



# Operator Manual

## Cam-Aligner





# Contents

1 Read me first!	4
2 EC Declaration of Conformity	5
3 System description	6
3.1 Agreed functionality	6
4 Technical data	7
5 Component description	9
5.1 ACC/AICC radar alignment equipment	14
5.2 ADAS calibration alignment equipment	15
6 Measurement references	17
6.1 Frame reference	17
6.2 Axle reference	17
7 Software settings	18
7.1 Communication	19
7.2 Equipment	20
7.3 Workflow	21
8 Wheel alignment preparations	22
8.1 Mount the self centering frame gauge	23
8.2 Mounting frame gauges when measuring the axle(s) on a 'dolly'	25
8.3 Mount wheel adapters	26
8.4 Mount reference blocks on wheel adapters	26
8.5 Mount inclinometer unit	27
9 Create a work order	28
9.1 Select a vehicle type	29
10 Measurement	31
10.1 Runout	33
10.2 Toe / Camber	39
10.3 Toe & Camber – rolling one axle	42
10.4 Toe & Camber – multi axle roll	45
10.5 Floor reference	50
10.6 Caster / KPI / Maximum Turn, toe out on turns (TOOT)	52
11 Align vehicle	56
11.1 Using the driven axle of the tractor as the reference	57
11.2 Using the rigid axle on the trailer as the reference	59
12 Adjustment	61
12.1 Adjust toe, camber, out of square	61
12.2 Adjust parallelism	65
12.3 Adjust caster (steering axles)	66
12.4 Adjust max turn	68
12.5 Adjust twinsteer	70
13 ACC/AICC calibration for radar unit with mirror	72
13.1 Measurement preparations	72
13.2 Mounting asymmetric camera markers	72
13.3 Mounting of AZOF/ELOF scale	73
13.4 Important safety information	74
13.5 Measurement, radar with mirror	75
13.6 Adjustment, radar with mirror	81
14 ACC/AICC calibration for Wabco radar	83
14.1 Measurement preparations	83
14.2 Important safety information	83
14.3 Mounting asymmetric camera markers	83
14.4 Measurement, Wabco radar unit	85
14.5 Adjustment, Wabco radar unit	90
15 LDWS measurement	91
15.1 Measurement preparations	91
16 ADAS safety system for Volvo/Renault	98

16.1 Measurement preparations .....	98
16.2 Measurement with dual board calibration stand .....	99
16.3 Measurement with single board calibration stand .....	105
16.3.1 FLS/LPOS .....	106
16.3.2 FLR/FLC .....	116
16.4 Calibration of target .....	127
17 ACC/LDWS measurement for Iveco .....	129
17.1 ACC calibration .....	131
17.2 LDWS calibration .....	136
18 Measurement and adjustment with Side radar tool.....	141
19 Frame measurement.....	144
19.1 Measurement preparations .....	144
19.2 Frame check .....	144
20 Equipment calibration.....	153
20.1 Calibrate the camera .....	153
20.2 Calibrate the inclinometer .....	157
20.3 Calibrate Wabco radar adapter .....	160

# 1 Read me first!

- Everyone working with the equipment should be well acquainted with the system, and able to work in compliance with the manual.
- Observe the safety instructions and warning labels.
- It is the responsibility of the system owner to replace damaged safety devices such as fuses and warning labels immediately.

	<b>CAUTION!</b>
	The indication CAUTION warns of the danger of minor physical injury or damage to equipment.
	<b>WARNING OF LASER RADIATION!</b>
	The indication LASER RADIATION warns of possible injuries to eyes due to unshielded laser radiation.
	<b>TIP RISK!</b>
	Wind gusts when moving unit
	<b>NOTE</b>
	Notes, usage tips or additional information.
<b>This font</b>	Indicates a physical button to press
<i>This font</i>	Indicates emphasis
<b>[This font]</b>	Indicates a software button to click

## 2 EC Declaration of Conformity

**CAR-O-LINER®**

ORIGINAL

### EC DECLARATION OF CONFORMITY

We, the manufacturer, hereby declare under our sole responsibility, that the product described below is in conformity with the provisions of the **European Directive 89/336/EEC** as well as any other Directive(s) as stated below. Any modification to the below mentioned product, that is not expressly agreed upon with us, will render this declaration invalid.

**Manufacturer:**

Car-O-Liner Commercial AB  
Mejerigatan 12  
SE-641 39 Katrineholm  
Sweden

**Description and identification of the product:**

- Type of equipment: Camera sensor
- Model(s)/Type(s): 72010, 72251, 75640, 75647
- Serial number(s): Dating from 2008 and forward
- Manufacturing year: Dating from 2008 and forward

**Above mentioned product is also in conformity with the following directive(s):**

- European Directive 89/336/EEC

**The following harmonized standard(s) has been applied for this declaration of conformity:**

- EN 61000-6-2:2005 EMC Immunity
- EN 61000-6-4:2007 EMC Emission

**The following other standard(s) and/or technical specification(s) has been applied for this declaration of conformity:**

- 

**Other references (EC Type-Examination or similar):**

NA

**Person authorized to compile the technical documentation:**

Andreas Johansson  
Mejerigatan 12  
641 39 Katrineholm

**Place and Date:**

Katrineholm 2014

**Person authorized to sign the Declaration of Conformity on behalf of the manufacturer:**

Morgan Ekskär, Director BU Truck & Bus OEM

**Signature:**



Car-O-Liner Commercial AB  
Mejerigatan 12  
SE-641 39 Katrineholm  
Sweden

Telefon  
0150 66 25 40  
Telephone  
+46 150 66 25 40

Fax  
0150 66 25 41  
Telefax  
+46 150 66 25 41

Email/Epost  
info@truckcam.com  
Website/Hemsida  
www.truckcam.com

Org. Nr.  
556122-6506  
Moms reg. Nr./VAT- nr.  
SE556122650601

Bankgiro  
5428-7180  
Innehav:  
F-skattelösnis

SWIFT/BIC  
ESSESE33

IBAN  
SE85 5000  
0000 0511  
8104 6505

## **3 System description**

### **3.1 Agreed functionality**

- The JOSAM cam-aligner system is designed for wheel alignment and frame check of commercial vehicles.
- The JOSAM cam-aligner system provides measurement of total toe, individual toe, axle offset, out of square, camber, caster, KPI, toe out on turn, max turn angles and steering gear middle position.
- The JOSAM cam-aligner system enables dynamic toe and camber measurement while in driving position. No lifting of the axles with run-out compensation is required during this measurement.
- The JOSAM cam-aligner system enables performing of run-out compensation of rims and wheel adapters, which is necessary for caster, KPI and turn angle measurements.
- The JOSAM cam-aligner system enables measurements to be performed fast and reliable on all types of commercial vehicles.
- The JOSAM cam-aligner system uses wireless communication technology for transmission of information between camera sensors and computer.
- The JOSAM ACC/AICC radar alignment system is designed as a compliment to the JOSAM cam-aligner wheel alignment system, to enable measuring and adjusting of ACC/AICC units on commercial vehicles.
- The JOSAM ACC/AICC radar alignment system is fully integrated with the JOSAM cam-aligner wheel alignment system, and measurements are done by the camera sensors. However, depending on design of the ACC/AICC radar unit itself, measurement values may in some situations require to be read manually from the system measurement scales and added to the system software.

Car-O-Liner Group AB may not be held responsible for any losses, damages or other effects, economical, human or otherwise, derived from using this equipment in ways not explicitly specified within this document.

## 4 Technical data

### Measurement specifications

Feature	Accuracy	Measurement Range
Total Toe	<0.4 mm/m	± 40mm / m
Individual Toe	<0.2 mm/m	± 40mm / m
Camber	<3 minutes	± 6°
Caster		± 20°
KPI		± 20°
Maximum turn		65°

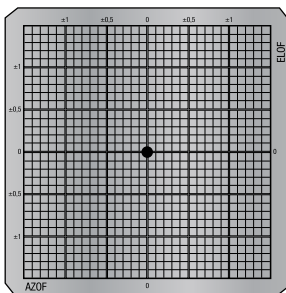
### Camera specifications

Operating time with fully charged batteries	16 hours
Charging unit operating voltage	100-240V, 50-60Hz
Operating temperature	-5° to +40° Celsius

### Radar alignment (ACC / ACC)

Laser module (Wave length)	635nm
Operating voltage	DC 3 or 5V
Operating current	≤50mA
Output power	1mW
Operating temperature	-10° to +40° Celsius

### Scale factor of the AZOF ELOF scales



The values of the AZOF ELOF scale shows angle degrees (°). When the scale is placed 1 meter in front of the vehicle, every narrow line will represent 0.1°.

**AZOF = Azimuth Offset**  
Horizontal error / adjustment

**ELOF = Elevation Offset**  
Vertical error / adjustment

### Vehicle brand/make and AZOF ELOF scale type.

There are different scales for different truck brands.

Laser scale for ACC	CA 1051
AZOF ELOF	TC-219
<b>Vehicle brand / make and AZOF ELOF scale type</b>	
Scania	Type 1
Volvo	Type 2
MAN	Type 4

**Communication module CA1009/72009 & CA1009 A/75642**

	<b>CA1009/72009</b>	<b>CA1009 A/75642</b>
Device type (transmitter/receiver/transceiver)	Transceiver	Transceiver
Frequency range	2,401 GHz - 2,495 GHz	2,406 GHz - 2,475 GHz
Low frequency	2,401 MHz	2,406 MHz
High frequency	2,495 MHz	2,475 MHz
Bandwidth	2,400 KHz	2,400 KHz
Maximum output e.i.r.p.	63 mW	63 mW
Modulation standard	802.11	802.11

## 5 Component description

### Camera sensor CA1010 A/B



The camera sensor is a rugged, high precision sensor specially designed to measure angles and distance relative to a reflective target. It has a strong housing with rubber protection at both ends.

The camera lens and built-in flasher is protected by a hardened front glass. The camera is equipped with an infra-red (IR) flasher, sending out short flashes of IR light a few times per second. When this light hits a reflective target, the light will reflect back to the camera lens. The lens is equipped with an IR-filter, only permitting IR light to pass through.

The result is a picture having a reflective target depicted against a black background. Thus the camera can operate in complete darkness or in sunshine, since it only uses the light from the IR flasher.

The picture is analyzed by a microprocessor within the camera sensor itself, and information is sent to the computer by wireless communication. The computer finishes the calculations, giving the three angles  $\alpha$  (alfa),  $\beta$  (beta) and camber as well as the distance to the target as a result. These parameters are then used by the computer software to calculate the wheel angles.

The camera is equipped with three electronic inclinometers as well as a gyroscope. The signals from these sensors are combined with the data from the camera to produce a very powerful tool to be used for wheel alignment. The gyroscope is used to extend the angle range to handle max turn angles for steerable axles. The electronic inclinometers are used to calculate camber, caster and KPI directly on the wheel itself.

The camera sensor is powered by a built-in battery pack, and the batteries are recharged every time the camera is placed in the charging cradle. The operating time of the batteries is >16 hours, depending on the way of use of the system. The camera has a standby mode where it consumes only 15% of the power. In standby mode the wireless connection is still active while the camera part itself is switched off. The software in the computer automatically switches the camera from standby mode to operation mode as needed.

### Type sign



A sticker showing the unit's radio number and serial number is placed on the back side of the camera.

**Inclinometer unit CA1007 A, inclinometer kit CA ANGLE K A**


The inclinometer unit is used to compensate influences from floor inclination, difference in tire size or tire pressure while measuring. The inclinometer monitors not only the horizontal position of the axle, but also monitors the angle of inclination of the axle while lifting the front axle. This enables the operator to measure correct caster and KPI values in lifted position without levelling the vehicle or the axle beam. By using the inclinometer unit during rolling measurement, the inclinometer monitors the horizontal position of the axle while moving the vehicle half a wheel turn. In this way high accuracy camber values can be achieved even on an uneven floor.

**Camera, inclinometer and communication module compatibility**

Wireless units of different generations are not compatible with each other. To identify the generation of a wireless unit, see the unit's nameplate.



Generation 1 nameplate.



A generation 2 nameplate is marked with a ring in the top right corner.

A generation 3 nameplate is marked with a dot in the top right corner.

**Reflective targets**


The reflective targets are markers that the camera sensor uses to determine angles and distances. These markers need to be kept clean to maintain high measurement accuracy and long life time of the system. For cleaning recommendations, see [8 "Wheel alignment preparations", page 22](#).

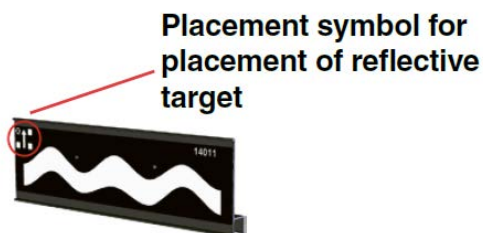


There are two types of reflective targets, standard and upgrade.



To keep the marker clean, make sure to always avoid touching the reflective surfaces on each side of the target when handling them.

Standard	Upgrade
TC-233-10	TC-216-10
TC-233-20	TC-216-20
TC-233-30	TC-216-30
TC-233-40	TC-216-40



## Communications device CA1009 A



The communications device is connected to a PC and powered via a USB cable. It permits the camera to communicate with the PC software.

## Wheel adapter CA1000



The wheel adapter is used to mount the cameras to the wheels of the vehicle. The wheel adapter is designed according to a tripod principle, to enable the best accuracy possible when measuring and fits aluminium as well as steel rims in sizes 12" – 22.5".

## Extension leg CA1034



Extension leg for spider wheel adapter CA1000, can extend the wheel adapter to 25.5". Three pcs of CA1034 per wheel adapter are needed.

## Magnet wheel adapter CA1006



Magnet wheel adapter for aluminium rims. The wheel adapter is used to mount the cameras to the wheels of the vehicle. Fits aluminium as well as steel rims in sizes 12" – 22.5".

**Universal wheel adapter AM10C**

Universal wheel adapter that is used to mount the cameras to the wheels of the vehicle. Fits rims in sizes 16" – 24".

**Self-centering frame gauges CA1004**

The frame gauges work according to a self-centering principle. When mounted to a vehicle they determine the chassis centre line, which is the standard reference in a camera wheel alignment system.

**Low friction plates AM268 A**

The low friction plates are used to eliminate friction between floor and tire when adjusting toe. The plates can hold a weight of up to six tons each.

**Turntable with low friction plate JT295 A**

The turntable with low friction plate is used to eliminate friction between floor and tire when measuring max turns and caster swings on the floor. To compensate for the height of these plates while measuring caster, KPI and turn angles on the front axle, the wooden height compensation plates (see below) are used for the rear axle. The plates can hold a weight of up to six tons each.

### Height compensation plates



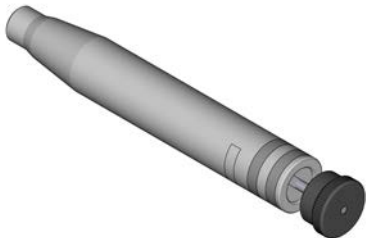
Used in conjunction with turntable with non-friction plate to compensate the height of the other axles of the vehicle.

### Reference blocks TC-416



The reference blocks are used to correctly position the cameras when performing a multiroll measurement.

### Front adapters



The front adapters are assembled to the front of the vehicle, usually in the towing bracket, to support the self-centering frame gauges. There are several types of front adapters available, adapted for different vehicle models.

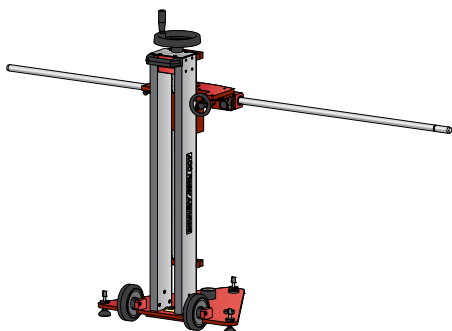
### Steering wheel holder



Is used to lock the steering wheel in the straight ahead position.

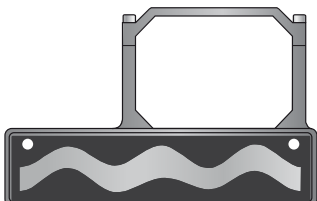
## 5.1 ACC/AICC radar alignment equipment

### Radar measuring stand CA1005



The JOSAM radar measuring stand CA1005 is the base unit of the ACC/AICC radar measurement system. It is also used for calibration of the LGS sensor on MAN vehicles, see [5.2 ADAS calibration alignment equipment, page 15](#).

### Camera marker, assymetric TC-217-50



Camera markers TC-217-50 are mounted to the camera sensors, and help to adjust the bar on the radar stand parallel to the rear axle.

### Parallelity target TC-229



Parallelity target TC-229 is used to ensure the rods on the radar stand maintain their position throughout the measurement sequence.

