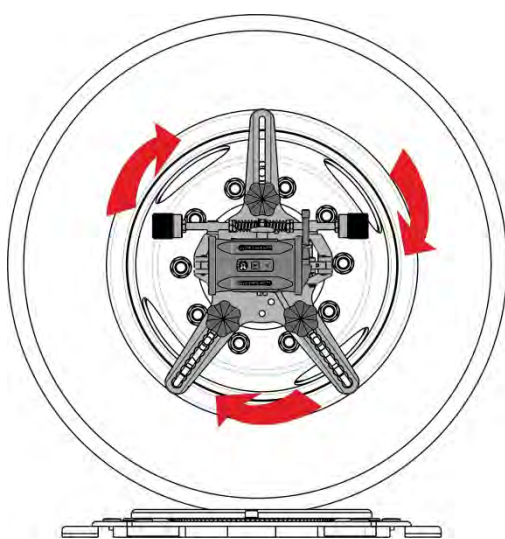


(Fig. 141)

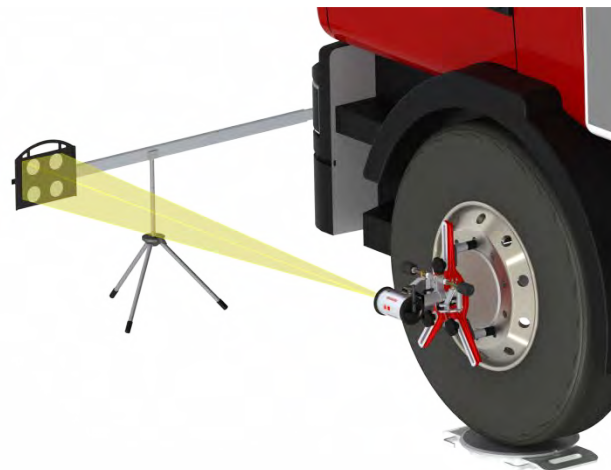
- Decide on a vehicle side where the first measuring sensor shall be inspected. (the left side of the vehicle in the example)
- Select the adjustment button for measuring the camber and check the single toe (in the example, the wheel position on the left).
- Click on the “**Continue**” button to return to overview.
- Now dismount the wheel alignment clamp to be inspected (in the example, the one on the left side of the vehicle) and mount it again on the rim by turning it by **180 degrees**. (Fig. 143)



(Fig. 142)



2. Position of the wheel alignment clamp



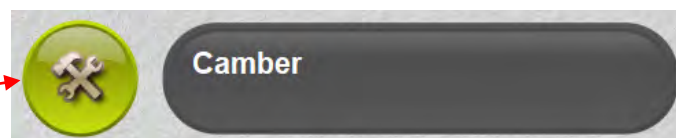
(Fig. 143)

- Then, point the camera towards the same reflector panel and align the camera horizontally with the level indicator. (Fig. 144)



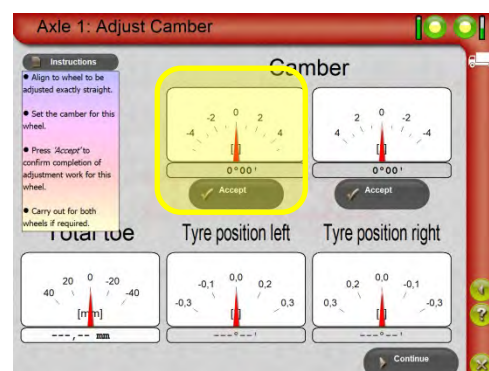
(Fig. 144)

- Select the *Adjustment* button for the camber measurement on the overview page in the program.



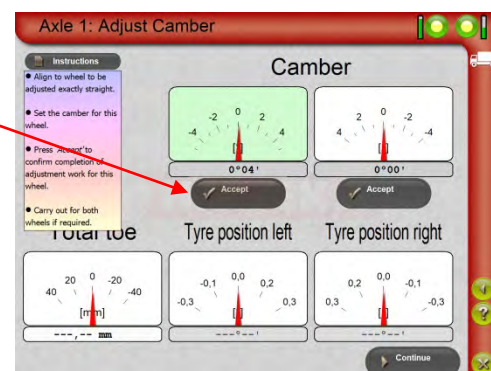
(Fig. 145)

The camber value is displayed again with the rotated wheel alignment clamp. (Fig. 146)



(Fig. 146)

- Click the **“Accept”** button to confirm the newly recorded measurement value and **“Continue”** to return to the overview.



(Fig. 147)

The newly recorded value is displayed in the **“After”** column in the overview window. (in the example, the column is on the left side)

After Before		Before After		Before After	
Toe	---, -mm ---, -mm	Total toe	---, -mm ---, -mm	Toe	---, -mm ---, -mm
Camber	0° 04' 0° 00'			Camber	0° 00' 0° 00'
Castor	---° ---'			Castor	---° ---'
King pin inclination (KPI)	---° ---'			King pin inclination (KPI)	---° ---'
Toe out on turn	---° ---'	Steering gear middle position	---° ---'	Toe out on turn	---° ---'
Max. turn	---° ---'	---, -mm ---, -mm		Max. turn	---° ---'

(Fig. 148)

Repeat this process for all wheel alignment clamps of your wheel alignment system. For the right side of the vehicle, the display values are to be checked in the right column according to the program.

If there is a deviation of more than 0°10' between the two measurements, the wheel alignment clamp must be re-adjusted.

If you detect faults in the function of the individual parts or in the recording of the measurement value, then please contact the authorised dealer of your wheel alignment system.

19 Servicing

19.1 Maintenance and Care

The contact surfaces of the magnetic feet must be kept free of dirt. Only in this way can full contact be ensured and therefore firm positioning on the rim.



Note

Please note that the wheel alignment clamps and their accessories are precision parts. These components must be used and maintained with great care at all times.



Caution

The protective screen in front of the camera lens must be cleaned with a dry, soft cloth, if necessary. Never use alcohol or other liquids!

Ensure not to scratch the detection side of the reflector panels.

Scratched reflectors may cause errors when measurements are recorded.



Only use the supplied battery charger to charge the battery in the camera measuring head. This charger conforms to European safety standards and has been designed specifically for use with the batteries in the wheel alignment system AXIS4000MB.

20 Error description



Caution

Operators may only redress errors that are clearly the result of operating or maintenance errors!

20.1 Description and causes of errors

Description	Possible causes	Troubleshooting
There is no connection to the cameras after program start	- There is insufficient battery power. - Incorrect interface connection specified in the program. - No or incorrect radio channel for the camera connection. - No USB driver installed for the receiver on the operating system.	- Charge the batteries in the camera measuring heads - Click on "Settings", the interface should be set to AUTO (see point 6.2.3) - Try to establish a new connection over a different radio channel - Install the USB driver from the CD provided.
The camera is not detecting any signals from the reflector panels	The reflector panels are badly damaged or dirty.	Clean the reflector panels, or replace with new reflectors, if necessary.
Camera measuring head does not sit securely on the rim	- Dirty rim surface - Dirty magnetic feet - Magnets on the rim are not fully in contact	- Clean the rim surface - Clean the magnet surface - Realign the magnetic feet
Measurement results are not realistic	- Distance of the reflector panels at the front from left to right is different from the distance at the back from left to right. - Alignment of the measuring head is not in order	- Distances must be checked! Same distance of the reflector panels at the front and back. - Check through handling control of the wheel alignment clamp and re-measurement of the toe and, if necessary, contact service.

21 Appendix

21.1 Overview of the extended settings

1	Confirmation Sound Confirmation sound activated (1) or not (0) Range: 0 ... 1; Default: 1	1
2	Printout: Request Printer Should the printer be request before each printout (1) or should generally the default printer be used (0)? Range: 0 ... 1; Default: 1	1
3	Transparency for Direction Arrow Sets transparency for pure axle visualisations. A transparency value of 0 means that the arrow is completely invisible. A value of 255 will show without any transparency. Default: 48	48
4	Use external PDF-Viewer Normally the software uses its own PDF-Viewer (0). If you like a different one, you can choose to use your systems default PDF-Viewer (1). Range: 0 ... 1; Default: 0	0
5	Suppress start measurement in the printout 0: printout of start and final measurement 1: suppresses the measured values of the start measurement in the printout if there is also a final measurement Range: 0 ... 1; Default: 0	0
6	Display of degree values How should degree values of angles be displayed 1: [degrees/minutes "] - e.g. 3°30'; 2: [decimal degrees "] - e.g. 3.5° Range: 1 ... 2; Default: 1	1
7	Printout: Background Picture Should a sample picture of the vehicle be shown in the background (1) or not (0)? Range: 0 ... 1; Default: 1	1
8	Light Beam Blinking Speed The visualisation of the light beam on the screen can be chosen constant (0) or blinking (1, 2, ... 5), whereas 5 is very slow. Range: 0 ... 5; Default: 0	0
9	Unit Track Values In which unit track values and the like should be shown? 0: [Decimal-Degree "] 1: [Degree/Minutes/Seconds "] 2: [mm] 3: [inch] Range: 1 ... 3; Default: 2	2
10	Printout: Background Picture (Nominal Data) Should a sample picture of the vehicle be shown in the background (1) or not (0)? This applies to nominal data only Range: 0 ... 1; Default: 0	0
11	Road Trains Especially for Australian Road-Trains there are own testing courses. Set this option to 1 for such courses or to 0, if this type of trailers does not come into consideration for you. Range: 0 ... 1; Default: 0	0
12	XLSX export Additionally export measured values as XSLX files (1) or only save in the dedicated format (0)? Files are saved in the XSLX folder under the database folder. Range: 0 ... 1; Default: 0	0
13	Entry field for wheel base difference Do you want to display an entry field for the wheel base difference (1) or not (0)? Range: 0 ... 1; Default: 1	0
14	Reminder for tyre pressure Do you want a reminder for entering the tyre pressure (1) or not (0) Range: 0 ... 1; Default: 1	0
15	Query for quick or full measurement Should a guided full measurement session be queried (1) or not (0) Range: 0 ... 1; Default: 1	1
16	Query for runout compensation Should runout compensation be active as a standard and queried during full measurement sessions (1) or not (0) Range: 0 ... 1; Default: 1	1
17	Decimal places for side displacement Number of decimal places for side displacement Range: 0 ... 1; Default: 1	1
18	Camber measurement with the toe at 0° Should be set at a steering axle before measuring the camber, however, previously set each wheel to 0° (1) or not (0)? Range: 0 ... 1; Default: 0	0