### Wabco adapter CA1055

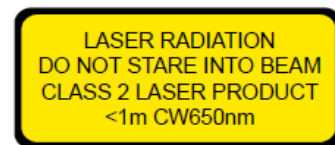


The Wabco adapter is used to measure and adjust the ACC/AICC radar units without built-in mirror.

### Laser unit CA1050



Laser unit CA1050 consists of a Class 2 laser driven by four standard AA batteries and mounted in a protective housing. A warning label and an information label (see below) are attached to the laser unit housing. For important information regarding safety when using a Class 2 laser product, please refer to section [13.4 "Important safety information", page 74](#).



### AZOF/ELOF scales TC-219



The AZOF ELOF scales attach to the laser unit CA1050, and is used to read the alignment values of the ACC/AICC unit. Different scales are used for different truck brands, see [4 "Technical data", page 7](#).

## 5.2 ADAS calibration alignment equipment

### ADAS calibration stand

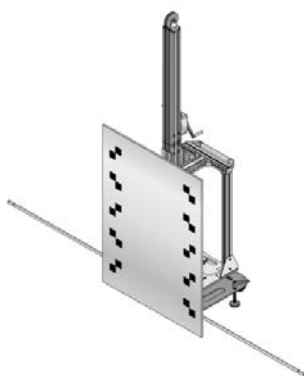
The stand consists of one or two optical targets used for static calibration of the vehicle's radar and camera sensors. Static calibration means that the vehicle is calibrated while standing in the workshop, as opposed to a driving (dynamic) calibration. The stand is used together with camera sensors CA1010 A to align and position the targets at the correct distance and height. Calibration is then made using the vehicle manufacturer's electronic service device and procedures.

There are two different versions of the calibration stand:

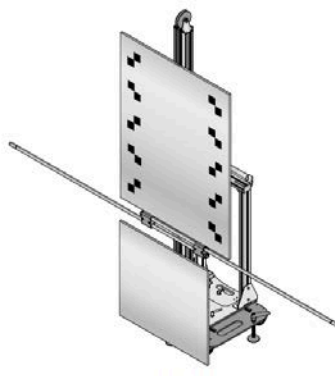
AM1874B for Volvo Group vehicles single board

AM1874 for Volvo Group vehicles dual board

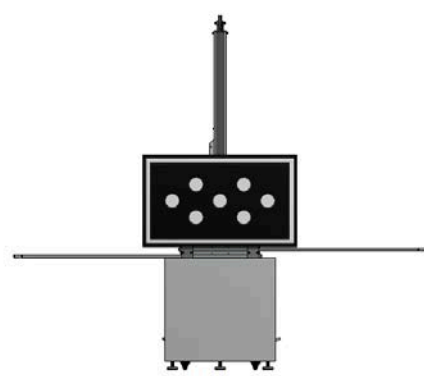
AM1884 for Iveco vehicles



AM1874B



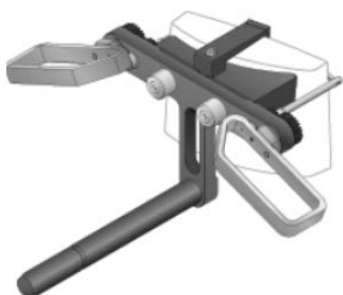
AM1874



AM1884

**LGS calibration equipment for MAN**

Add-on equipment to be used together with stand CA1005 when calibrating the LGS sensor on MAN vehicles.

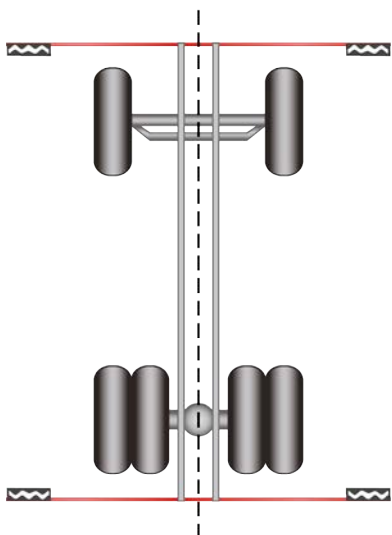
**Side radar tool**

Special tool used for calibrating side radar direction, purchased from MAN.

## 6 Measurement references

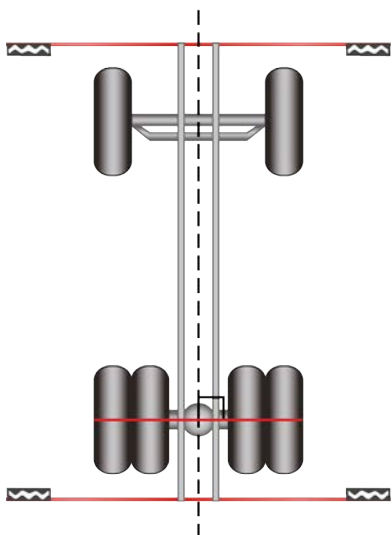
Definitions of the measurement references mentioned in this user manual.

### 6.1 Frame reference



The frame reference method is the standard reference for the JOSAM camaligner system. The chassis centerline is determined by the centering frame gauges which are hung at the front and rear of the frame or body.

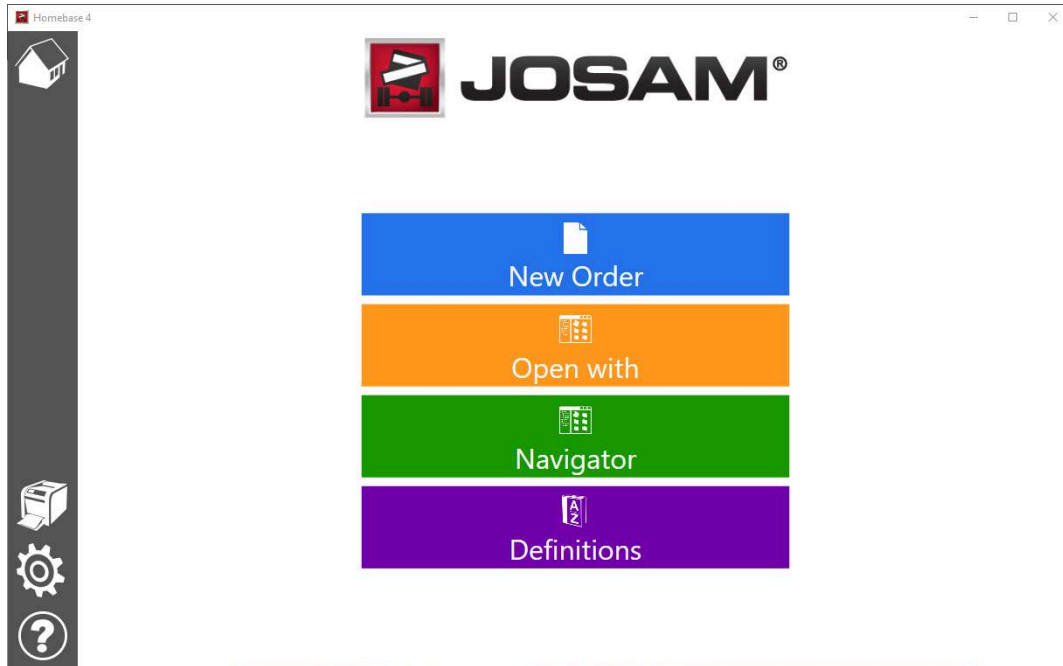
### 6.2 Axle reference



The axle reference method uses a line perpendicular to the rear axle of the vehicle, e.g. all front axles are calculated in relation to the out of square of the rear axle. The out of square for the reference axle is measured using the chassis centerline reference as described above.

## 7 Software settings

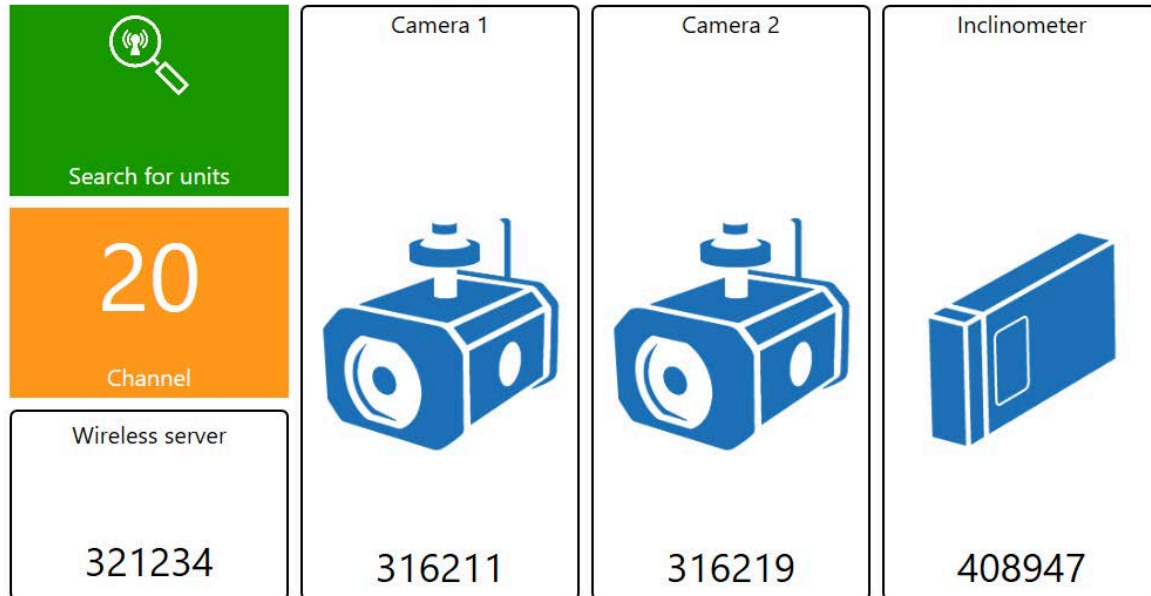
*This manual will only describe the sections specific to the Cam-aligner plugin. For the common settings, see the Homebase 4 Manual.*



Click **[Settings]** to enter the program setup. Before using the system for the first time, it is required to enter the setup area to configure the program settings. 

## 7.1 Communication

Units [Camera System](#) Customization Licenses About  
[Communication](#) Equipment Workflow

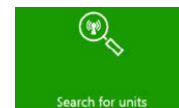


The wireless system must be configured before becoming fully functional prior to using for the first time. To do this make sure the cameras and inclinometer are powered up, then enter the Communication tab. The program will try to automatically detect the cameras and the inclinometer.

Please verify that the detected camera and inclinometer radio numbers match the units you wish to use.

If radio numbers are incorrect or reads 000000:

Press the **[Search for units]** button and follow the instructions.

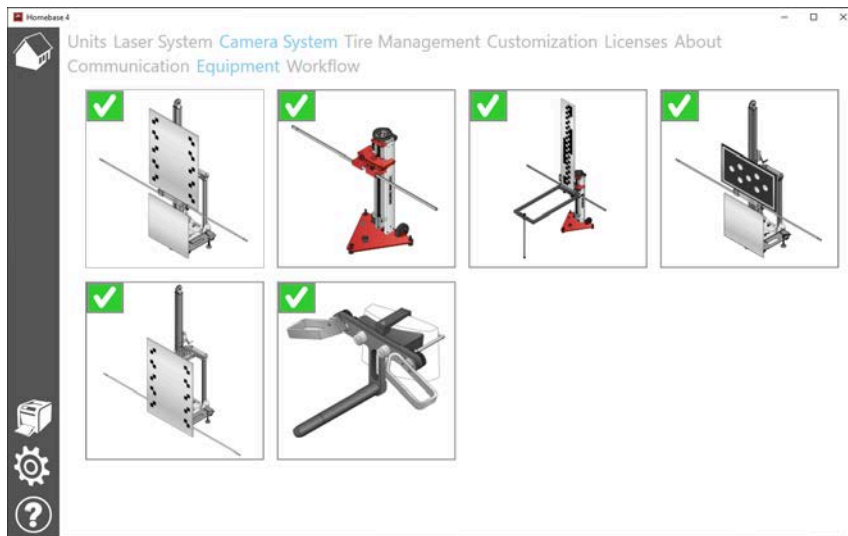


If more than one Cam-aligner system is to be used in the same workshop, it will be necessary to separate the systems on different channels.

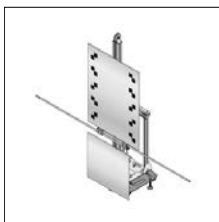
To change channel, make sure the correct cameras and inclinometer are connected, then press the **[Channel]** button and follow the instructions.



## 7.2 Equipment



The Equipment tab is used to tell the software what equipment you have in your Workshop. The software will use this information to decide what functions to enable.



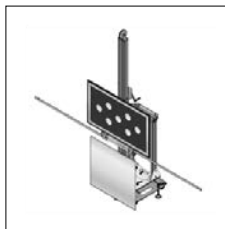
ADAS calibration stand for Volvo Group (dual board) FLS/LPOS



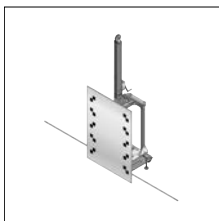
ACC/LDWS radar calibration stand



ADAS calibration stand for MAN



ADAS calibration stand for Iveco



ADAS calibration stand for Volvo Group (single board) FLS/LPOS and FLC/FLR

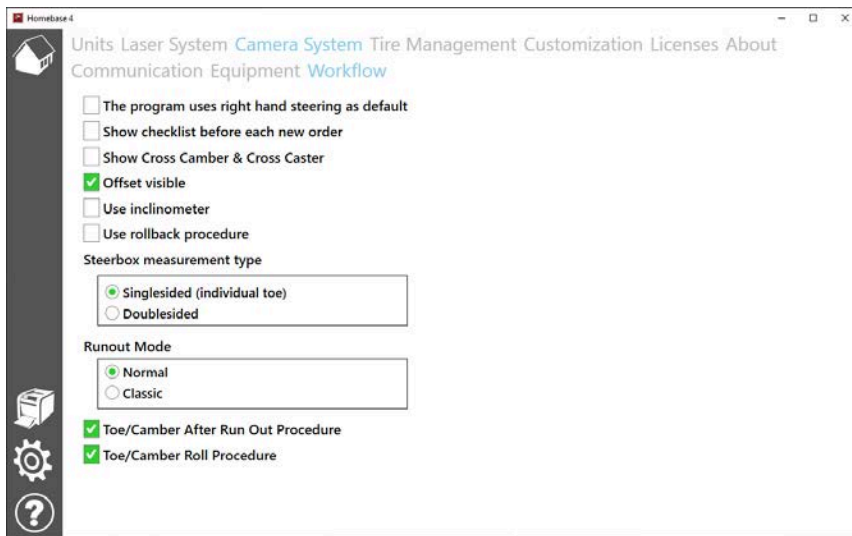


Side radar tool



Remember to update these settings when your workshop equipment inventory has been changed.

## 7.3 Workflow



### The program uses right hand steering as default

If selected, the standard models will be equipped with right hand steering, and the program will default to right hand steering when creating new vehicle definitions.

### Show checklist before each new order

If selected a checklist with reminder points will be shown in the new order flow.

### Show Cross Camber & Cross Caster

If selected, Cross Camber & Cross Caster will be calculated and presented.

### Offset visible

If selected the program will measure and display the axle relative to the frame offset on screen and on the print report.

### Use inclinometer

If selected the software will try to use the Inclinometer in all relevant measurements. Note, the inclinometer must be connected and placed according to the instructions.

### Use rollback procedure

If selected a rollback procedure is added to the Multi Axle Roll procedure. This procedure is intended to roll the vehicle back in the same position as before the measurement started. (For example, To end up on turnplates when the measurement is done).

### Steerbox measurement type

Selects how the software will calculate the steering box value.

- **Singlesided** means that the steering box value will be equal to the toe on the side where the steering box is placed.
- **Doublesided** means that the steering box value will be a combination of left and right toe. (Independent of where the steering box is placed)

### Runout Mode

Selects the type of runout mode that will be available. [10.1 See "Runout", page 33.](#)

- **Normal runout mode (default).** This method requires more OK confirmations on the camera and is similar to previous Josam truckaligner I & II systems.
- **Classic runout mode.** This method requires fewer OK confirmations on the camera and is similar to the Josam laser AM system and previous Truckcam systems.

### Toe/Camber After Run Out Procedure

If activated the Toe/Camber After Run Out procedure will be available. Default is activated.

### Toe/Camber Roll Procedure

If activated the Toe/Camber Roll procedure will be available. Default is activated.

## 8 Wheel alignment preparations

Before starting the measurement procedure the following preparations must be completed.

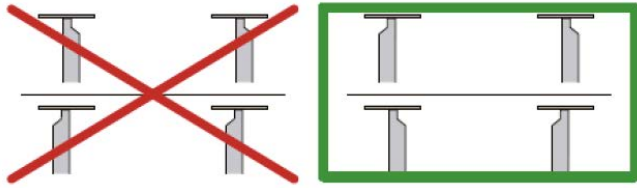

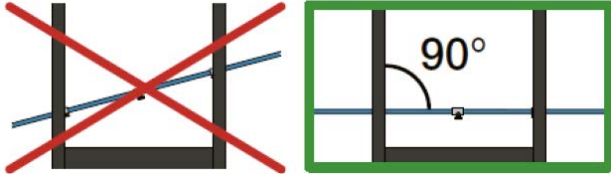

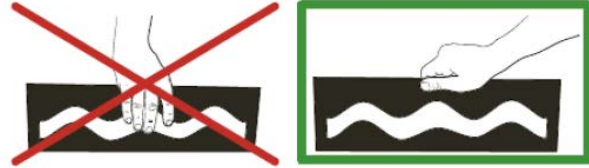

- Make sure that the vehicle is parked as straight as possible.
- Make sure the target is facing the front of the vehicle. Mount the wheel adapters to the wheels.
- Mount the cameras on to the wheel adapters reference axle. Assemble the frame gauges to the front and rear of the vehicle.
- Check that all vital parts, like bolt joints and bushings, are free of any excessive play.






Play will have influence on wheel positions and measurements.

- Check tire pressure, tire size and inflate the tires to the specified pressure.
- Check if the floor or other surface that you're measuring on is reasonably flat or use the inclinometer unit to compensate such influences.

## 8.1 Mount the self centering frame gauge

1.	 <p>Place the frame gauge hangers symmetrically on the frame gauge.</p> <div data-bbox="231 539 327 633">  </div> <div data-bbox="343 539 1393 633"> <p>The symmetrical positioning is absolutely necessary in order to obtain accurate measurement values</p> </div>
2.	  <p>Mount the self centering frame gauges as square as possible (within eyesight accuracy) to the chassis, one at the front, the other at the rear.</p> <p>Make sure the frame gauges are levelled, by checking the built-in spirit level and adjusting the frame gauges if necessary.</p> <p>There are several different adapters available to make it easier to mount the frame gauges to the vehicle, such as bumper adapters and chassis extenders, please check out the accessories list in the product sheet or contact your local distributor for further information.</p>
3.	 <p>Place the reflective targets on the frame gauges.</p> <div data-bbox="231 1756 327 1850">  </div> <div data-bbox="343 1756 1393 1850"> <p>To keep the markers clean, make sure to always avoid touching the reflective surfaces on each side of the targets when handling them.</p> </div>



4.	 <p>Check the placement symbols on the targets to ensure that they are correctly placed.</p>
5.	 <p>Check that the positioning screws on the frame gauges are placed in the same positioning hole for all frame gauge beams when using frame gauge CA1004 and TC-233 targets.</p>
6.	 <p>Check that the positioning screw of the frame gauge is placed in the same positioning hole for all four targets when using frame gauge JT120 A and TC-216 targets.</p>

## 8.2 Mounting frame gauges when measuring the axle(s) on a 'dolly'

Place the hangers symmetrically on the frame gauge, as described above.

Mount the tow bar adapter to the towing eyelet. Mount the front frame gauge by placing the frame gauge hangers in the correct position on the tow bar adapter bar.

Mount a frame gauge in the rear end of the axle frame (the 'dolly').

Place the four reflective targets in their correct positions, as described above.

Check that the front frame gauge is perpendicular to the tow bar by eye sight.



## 8.3 Mount wheel adapters

The wheel adapters are made to fit both aluminium and steel rims in sizes 14" to 22.5". If Extension leg CA1034 is used the wheel adapter can fit size 25.5"



They are mounted by fitting the hooks at the end of the wheel adapter legs either on the inside of the rim or between rim and tire, depending on rim make, and rotating the knob on the side of the wheel adapter to secure it. For light commercial vehicles like vans, transporters etc, use the smaller leg with the van hook on the wheel adapter and place it between rim and tire.



### Attention

**Hazard:** To avoid any measuring errors, make sure to always use the same type of wheel adapter and gripping hooks/magnets on both sides of each axle. Also make sure to attach the wheel adapters to the rim in a consistent manner on left and right side of each axle.

**Risk:** Measuring errors

**How to avoid:** Always use the same type of wheel adapter and gripping hooks/magnets on both sides of each axle. Attach the wheel adapters to the rim in a consistent manner on left and right side of each axle.

## 8.4 Mount reference blocks on wheel adapters



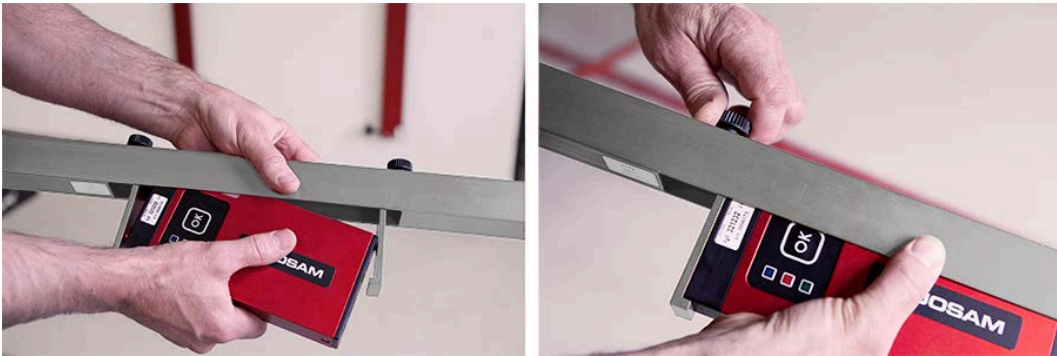
Use a 4mm Allen key to loosen the tightening screws on the TC-416 reference block..

Insert the reference block on the wheel adapter axle, as far inwards as possible. Make sure the reference block fits over the wheel adapter nut (as seen in the picture)

Tighten the screws on the reference block until the block fits tight to the wheel adapter axle and is not movable.



## 8.5 Mount inclinometer unit

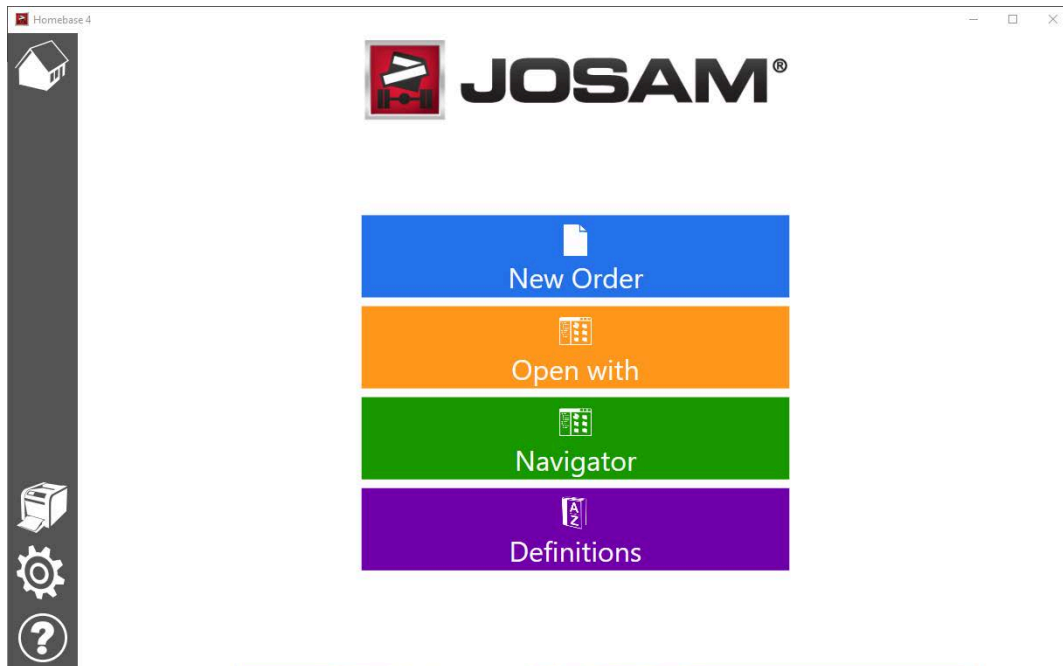


Take the inclinometer out of the TC-395 charging cradle. Mount the CA1007 inclinometer unit into the CA1065 inclinometer bar by inserting the unit into the slot of the bar and by tightening the screws in order to clamp the unit to the bar. The Josam stickers on inclinometer and inclinometer bar should both be facing in the same direction (towards the vehicle's front).

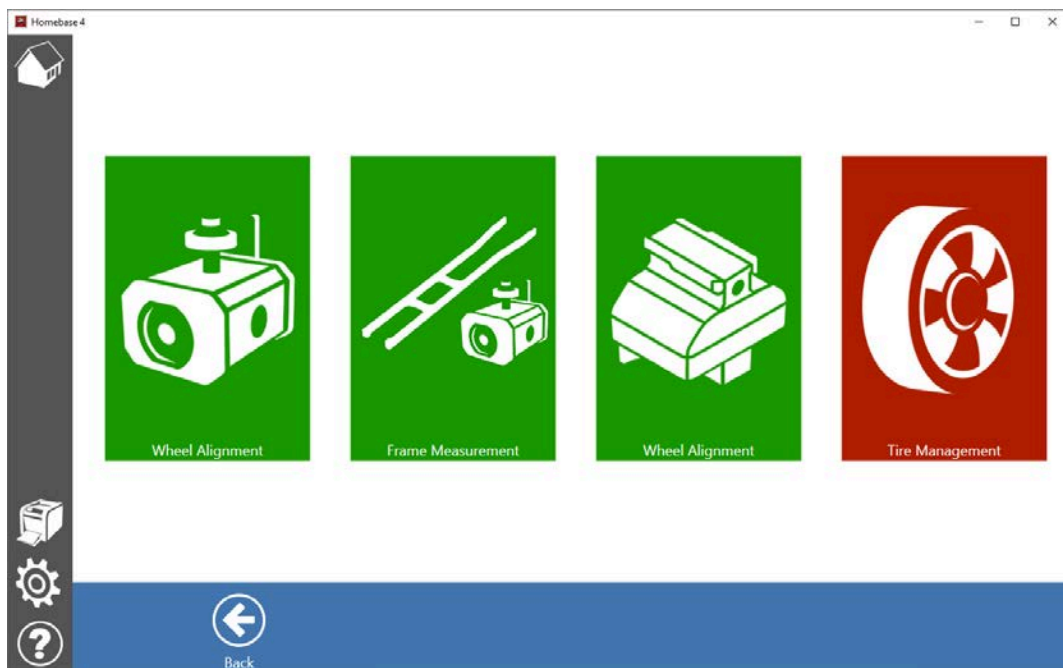


Before use with the measurement software, the mounted inclinometer unit and bar must be calibrated using the built-in inclinometer calibration function in the software. See "Calibrate the inclinometer" on page 134.

## 9 Create a work order



To access the new order menu click on **[New order]**

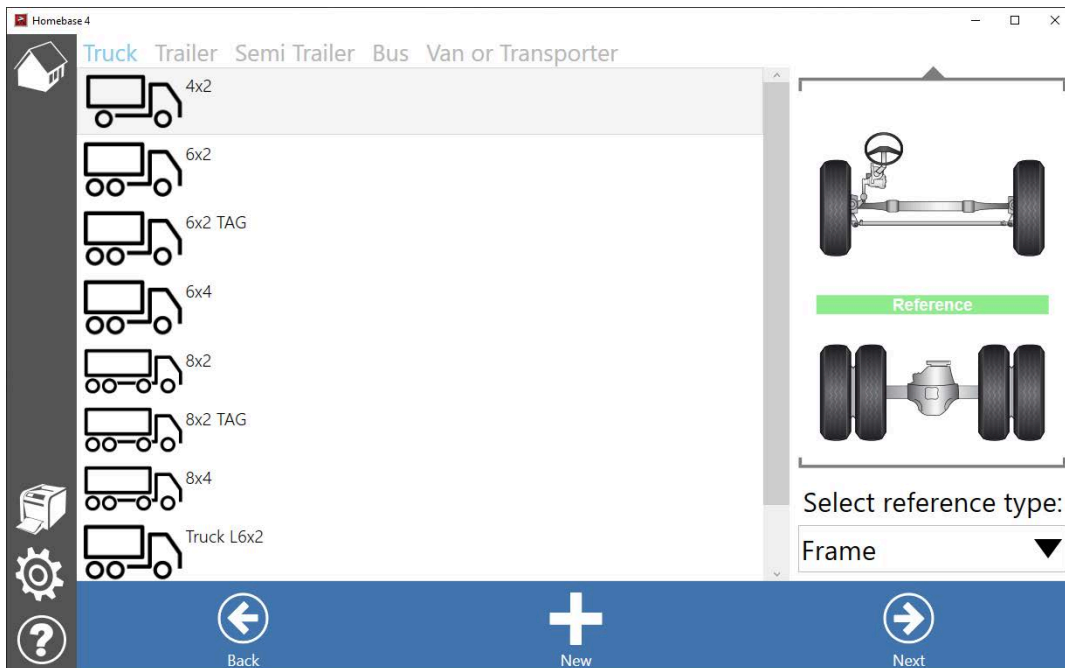


The list of plugins may vary depending on the installation.

Select **[Wheel alignment]**



## 9.1 Select a vehicle type



Select a vehicle type from the top menu (Truck, Trailer, Semi-trailer, Bus, Van or Transporter). Click on the desired vehicle definition.

If the desired definition doesn't exist, a new definition can be created by clicking **[New]**



See Homebase 4 User Guide, chapter Definitions, for detailed instructions.

Select reference type:

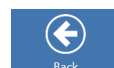


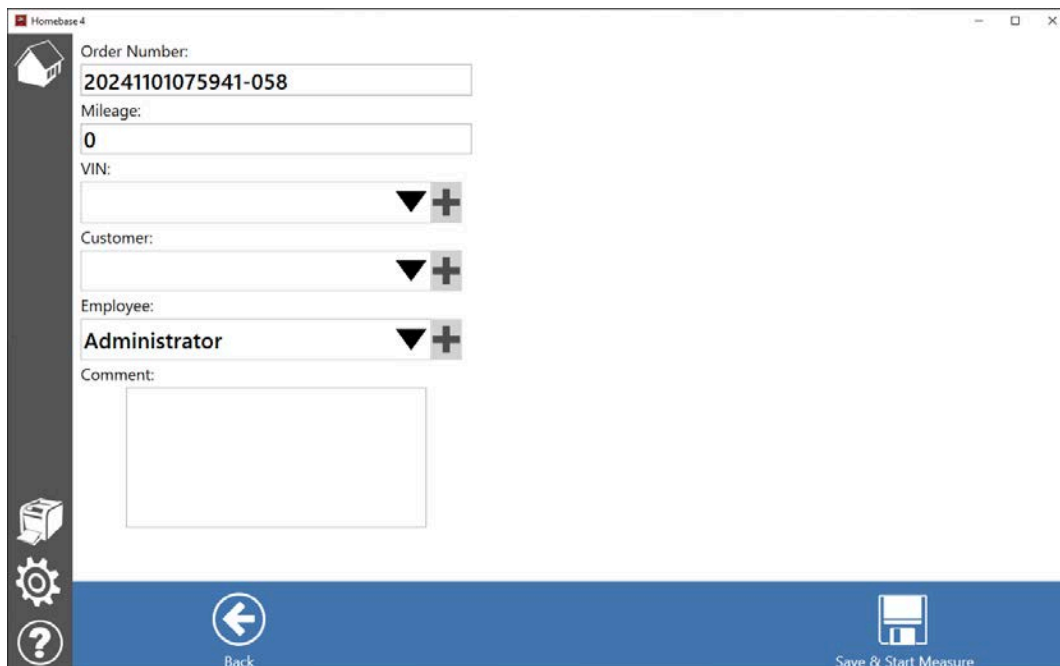
Choose desired reference type, Frame (default) or Axle. See [6 "Measurement references"](#), [page 17](#) for detailed instructions.

Click on **[Next]** to continue.



Click on **[Back]** to return to the definition selection window.





Enter the VIN (Vehicle Identification Number) or vehicle number plate. A previously used VIN can also be selected from the list.

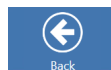
Enter or choose customer and employee. Add comments if needed.

Click on **[Save and start measure]**



The software will proceed to the Cam-aligner main window.

Click on **[Back]** to return to the vehicle selection window.