Branch/representative - Company No. HAWEKA AG Kokenhorststr. 4 30938 Burgwedel				Customer Vehicle identification number WPOUIER234567654321 Examiner Name				Repair order No. 4612 Date 12.12.2016					
Registration number		Date of first registration		Type		Engine No. dfghjklj56789		Total mileage ----- km					
Vehicle equipment													
Betonmischer													
Make of tyre		Tyre designation		Tyre size		Mileage							
Conti		Sportcontact		385/90 R22,5		100000 km							
Tyre check													
		1. VA		2. VA		1. HA				2. HA			
		left right		left right		left right		left right		left right		left right	
Tyre pressure (cold tyre)		in (bar)		8,5 8,5		8,4 8,4		8,0 8,1		8,0 8,1		8,0 8,1	
Profile depth outer		in (mm)		10,0 10,0		10,0 10,0		10,0 10,0		10,0 10,0		10,0 10,0	
Profile depth centre		in (mm)		10,0 9,0		9,0 9,0		9,0 9,0		9,0 9,0		9,0 9,0	
Profile depth inner		in (mm)		9,5 10,0		10,0 10,0		10,0 10,0		10,0 10,0		10,0 10,0	
Tyre radial run-out		in (mm)		2,00 1,00		2,00 1,00		1,00 2,00		1,00 2,00		1,00 2,00	
Wheel rim lateral run-out		in (mm)		0,00 0,00		0,00 0,00		1,00 1,00		2,00 0,00		0,00 1,00	
Chassis measurement													
Front wheels													
				before		before		after		after			
				1. VA		2. VA		1. VA		2. VA			
				left right		left right		left right		left right			
Total toe		in (mm)		- 2,9		- 0,2							
Single track (running direction to the centre of steering)		in (mm)		0,1 - 2,9		4,3 - 4,4							
Camber		in (°)		- 0,58° 0,07°		0,73° 1,08°		0,37° - 0,34°					
Castor		in (°)		2,71° 3,10°		2,57° 3,06°							
King pin inclination		in (°)		18,84° 19,66°		18,84° 19,48°							
Steering lock angle (steering lock links)		in (°)		at 20° 17,55°		9,40° 9,40°		at 20°					
Steering lock angle (steering lock right)		in (°)		17,65° at 20°		8,17° 9,00°		at 20°					
Steering lock (maximum)		in (°)		33,88° 33,69°		15,93° 15,15°							
Rear wheels													
				before		before		after		after			
				1. HA		2. HA		1. HA		2. HA			
				left right		left right		left right		left right			
Total toe		in (mm)		- 2,6		- 2,7							
Single track (running direction to the centre of steering)		in (mm)		- 5,7 3,1		- 3,8 1,1							
Camber		in (°)		- 0,21° 0,18°		- 0,20° 0,18°							
Rear wheels with leading or trailing axle steered													
Castor		in (°)											
King pin inclination		in (°)											
Angle of wheel (steering lock left)		in (°)											
Angle of wheel (steering lock right)		in (°)											
Wheel base measurement													
				1. HA				2. HA					
Lateral offset between rear axle and centre of frame						0,4 mm to the right →				5,0 mm to the left ←			
Inclination of the rear axles						0,38° to the left ←				0,21° to the left ←			
				1. VA				2. VA					
Lateral offset between front axle and centre of frame						0,2 mm to the right →				0,0 mm			
Inclination of the front axles						0,13° to the right →				0,38° to the right →			
				1. VA to 1. HA		1. VA to 2. HA		1. HA to 2. HA		1. VA to 2. VA			
Wheel base, left side				4290 mm		5691 mm		1401 mm		1890 mm			
Wheel base, right side				4291 mm		5690 mm		1399 mm		1895 mm			
Wheel base difference				-1 mm		1 mm		2 mm		-5 mm			
Parallelism				0,51°		0,34°		- 0,16°		- 0,25°			
Comments													

21.2.2 Format: Standard

Haweke AG
Kokenhorststr. 4
30938 Burgwedel
Phone +49 5139 8996-0 — Fax +49 5139 8996-222
Web www.haweke.com — eMail info@haweke.com



Mechanic:

Date: 12.12.2016, 14:53
Number plate: Mercedes Test

After		Before	Before		After	Before		After
Toe	---, -mm	0,1mm	Total toe		- 2,9mm	---, -mm	Toe	
Camber	0,37°	- 0,58°	- 2,9mm	---, -mm	0,07°	- 0,34°	Camber	
Castor		2,71°	Steering gear middle position		3,10°		Castor	
King pin inclination (KPI)		18,84°	0,1mm	---, -mm	19,66°		King pin inclination (KPI)	
Steer.(20° FA) I.		20,00°			20,00°		Steer.(20° FA) I.	
Steer.(20° FA) O.		17,65°			17,55°		Steer.(20° FA) O.	
Max. turn	---, -°	33,88°	Total toe		33,69°	---, -°	Max. turn	
Toe	---, -mm	4,3mm	- 0,2mm	---, -mm	- 4,4mm	---, -mm	Toe	
Camber	--, --°	0,73°	Parallelism of Steering Axles		1,08°	--, --°	Camber	
Castor		2,57°			3,06°		Castor	
King pin inclination (KPI)		18,84°	0,03°	--, --°	19,48°		King pin inclination (KPI)	
Steer.(20° FA) I.		9,40°			9,00°		Steer.(20° FA) I.	
Steer.(20° FA) O.		8,17°			9,40°		Steer.(20° FA) O.	
Max. turn	--, --°	15,93°			15,15°	--, --°	Max. turn	
Toe	---, -mm	- 5,7mm	Total toe		3,1mm	---, -mm	Toe	
Camber	--, --°	- 0,21°	- 2,6mm	---, -mm	0,18°	--, --°	Camber	
			Out of square					
			- 0,38°	---, --°				
			Offset					
			0,4mm	---, -mm				
Toe	---, -mm	- 3,8mm	Total toe		1,1mm	---, -mm	Toe	
Camber	--, --°	- 0,20°	- 2,7mm	---, -mm	0,18°	--, --°	Camber	
			Out of square					
			- 0,21°	---, --°				
			Offset					
			- 5,0mm	---, -mm				

22 EC Declaration of Conformity

The manufacturer:

HAWEKA AG
Kokenhorststraße 4
30938 Burgwedel

hereby declares that the system described in the following:

Electronic camera radio system for wheel alignment of commercial vehicles Type: *AXIS4000MB*

conforms to the following guidelines and standards.

EMC directive	2014/30/EU
3B Low-voltage directive	2006/95/EG
RED Directive	2014/53/EU
RoHS II Directive	2011/65/EU

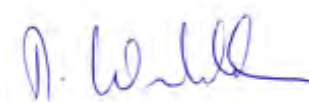
Applicable European standards:

EMC standard for radio equipment and services with short-range (SRD)	ETSI EN 301 489-03 ETSI EN 301 489-01 ETSI EN 300 220-1 ETSI EN 300 220-2
Broadband transmission systems 2,4 GHz ISM-band	ETSI EN 300 328 V2.1.1
Interference immunity and interference emission	EN 61326-1
Photobiological safety of lamps and lamp systems	EN 62471
Exposure limit for artificial optical radiation	BGI 5006
IP protection classes IP54	DIN EN 529
Shock test: Free fall	DIN EN 60068-2-31, EC

Structural modifications which affect the technical data provided in the Operating Instructions and the intended use invalidate this Declaration of Conformity!

Chairman of the Board
 Dirk Warkotsch

Burgwedel, 04/12/2017

(Signature)



HAWEKA AG

Kokenhorststr. 4 ♦ 30938 Burgwedel

 05139-8996-0  05139-8996-222

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