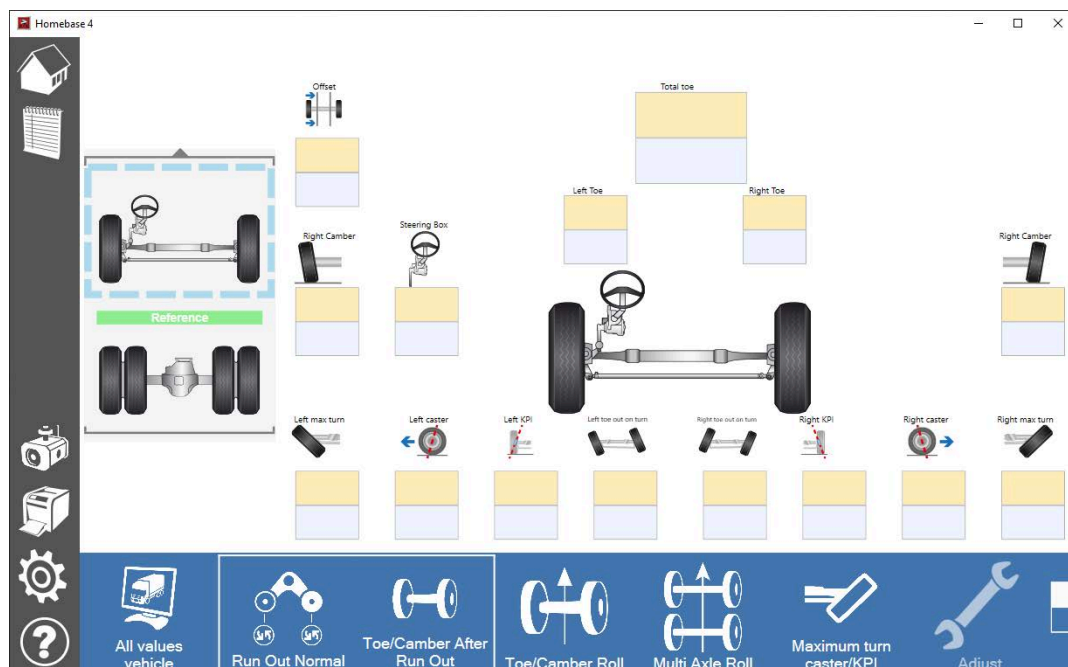


# 10 Measurement

## Cam-aligner main window

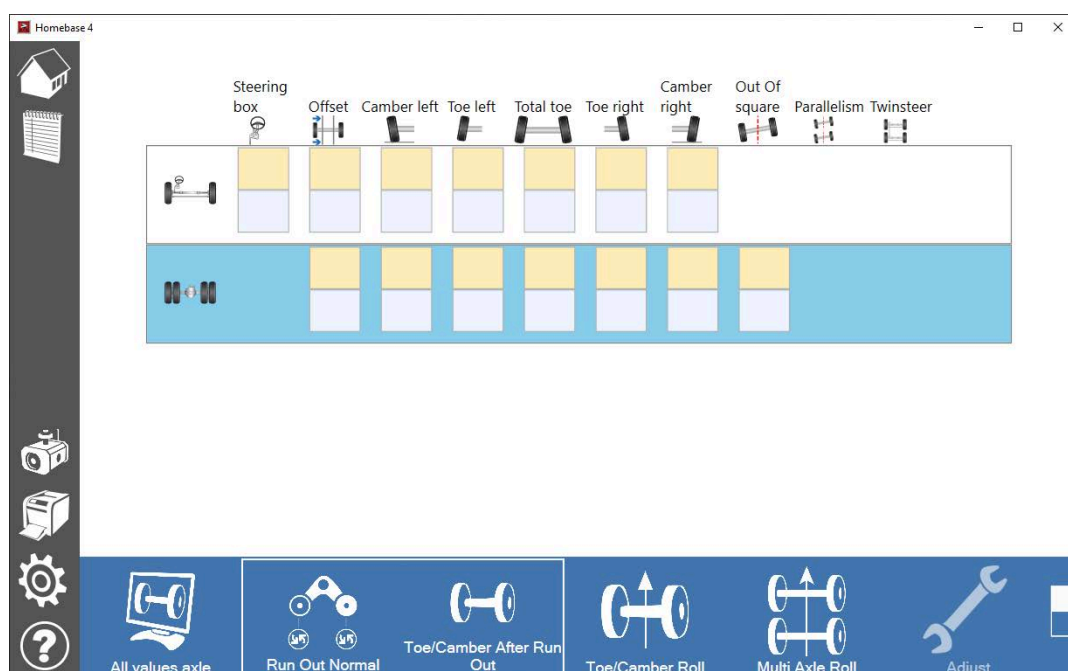
The Cam-aligner main window is the starting point for all operations. It can be displayed as two separate views: *All values axle* and *All values vehicle*.

### All values axle



Shows the measured values for one axle at a time. Select an axle from the list to the left. The selected axle is then indicated with a dashed blue square. When the axle has been measured, the measurement results are displayed to the right.

### All values vehicle



Shows the measured values for all axles. Click an axle to select it. The selected axle is then highlighted in blue.

Menu options available in the Cam-aligner main window:



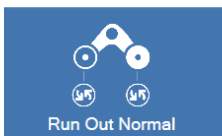
Return to the start window, Home



Switch to view All values axle



Switch to view All values vehicle



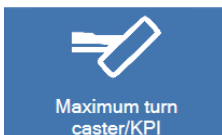
Perform runout



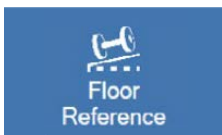
Measure toe and camber after runout



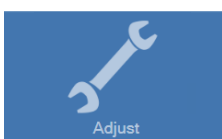
Measure toe and camber by rolling (one axle per roll)



Measure caster, KPI, toe out on turns and maximum turn (visible if steering axle is selected)



Measure floor reference used during measurement of caster, KPI, toe-out-on-turns and maximum turn



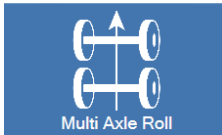
Adjustment of total toe, individual toe, camber, caster and steering box position



Show additional menu options



Align an articulated vehicle before measuring and adjusting



Perform a multi-axle roll measurement



Camera calibration



ADAS calibration



Adjust twin-steer

## 10.1 Runout

To compensate the wheel adapter for skewness in the wheel rims and/or the wheel adapter itself, the software enables you to perform a runout compensation. This function guides the operator to adjust the two knobs on the wheel adapter to compensate for above mentioned skewness. Please note that one of the knobs is marked with a white spot to help identify one knob from the other.



It is strongly recommended to perform runout on steering axles, especially when there are more than one steering axle on the vehicle, i.e. twin steered vehicles.

There are two runout methods in the Cam-aligner system.

**A. Normal (Default)**

This method requires more OK confirmations on the camera and is similar to previous Josam truck-aligner I & II systems.

**B. Classic**

This method requires fewer OK confirmations on the camera and is similar to the Josam laser AM system and previous TruckCam systems. This Run Out method is a simplified version of the Normal Run Out mode, and is not described in detail here. Follow the instructions given in the software.



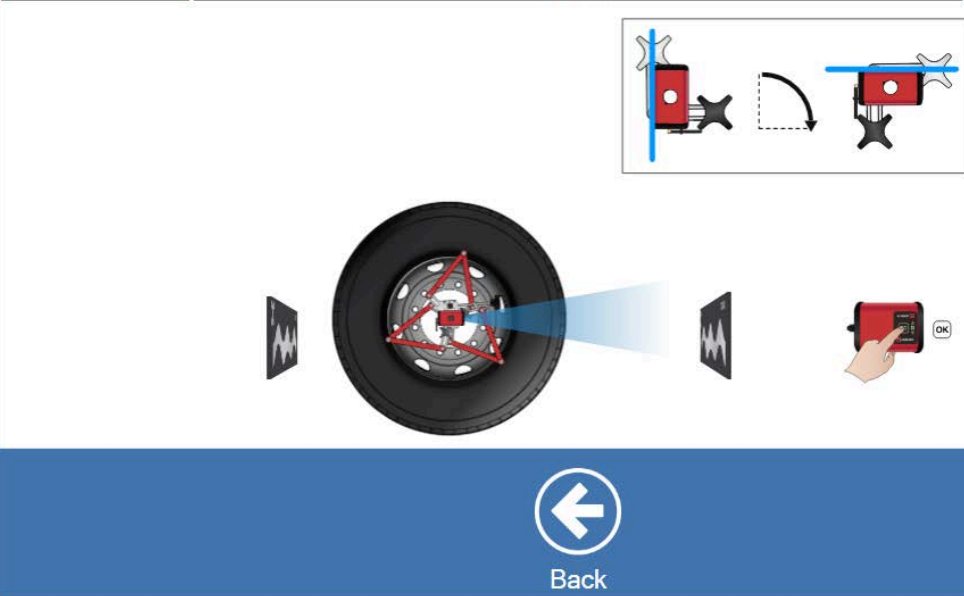
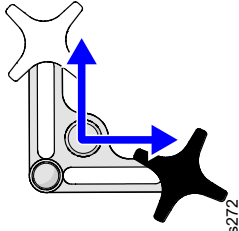
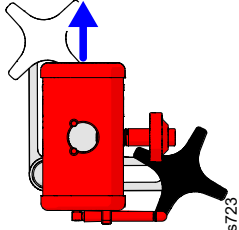
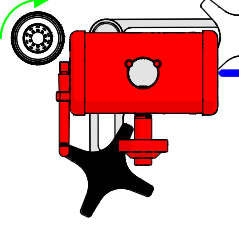

The default method can be changed in the **[Settings]** window

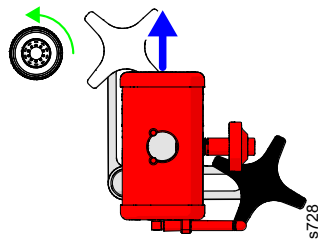
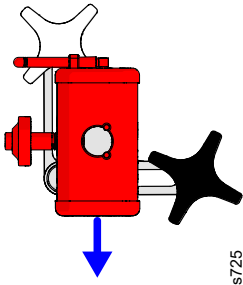
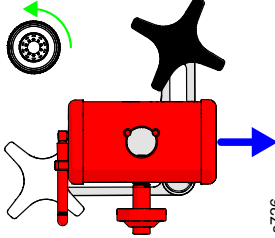





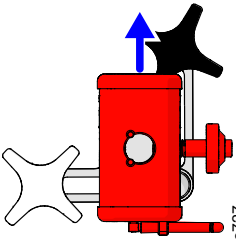
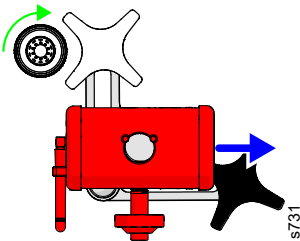

Click on **[Run Out Normal]** or **[Run Out Classic]** in the bottom menu.



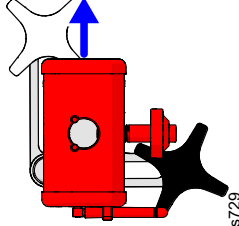
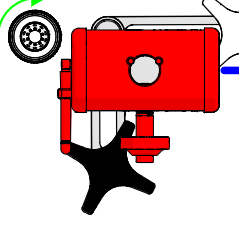

Follow the steps presented by the help texts in the white square on the computer screen.



**Run Out Normal (Default)**

1.	<div data-bbox="268 241 1236 387"> <p>1. Jack axle and mount wheel adapters.  2. Turn the wheel so that white knob is pointing straight up.  3. Mount and lock the camera pointing straight upwards.  4. Rotate the wheel so the camera aims towards the far marker.</p> <p>Press OK</p> </div> <div data-bbox="268 387 1236 981">  </div>	<div data-bbox="1372 387 1417 660"> 1 2 3 4 5 6 7 </div>
2.	<p>Attach the Wheel Adapter and turn the wheel so that the white knob points straight up.</p>	
3.	<p>Mount and lock the camera pointing straight upwards.</p>	
4.	<p>Rotate the wheel so that the camera aims towards the far marker.</p>	
	<p>Press the cameras <b>[OK]</b> button.</p>	


5.	Turn the wheel so that the white knob points straight up.	 <p>s728</p>
6.	Turn the camera so that it points straight down.	 <p>s725</p>
7.	Rotate the wheel so that the camera aims towards the far marker.	 <p>s726</p>
	Press the cameras <b>[OK]</b> button.	

8.	<div data-bbox="264 203 1433 344"> <div>Adjust to zero using the white knob.</div> <div>Confirm by pressing OK.</div> </div> <div data-bbox="264 344 1433 949"> <div>0.0</div> <div>  <div> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> </div> </div> <div> <div>5</div> <div>4</div> <div>3</div> <div>2</div> <div>1</div> <div>0</div> <div>-1</div> <div>-2</div> <div>-3</div> <div>-4</div> <div>-5</div> </div> <div>  <div>Back</div> </div> </div> <div data-bbox="264 999 1134 1028">Adjust to zero rotating the white knob then press the cameras <b>[OK]</b> button.</div>
9.	<div data-bbox="264 1160 1090 1189">Rotate the camera so that it points straight up.</div> <div data-bbox="1090 1039 1433 1308">  <div>s727</div> </div>
10.	<div data-bbox="264 1429 1031 1458">Rotate the wheel so that the camera aims towards the far marker.</div> <div data-bbox="264 1671 639 1700">Press the cameras <b>[OK]</b> button.</div> <div data-bbox="1090 1308 1433 1794">  <div>s731</div>  </div>

11.	<div data-bbox="225 203 1394 954"> <div>Adjust to zero using the black knob.</div> <div>Confirm by pressing OK.</div> <div>0.0</div> <div>  </div> <div> <div>1</div><div>2</div><div>3</div><div>4</div><div>5</div><div>6</div><div>7</div> </div> <div> <div>5</div><div>4</div><div>3</div><div>2</div><div>1</div><div>0</div><div>-1</div><div>-2</div><div>-3</div><div>-4</div><div>-5</div> </div> <div>   Back         </div> </div> <p>Adjust to zero by using the black knob. Press the camera <b>[OK]</b> button.</p>
12.	<div data-bbox="225 1032 1050 1296">Turn the camera so that it points straight up.</div> <div data-bbox="1054 1032 1396 1296">   s729         </div>
13.	<div data-bbox="225 1301 1050 1565">Rotate the wheel so that the camera aims towards the far marker.</div> <div data-bbox="1054 1301 1396 1565">   s730         </div>
	<div data-bbox="225 1570 1050 1787">Press the camera <b>[OK]</b> button.</div> <div data-bbox="1054 1570 1396 1787">   OK         </div>

14.	<div data-bbox="264 197 1422 936"> <div data-bbox="264 197 1422 342"> <p>Run-Out complete!</p> <p>Press OK on the camera to perform runout on the next wheel, or Press "Back" in the top menu to start measuring.</p> </div> <div data-bbox="264 342 1422 786"> <p>-0,2</p>  </div> <div data-bbox="264 786 1422 936">  <p>Back</p> </div> </div> <div data-bbox="1369 342 1417 611"> <p>1 2 3 4 5 6 <b>7</b></p> </div>
-----	--

When the runout is within tolerance you will get a green check mark like in the picture above, showing the deviation between black and white knob. The wheel adapter is now compensated for any skewness in the rim and/or the wheel adapter. The wheel adapter spindle is now, figuratively speaking, an extension of the axle.

<p>When the runout is outside tolerance a red cross will be displayed. Repeat the runout procedure for this wheel.</p>	<p>1.5</p> 
--	--

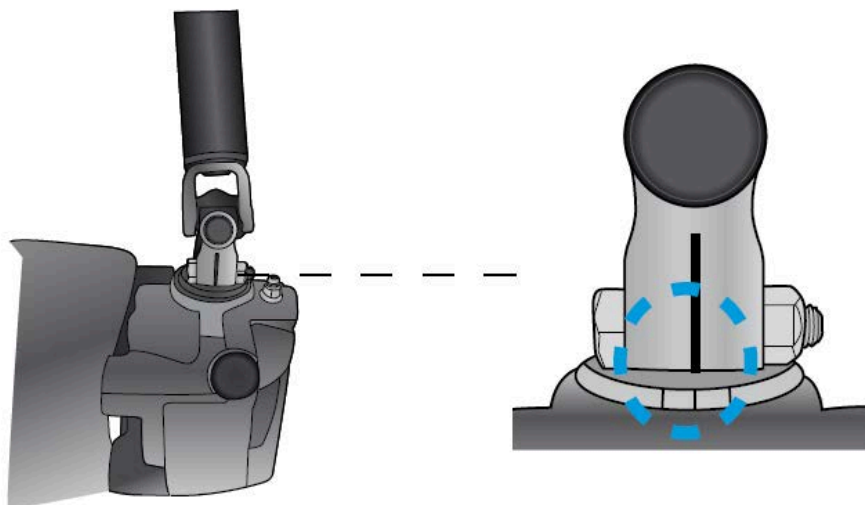
## 10.2 Toe / Camber

Toe and camber can be measured using two methods:

- **After runout:** Lift the vehicle and compensate skewness in the wheel adapter, and the wheel adapter rims.
- **Roll:** Roll the vehicle half a wheel turn forward. When using the rolling method, the software will compensate the rim and wheel adapter skewness. Toe, camber, out of square and parallelism are measured in one procedure on all axles simultaneously. See [10.3 "Toe & Camber – rolling one axle", page 42](#)

### Procedure when measuring toe/camber after runout

Click **[Toe/Camber after runout]**



When measuring a front axle, the software will ask you to put the steering gear in middle position.



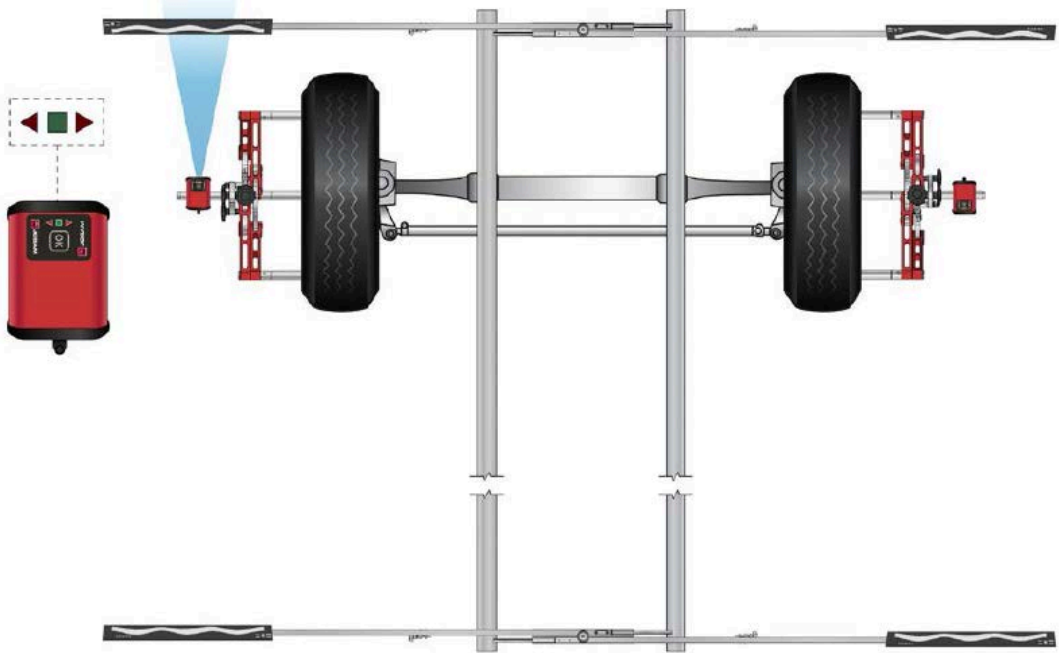
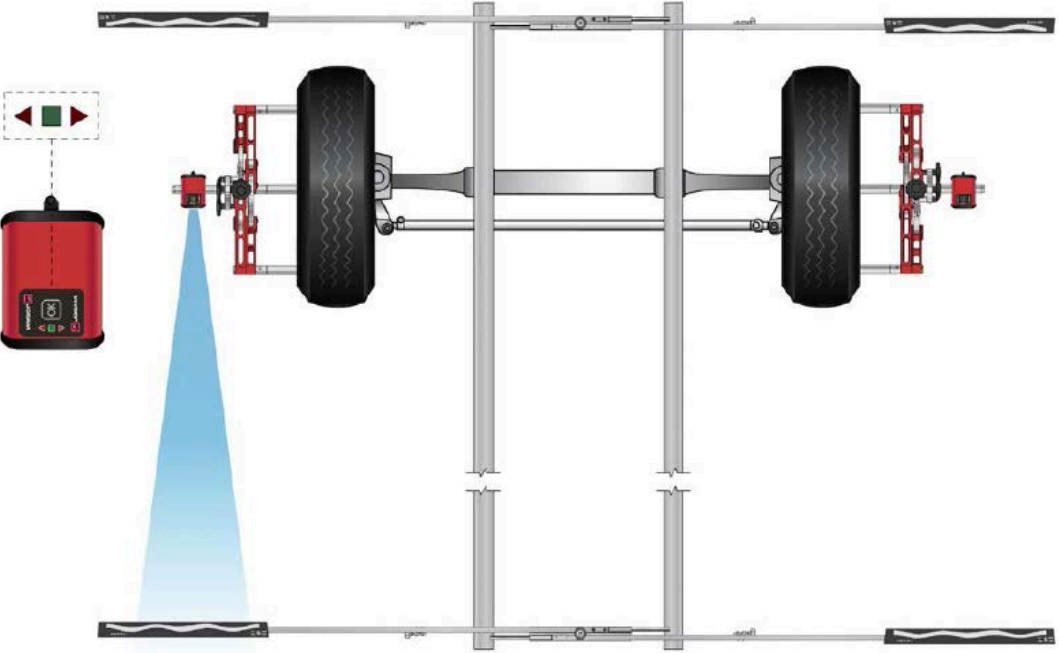
Make sure that the steering axle is lowered onto non-friction plates before starting.

Click the **[Next]** button on the right lower part of the screen to confirm that you have put the steering box mechanically in the middle position.

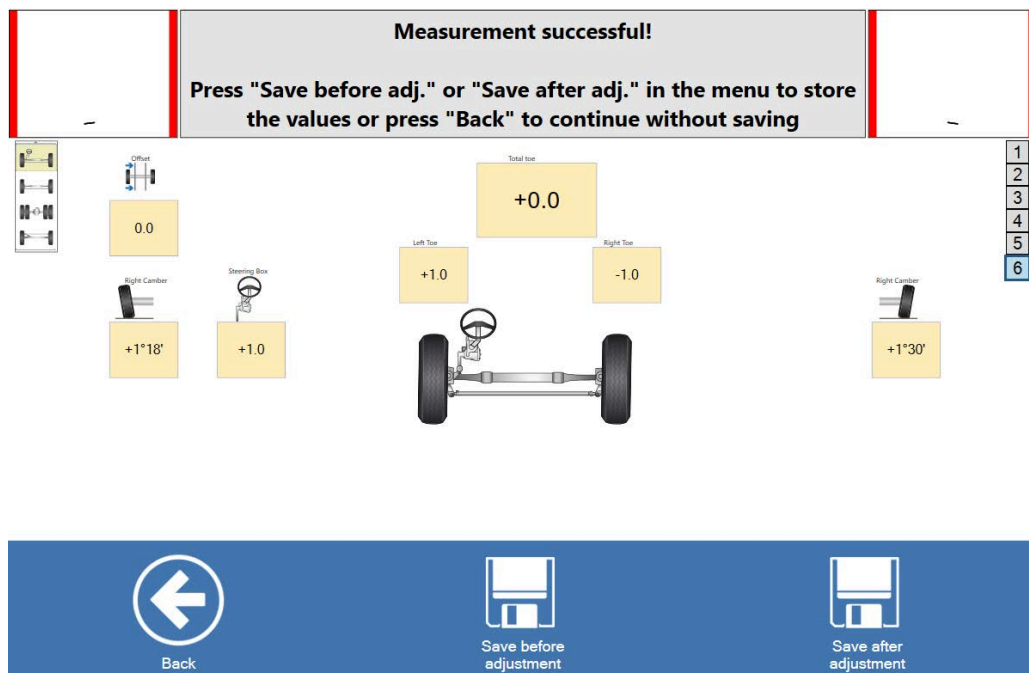


Follow the instructions given by the help text in the square and animations.

This instruction applies to both sides of the vehicle. Start on steering box side:

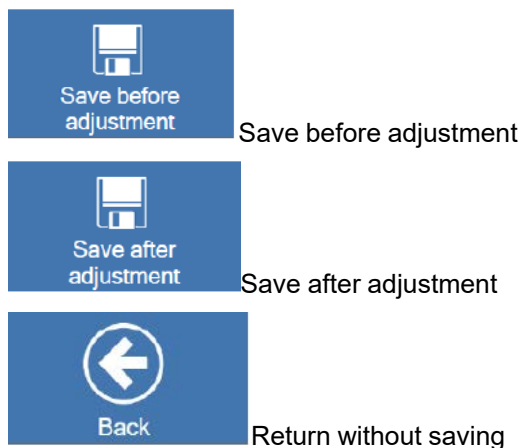
1.	 <p>Aim the camera horizontally at the nearest marker and press the <b>OK</b> button on the camera.</p>
2.	 <p>Aim the same camera horizontally at the far marker. Press the <b>OK</b> button on the camera.</p>
3.	<p>Repeat the same procedure on the opposite side to complete the measurement.</p>

4.



The measured toe and camber values, and in applicable cases the axle offset and steering box middle position, are displayed on the computer screen. You can select to store the values before or after adjustment. When using a specification the software will indicate if the measured values are within (green color) or outside (red color) specification.

5.



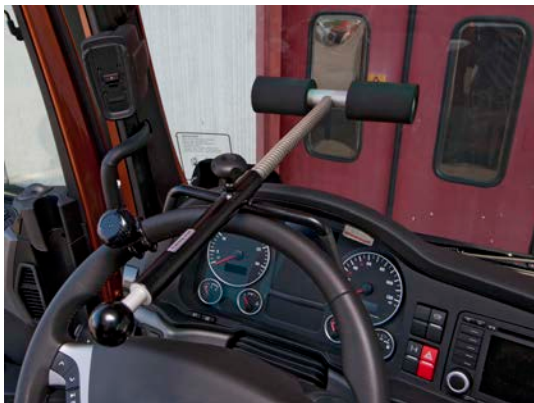
After selecting how to continue, the program will return to the Cam-aligner main window. All measured values will be displayed on the measured axle.

## 10.3 Toe & Camber – rolling one axle

When measuring using the rolling method, the software compensates the skewness of the rims and wheel adapters automatically and measures wheel angles like toe, camber, out of square and parallelism in one single procedure, for one or more axles at the same time.



Before starting measurement, a steering wheel holder should be assembled between the steering wheel and the wind shield or A pillar.






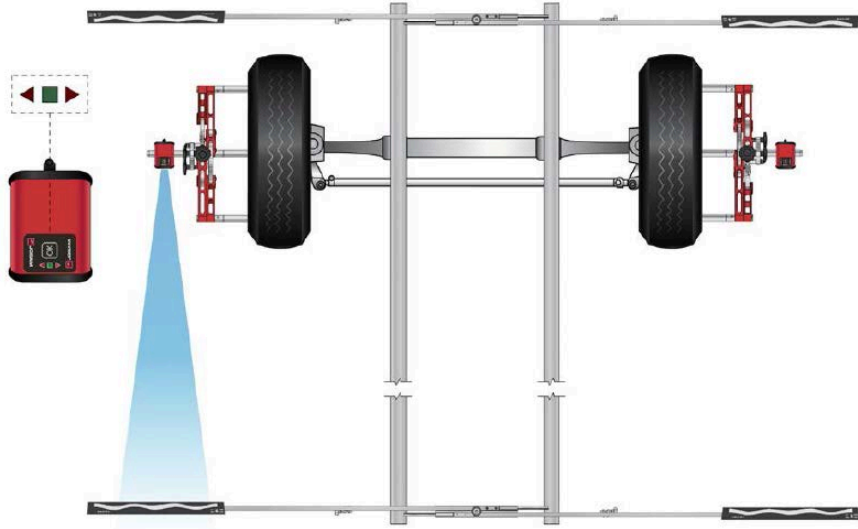
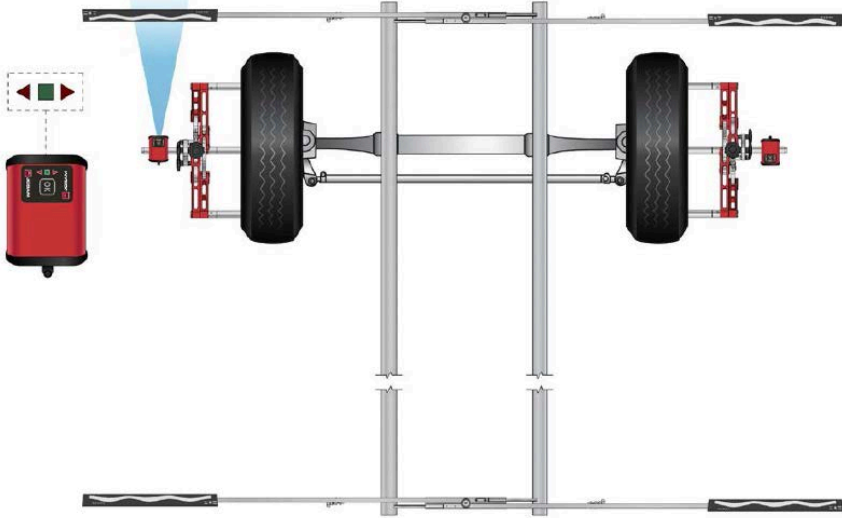
### Caution

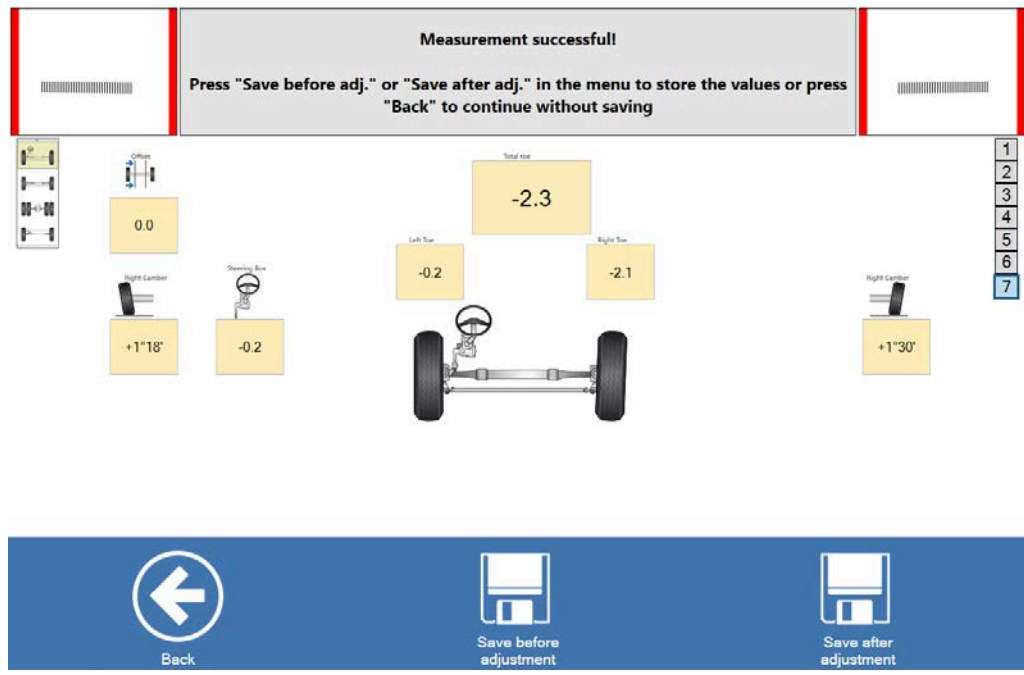
**Hazard:** Be careful when assembling the steering wheel holder against the wind shield.

**Risk:** Damage to the wind shield may occur




**How to avoid:** Be careful when assembling the steering wheel holder against the wind shield.

1.	Click <b>[Toe/camber roll]</b> in the Cam-aligner main window.	
2.	 <p>When measuring a front axle, the software will ask you to put the steering box in middle position.</p>	
3.	Click <b>[Next]</b> on the right lower part of the screen to confirm that you have put the steering box mechanically in the middle position. Follow the instructions given by the help text in the square and animations. On both sides of the vehicle, starting on steering box side:	

4.	 <p>Aim the camera reasonably horizontal at the far marker and press the <b>OK</b> button on the camera.</p>
5.	 <p>Aim the same camera reasonably horizontal at the near marker. Press the <b>OK</b> button on the camera.</p>
6.	<p>Repeat the same procedure on the opposite side.</p>

7.	Slowly roll the vehicle half a wheel turn in the driving direction, until the measured wheel angle values appear on the screen, to complete the measurement
8.	 <p>The measured toe and camber values, and in applicable cases the axle offset and steering box middle position, are displayed on the computer screen. You can select to store the values before or after adjustment. When using a specification the software will indicate if the measured values are within (green color) or outside (red color) specification.</p>

Continue by choosing either:

		Save before adjustment
		Save after adjustment
		Return without saving

After saving, the program will return to the Cam-aligner main window. All measured values will be displayed on the measured axle.

## 10.4 Toe & Camber – multi axle roll



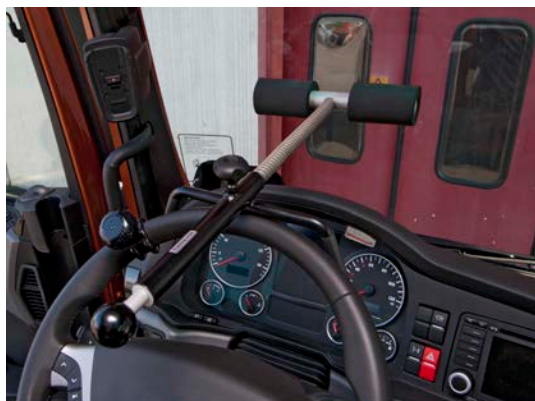
Multi axle roll method is preferably used on multiple driven or rigid axles, or diagnosis. The method requires at least four wheel adapters, all equipped with TC-416 reference blocks. For information on how to mount the reference blocks on the wheel adapters, see [8.3 "Mount wheel adapters", page 26](#).



Check that the cameras and reference blocks are fitted with arrow stickers and reference stickers from the 16776 arrow sticker kit.



Before starting measurement, a steering wheel holder should be assembled between the steering wheel and the wind shield or A pillar.



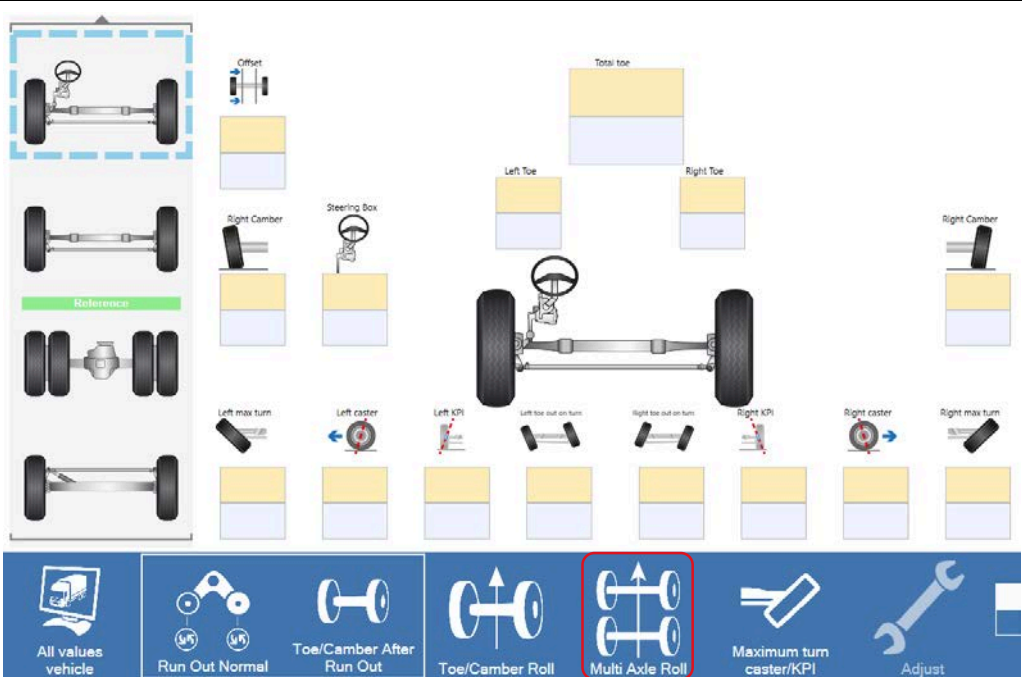
### Caution

**Hazard:** Be careful when assembling the steering wheel holder against the wind shield.


**Risk:** Damage to the wind shield may occur

**How to avoid:** Be careful when assembling the steering wheel holder against the wind shield.

1.



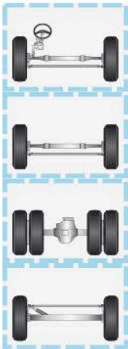
Click **[Multi axle roll]** in the Cam-aligner main window.



2.

**Select the axles you wish to measure.**

**Then press "Continue"**



1

2


3

4


5

6

7



Back



Next

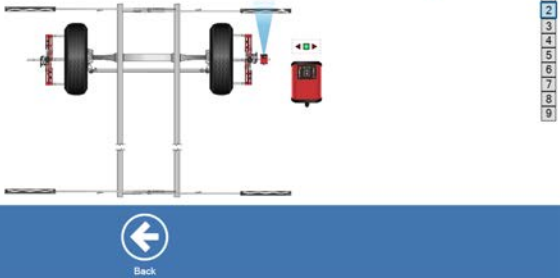
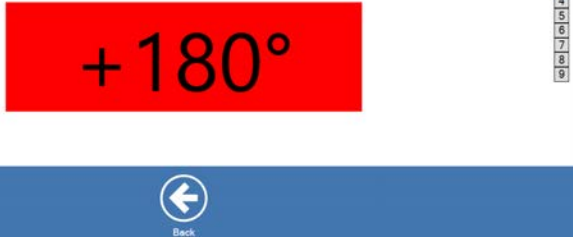
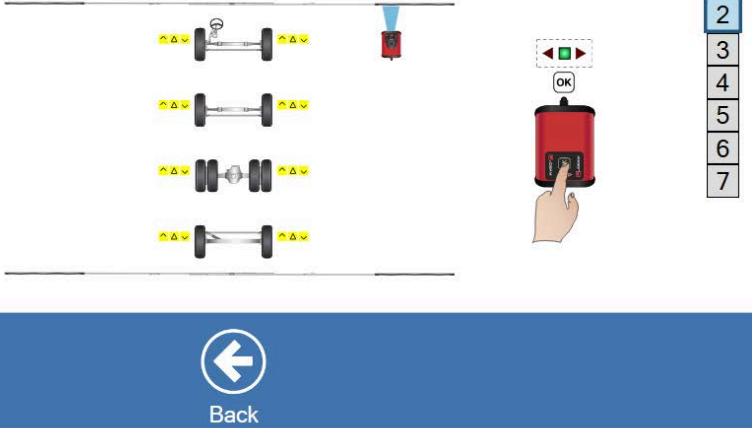
Choose which axles to roll simultaneously by selecting the axles on the screen. We recommend to equip all wheels with wheel adapters and measure the complete vehicle in one roll. If you have selected "measure the steering box middle position" in the setup, you must place the steering box in the middle position before the measurement.

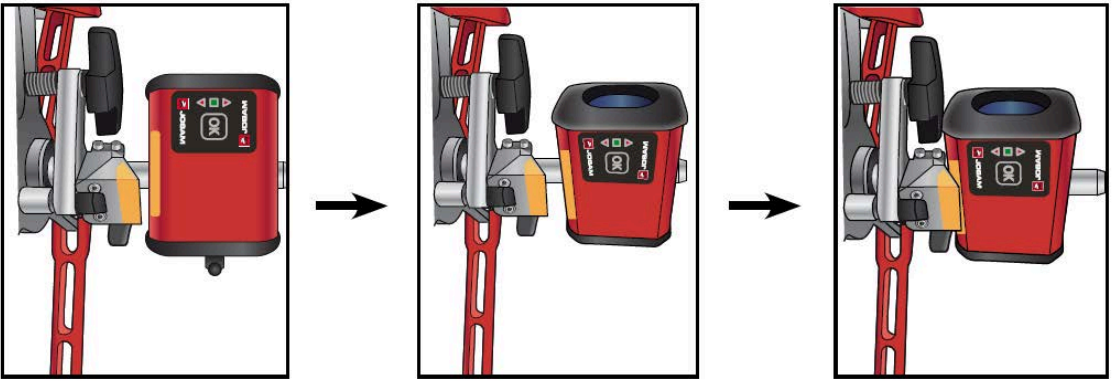
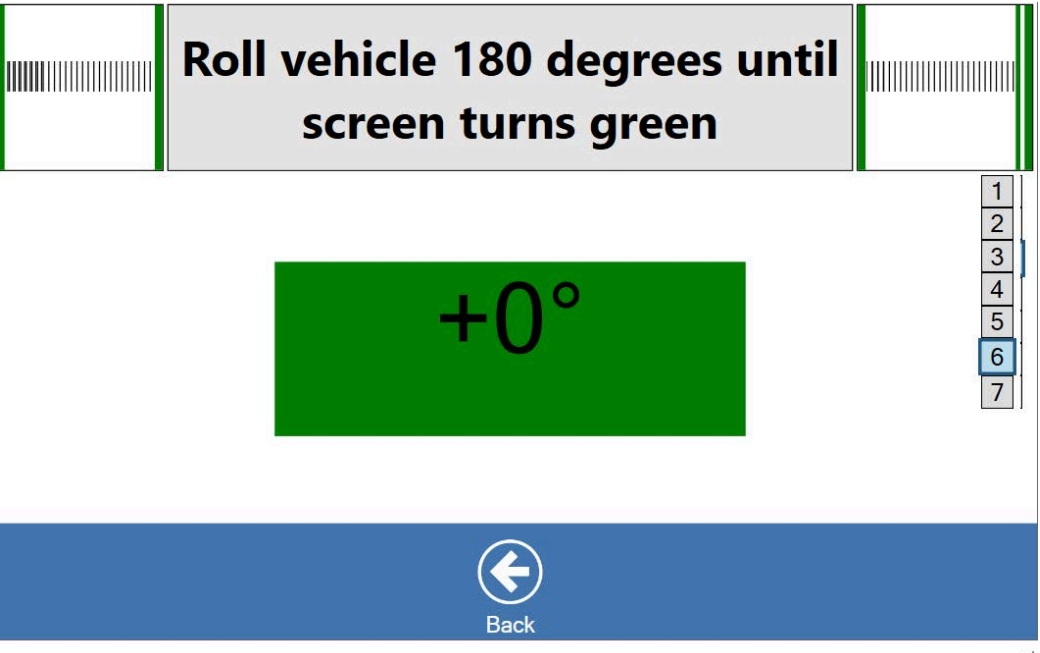

i

Make sure the steering box position is in the correct middle position mechanically.

3.

If "Use rollback procedure" is selected in Workflow page, see [7.3 Workflow, page 21](#), a rollback procedure will be added to the measurement. The following steps will be performed:

4.	<div data-bbox="236 203 1069 600"> <p>1. Park the steering axle of the vehicle on the turn plates 2. Mount a camera on the right front wheel. 3. Aim the camera at the front marker. 4. Press OK</p>  </div> <p>Aim the camera at the right front marker. Press <b>OK</b></p>
5.	<div data-bbox="236 676 1018 1070"> <p>Roll the Vehicle backwards 180 degrees until the screen turns green.</p>  </div> <p>Roll the vehicle backwards 180 degrees until the screen turns green.</p>
6.	<div data-bbox="236 1211 1279 1848"> <p>Follow the instructions below, on each wheel: 1. Mount cameras with arrow point to the vehicle. 2. Aim the camera to the front marker, Press OK. 3. Aim the camera to the rear marker, Press OK. 4. Place the camera with the reference surface to the reference block, Press OK.</p>  </div> <p>Start the measurement on the opposite side of the steering box position on the first axle with the following steps:</p>
7.	Aim the camera at the front marker, click <b>OK</b> .
8.	Aim the camera at the rear marker, click <b>OK</b> .

9.	 <p>Place the camera so that the reference surface of the camera meets the surface of the reference block.</p>
10.	 <p>Perform the procedure on all wheels on one side with the first camera. Then perform the procedure using the second camera on the other side, ending up at the front wheel on the steering box side. Leave the camera in the last position since it is the reference for rolling 180°.</p>
11.	<p>Slowly roll the vehicle half a wheel turn in the driving direction, until the background of the roll value displays green.</p>
12.	<p>Then repeat the measuring procedure in the opposite direction, starting at the steering box position on the first axle with the following 3 steps:</p> <div data-bbox="271 1646 359 1736">  </div> <div data-bbox="383 1646 1428 1736" style="background-color: #f0f0f0; padding: 5px;"> <p>Move the camera back into the slot before performing a measurement.</p> </div>
13.	<p>Aim the camera at the front marker, click <b>OK</b>.</p>
14.	<p>Aim the camera at the rear marker, click <b>OK</b>.</p>

15.

**Follow the instructions below, on each wheel:**

**1. Mount cameras with arrow point to the vehicle.**

**2. Aim the camera to the front marker, Press OK.**

**3. Aim the camera to the rear marker, Press OK.**

**4. Place the camera with the reference surface to the reference block, Press OK.**

	Offset	Left camber	Left toe	Total toe	Right toe	Right camber	Out of square	Parallelism	Twist Stair
	0	0°	+0.0	+0.0	+0.0	0°			
	0	0°	+0.0	+0.0	+0.0	0°			+0.0
	0	0°	+0.0	+0.0	+0.0	0°	+0.0	+0.0	
	0	0°	+0.0	+0.0	+0.0	0°	+0.0	+0.0	+0.0

Back

Save before  
adjustment

Save after  
adjustment

1

2

3

4

5

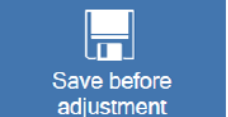


6

7

Place the camera so that the reference surface hits the surface of the reference block. Click **OK**.

16.

The measured values are displayed on the computer screen. You can select to store the values before or after adjustment. When using a specification the software will indicate if the measured values are within (green color) or outside (red color) specification.

Continue by choosing either:		
		Save before adjustment
		Save after adjustment
		Return without saving

After selecting, the program will return to the Cam-aligner main window. All measured values will be displayed on the measured axle.

## 10.5 Floor reference

### Using the inclinometer unit in combination with caster / KPI measurement


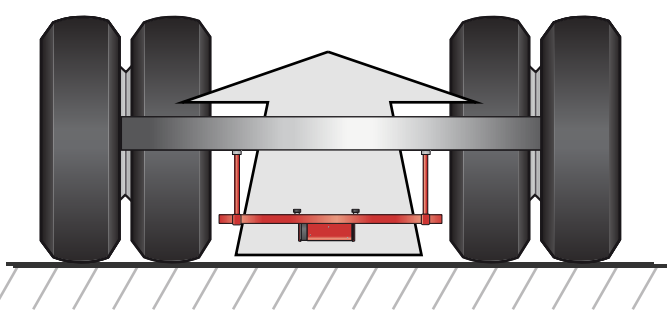

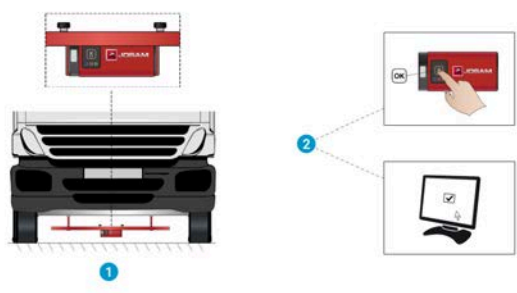




Make sure the inclinometer is calibrated to the inclinometer bar, see 20.2 Calibrate the inclinometer page 157

By using the inclinometer unit, the need for compensation at the rear can be eliminated.

The inclinometer will monitor the angle changes of the axle beam and compensate the measurement accordingly.

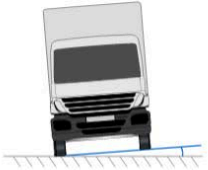
Before lifting or rolling onto turntables it is necessary to take a reference measurement.

1.	In the bottom menu, click <b>[Floor reference]</b>	
2.	<div data-bbox="279 862 949 1176">  </div> <p>Mount or hang the inclinometer on the axle you want to measure using the hanger adapters.</p> <div data-bbox="271 1232 359 1321">  </div> <p>The LEDs and OK button on the inclinometer unit should always face forward in the driving direction!</p>	
3.	<div data-bbox="462 1344 1236 1467"> <p>1. Mount inclinometer on the axle with the vehicle on the floor and with the LED facing forward  2. Press "Take value" or OK on the inclinometer  3. Press Back</p> </div> <div data-bbox="534 1489 1053 1780">  </div> <div data-bbox="271 1792 1428 1915">  </div> <p>Click <b>[Take Value]</b> or press the OK button on the inclinometer unit. The software saves the angle of the axle in the driving position.</p>	<div data-bbox="1257 1937 1372 2016">  </div>

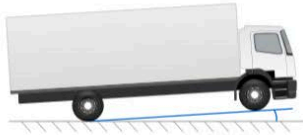
4.

**Floor reference saved!**


**Press Back**



**-0.45**




**-2.07**



Back

When the floor reference value is saved, click **[Back]** to return to the Cam-aligner main window.



Back

## 10.6 Caster / KPI / Maximum Turn, toe out on turns (TOOT)

Caster and KPI can be measured in two ways, either in lifted position or with the vehicle placed on turntables. Regardless of the method used, the rear height of the vehicle should be compensated, either by being lifted to the same height or by compensating for the height of the turntables. This in order to have realistic values of caster and KPI in ride height.



To achieve the best result in lifted position, make sure that the axle is leveled.

### Using turntables and height compensation plates

When using turntables with low-friction plates, the height of the rear axle is to be compensated with compensation plates.



### Using inclinometer

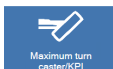
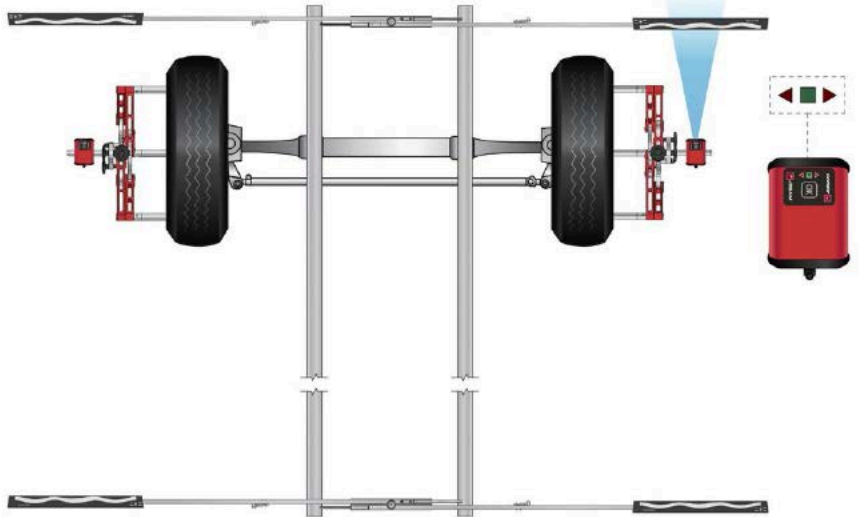
By using the inclinometer unit with a floor reference measurement ([10.5 "Floor reference", page 50](#)), the need for compensation at the rear can be eliminated, as the inclinometer measures the angle change from ride height to lifted position or position on turntables.

When using the inclinometer, the inclinometer is monitoring the angle changes of the axle beam and compensates the measurement accordingly.

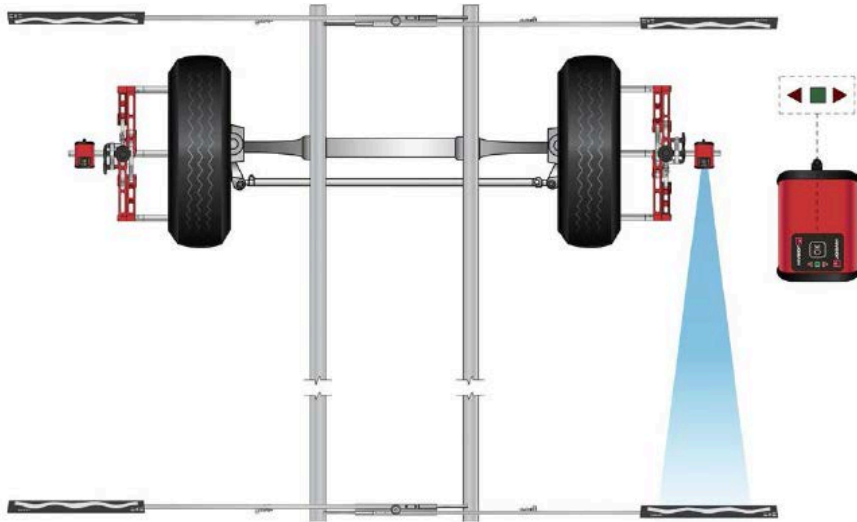


To have correct measurement results, please perform a floor reference measurement followed by a run-out compensation of wheel adapters before proceeding with this measurement. See [10.5 Floor reference page 50](#) and [10.1 Runout page 33](#).

### Measuring

1.	Click <b>[Maximum turn / caster / KPI]</b> in the Cam-aligner main window. On both sides of the vehicle, starting on opposite side of the steering gear:	
2.	 <p>Aim the camera reasonably horizontal at the front marker and press the <b>OK</b> button on the camera.</p>	

3.



Aim the camera reasonably horizontal at the rear marker and press the **OK** button on the camera.

4.

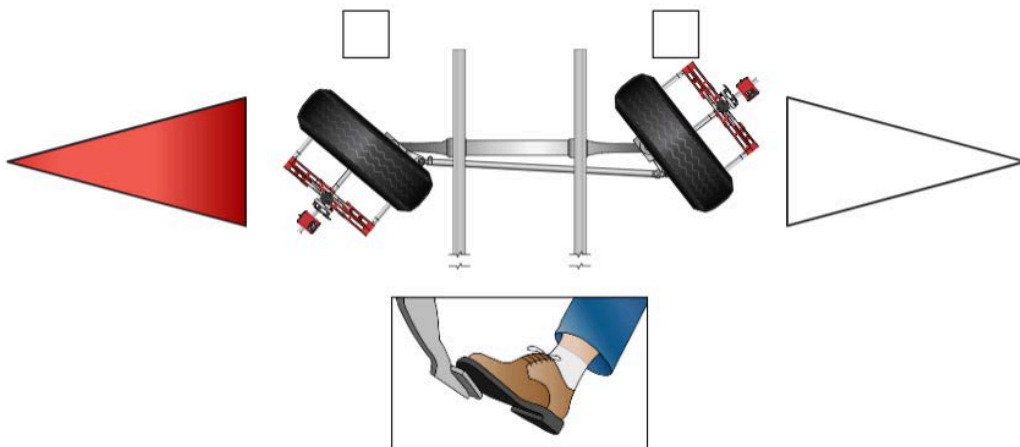
Repeat the same procedure on the opposite side to complete the measurement.

5.

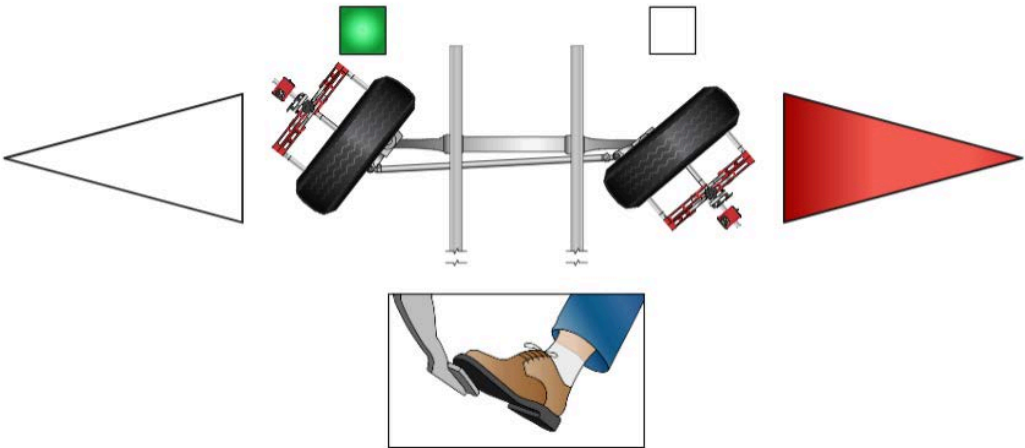
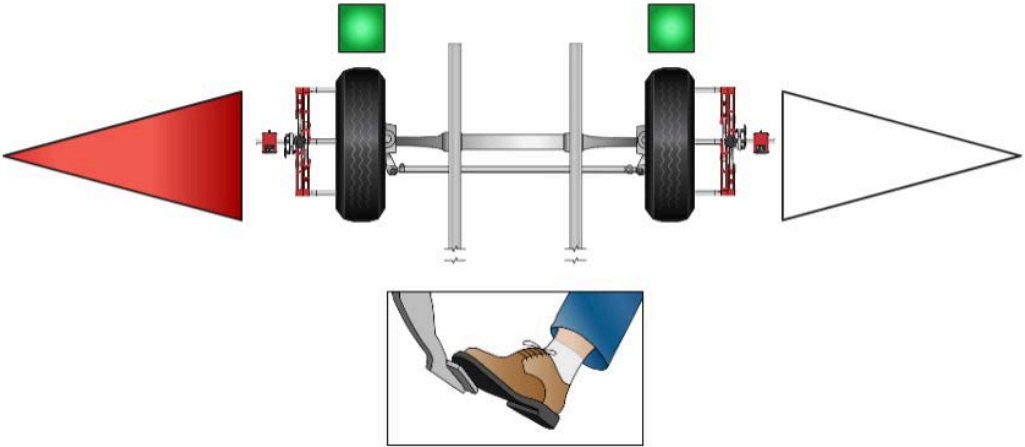


Enter the driver's seat and brake the wheels.

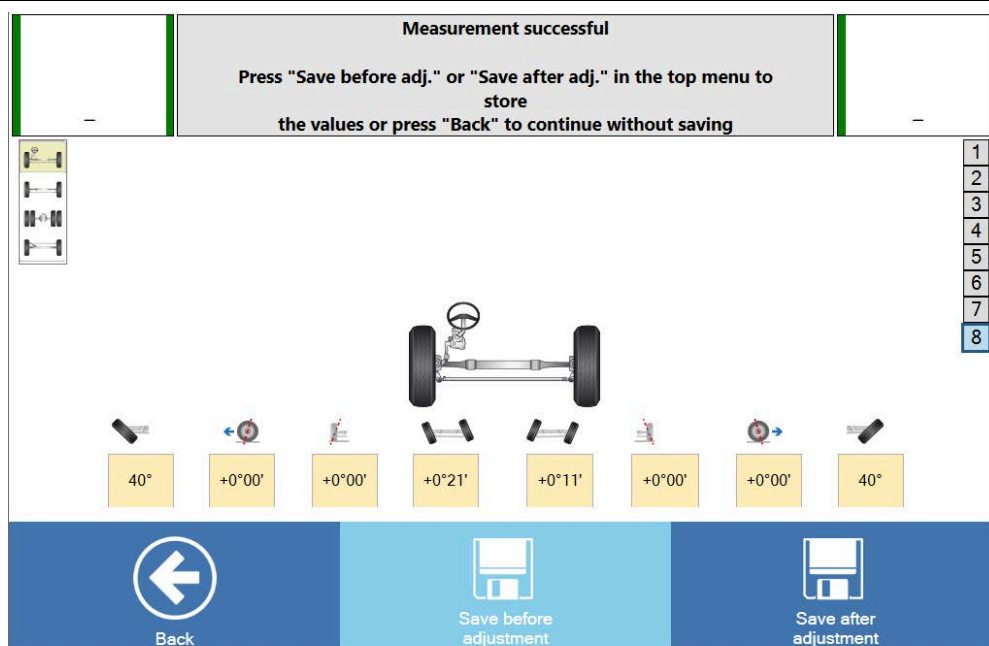
6.



Turn smoothly to maximum left and wait until green light appears in the black square above the wheel on the computer screen.

7.	 <p>Turn smoothly to maximum right and wait until green light appears in the black square above the wheel on the computer screen.</p>
8.	 <p>Turn back to straight ahead position until values are shown on the computer screen.</p>




9.



The measured values are displayed on the computer screen.

You can select to store the values before or after adjustment. When using a specification the software will indicate if the measured values are within (green color) or outside (red color) specification.

Continue by choosing either:

	Save before adjustment
	Save after adjustment
	Return without saving

After saving, the program will return to the Cam-aligner main window. All measured values will be displayed on the measured axle.

# 11 Align vehicle


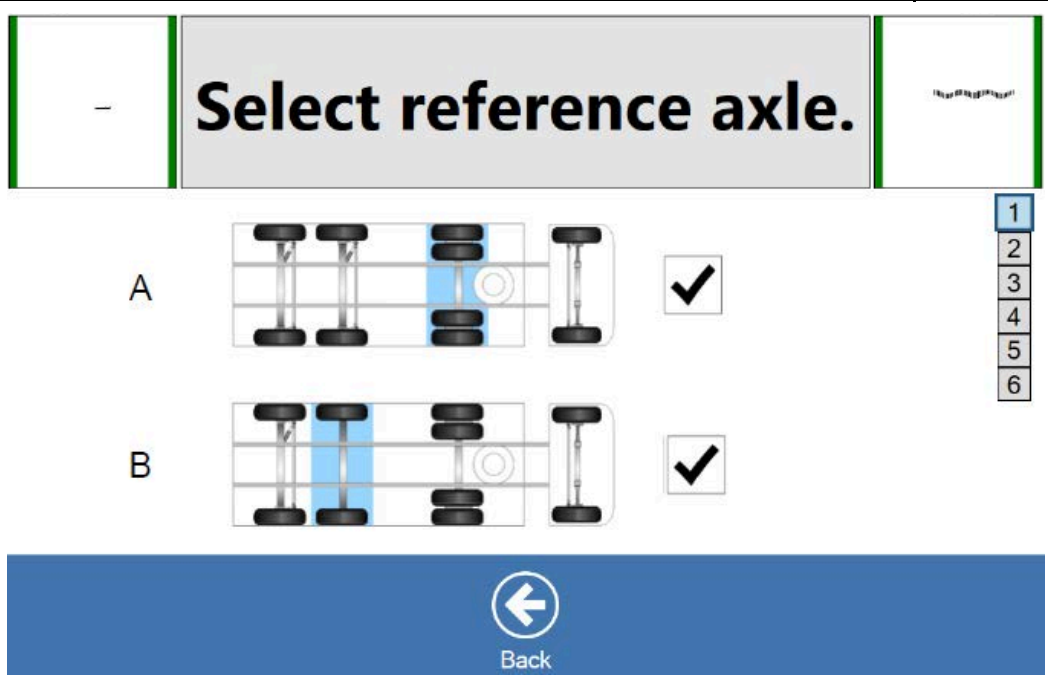
Align vehicle is a help function for the alignment of the two sections of an articulated vehicle. This procedure is used before continuing with regular measurements and adjustments.



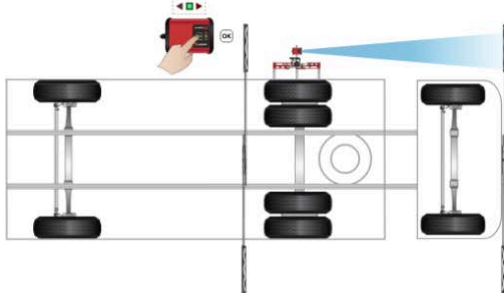
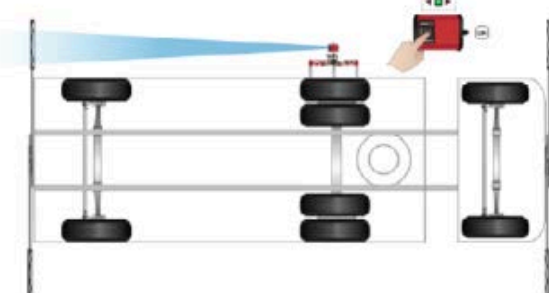
Vehicles used in the "align vehicle" function should have at least one steerable axle at the rear, ie, behind the articulation point. This axle must be steered from the front of the vehicle.

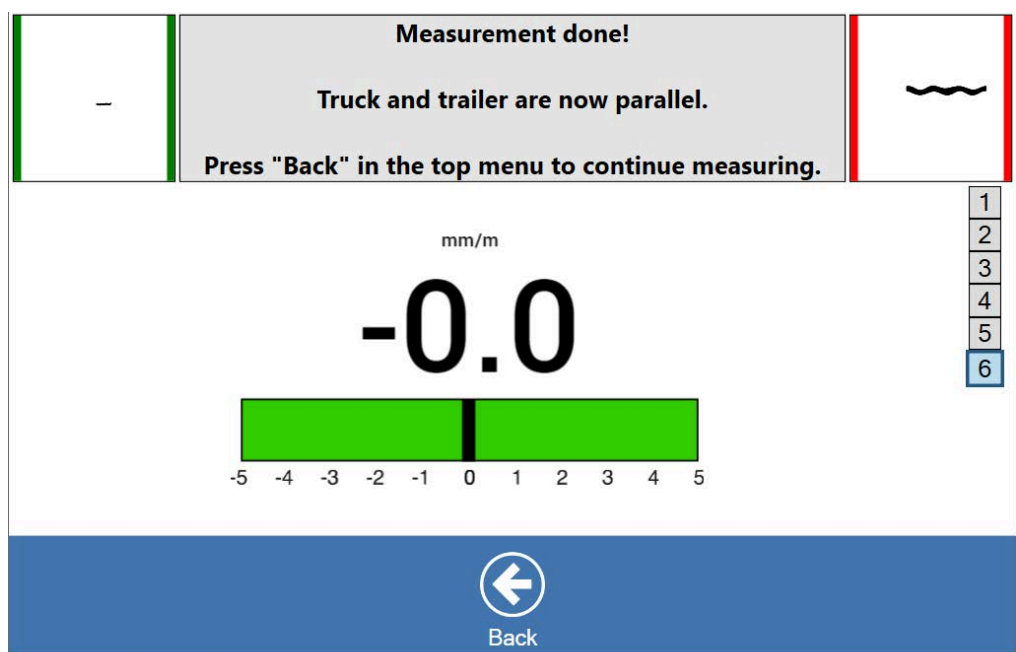
## For example:

- A tractor/trailer combination where the semi-trailer has one or more steerable axle(s) connected to the fifth wheel (sometimes referred to as a city trailer).
- Regular tractor-trailer combination.
- Articulated buses with only stiff axles at the rear, should always be measured as two separate vehicles - a tractor unit and a trailer unit.

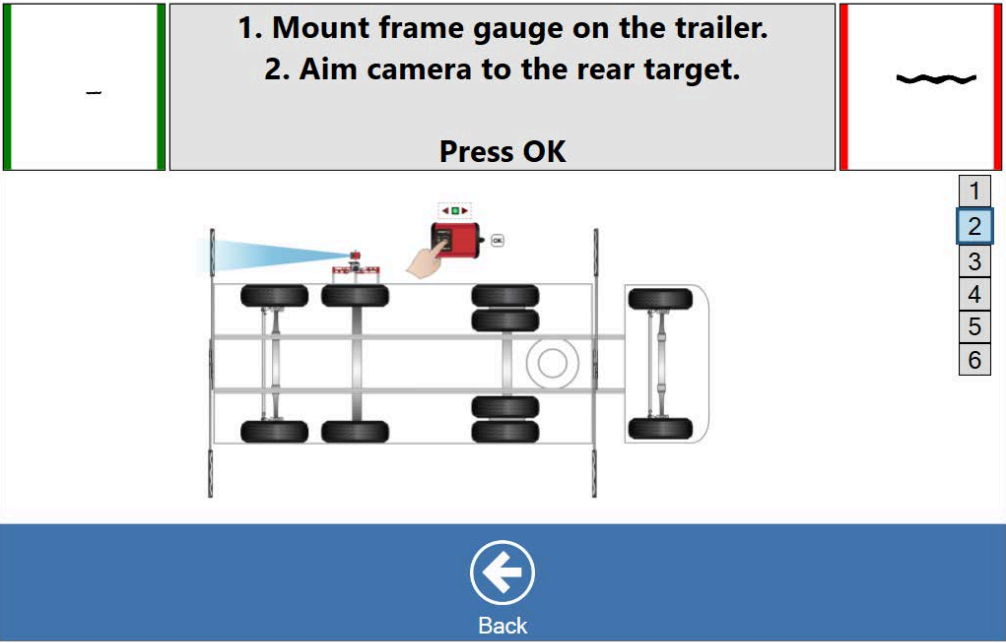
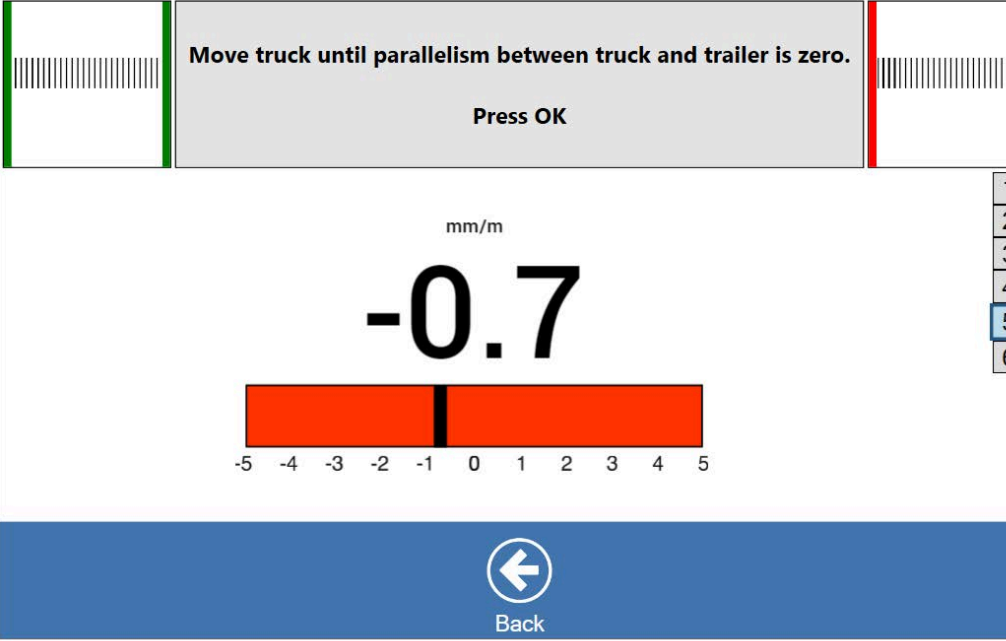
1.	In the Cam-aligner main window, click on <b>[Align articulated vehicle]</b>	
2.	<div data-bbox="263 795 1316 1467">  </div> <p>Start by selecting a reference axle:</p> <ul style="list-style-type: none"> <li>• Drive axle of the tractor unit (A), then continue to <a href="#">11.1 "Using the driven axle of the tractor as the reference", page 57</a></li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>• Rigid axle on a trailer (B), then continue to <a href="#">11.2 "Using the rigid axle on the trailer as the reference", page 59</a></li> </ul>	

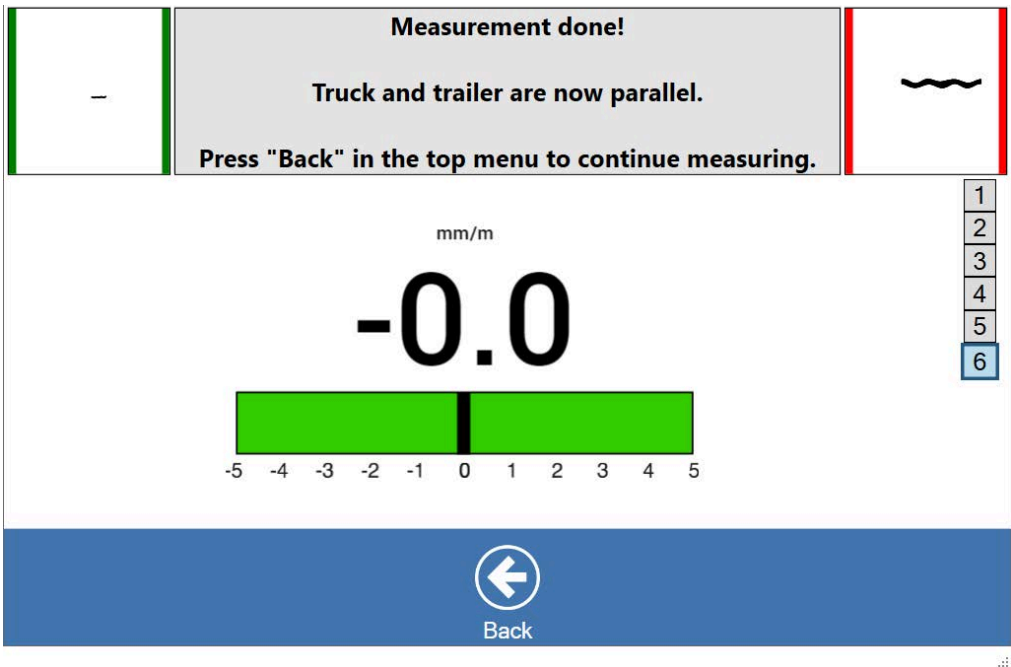

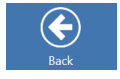
## 11.1 Using the driven axle of the tractor as the reference

1.	<div data-bbox="236 322 1278 963"> <div> <div>1. Mount frame gauge on the tractor unit. 2. Aim camera to the front target.</div> <div>Press OK</div>  <div> <div>←</div> <div>Back</div> </div> </div> <div> <p>Mount the frame gauges on the tractor unit, and place a wheel adapter with camera on the main drive axle of the tractor unit. Perform a "run-out compensation" of the wheel adapter, see chapter <a href="#">10.1 "Runout"., page 33</a></p> <p>Follow the instructions displayed by the help text and animations.</p> </div> </div>
2.	<p>Aim the camera horizontally at the front marker and press the <b>OK</b> button on the camera.</p>
3.	<div data-bbox="236 1211 1278 1874"> <div> <div>1. Move the rear frame gauge to the end of the trailer. 2. Aim camera to the rear target.</div> <div>Press OK</div>  <div> <div>←</div> <div>Back</div> </div> </div> <div> <p>Aim the camera horizontally at the rear marker and press the <b>OK</b> button on the camera.</p> </div> </div>
4.	<p>Move the rear frame gauge to the end of the trailer, as shown in above illustration.</p>

5.	 <p>Make sure the camera is still aiming at the rear marker, then press the <b>OK</b> button on the camera.</p>
6.	<p>While making sure the camera continues to aim at the rear marker at all times, roll the tractor unit forward until the parallelism bar graph on the computer screen shows zero.</p>
7.	 <p>Press the <b>OK</b> button on the camera.</p> <p>Alignment of vehicle parts is complete, and tractor unit and trailer unit are now parallel.</p>
8.	<p>Click <b>[Back]</b> to return to the Cam-aligner main window.</p> <div data-bbox="263 1825 1181 1926">  <p>After alignment of vehicle, perform a runout on all wheels before measuring toe and camber.</p> </div> <div data-bbox="1252 1780 1380 1870">  </div>

## 11.2 Using the rigid axle on the trailer as the reference

1.	<div data-bbox="236 280 1246 920">  </div> <p>Mount the frame gauges on the trailer unit, and place a wheel adapter with camera on the first rigid axle on the tractor unit. Perform a run-out compensation of the wheel adapter, see <a href="#">10.1 "Runout", page 33</a>.</p>
2.	Aim the camera straight at the rear marker and press the <b>OK</b> button on the camera.
3.	Aim the camera straight at the front marker and press the <b>OK</b> button on the camera.
4.	Move the front frame gauge to the front of the tractor unit as shown in above illustration.
5.	Make sure the camera is still aiming at the front marker, then press the <b>OK</b> button on the camera.
6.	<div data-bbox="236 1290 1246 1928">  </div> <p>While making sure the camera continues to aim at the front marker at all times, roll the tractor unit forward until the parallelism bar graph on the computer screen displays zero.</p>

7.	<div data-bbox="268 197 1284 862">  </div> <p>Press the <b>OK</b> button on the camera.</p> <p>Alignment of vehicle parts is complete, and tractor unit and trailer unit are now parallel.</p>
8.	<div data-bbox="268 963 1189 1108"> <p>Click <b>[Back]</b> to return to the Cam-aligner main window.</p> <div data-bbox="268 1008 359 1108">  </div> <div data-bbox="375 1008 1189 1108"> <p>After alignment of vehicle, perform a runout on all wheels before measuring toe and camber.</p> </div> </div> <div data-bbox="1260 963 1380 1041">  </div>

## 12 Adjustment

When diagnostic measurements show that an adjustment is needed, you can use the Adjust function in the software to adjust any of the parameters below:

- individual and total toe, see [12.1 "Adjust toe, camber, out of square", page 61](#)
- camber, see [12.1 "Adjust toe, camber, out of square", page 61](#)
- out of square, see [12.1 "Adjust toe, camber, out of square", page 61](#)
- parallelism, see [12.2 "Adjust parallelism", page 65](#)
- caster, see [12.3 "Adjust caster \(steering axles\)", page 66](#)
- maximum turn, see [12.4 "Adjust max turn", page 68](#)
- double steered vehicles, see [12.5 "Adjust twinsteer", page 70](#)

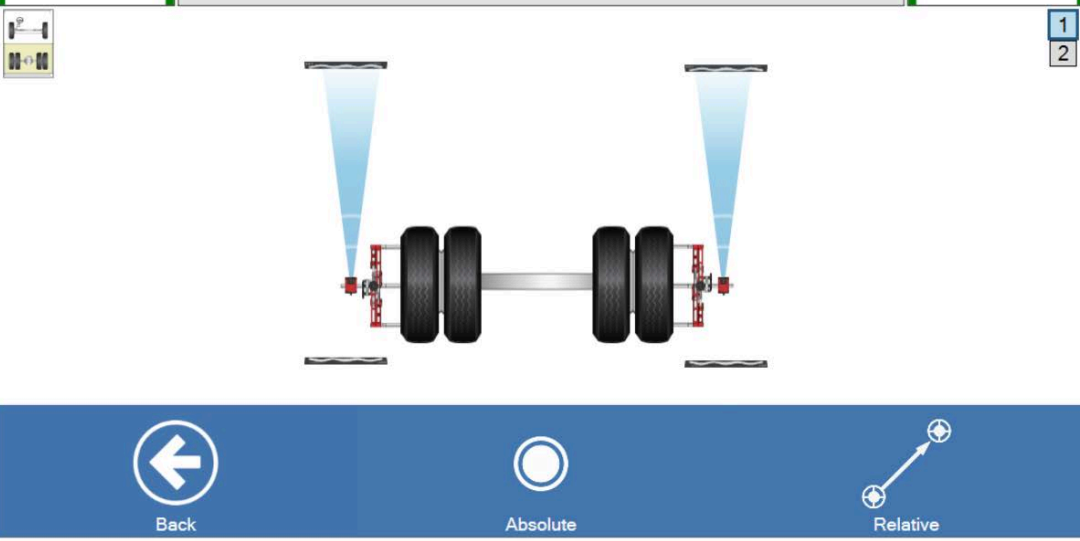







### 12.1 Adjust toe, camber, out of square

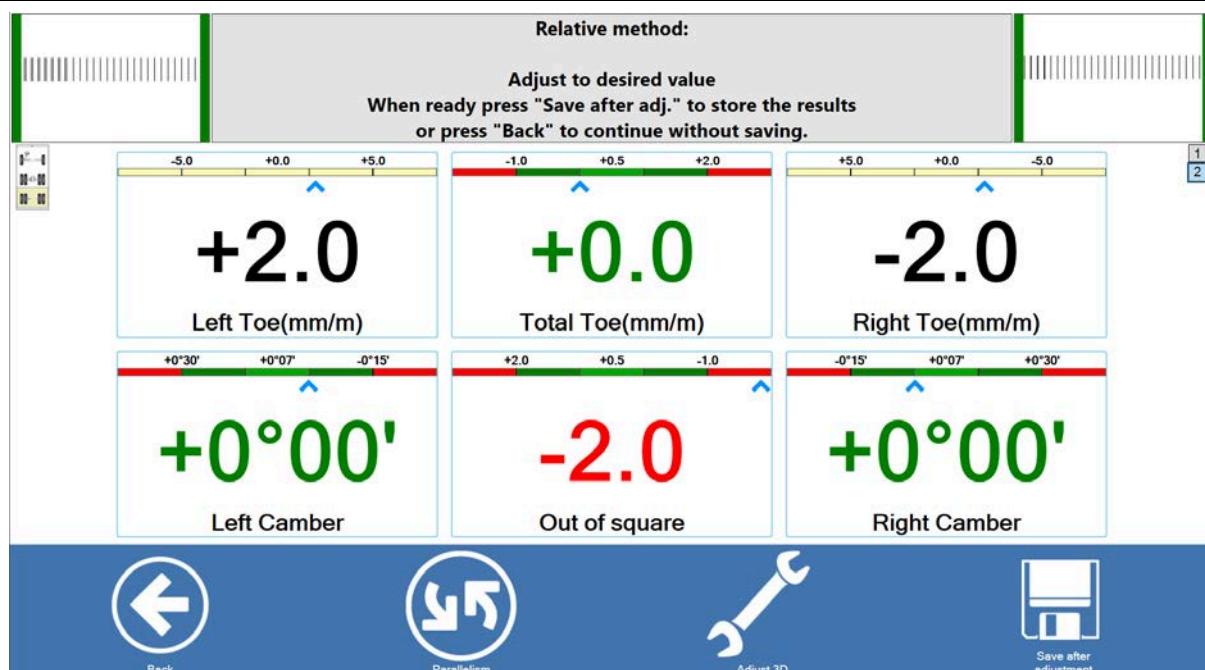


The toe and camber adjust window will not be accessible until a toe/camber measurement has been performed.



To enter toe and camber adjustment, press **[Adjust]** in the Cam-aligner main window.

1.	<div data-bbox="268 197 1372 862"> <div> <div>1. Aim cameras at the far markers.</div> <div>2. Press "Relative" or "Absolute" measuring method in the top menu to start adjusting.</div> </div>  </div> <p>Aim cameras at the far markers.</p>				
2.	<table border="1"> <tr> <td data-bbox="256 916 866 1010">Choose <b>[Relative]</b></td><td data-bbox="866 916 1436 1010">  </td></tr> <tr> <td data-bbox="256 1010 866 1104">or <b>[Absolute]</b> measuring method.</td><td data-bbox="866 1010 1436 1104">  </td></tr> </table> <div data-bbox="268 1131 1428 1590"> <div>  <div> <p><b>Absolute method:</b></p> <ul style="list-style-type: none"> <li>• Will always show the real values.</li> <li>• The user must "manually" compensate for changes due to jacking etc.</li> <li>• This method is only available when a <b>toe/camber after runout</b> measurement has been performed.</li> </ul> <p><b>Relative method:</b></p> <ul style="list-style-type: none"> <li>• Will always start with the latest measured values, independent of jacking etc.</li> <li>• Makes it possible to directly adjust to the desired value.</li> <li>• The vehicle should not be jacked or moved after you have initiated relative adjustment.</li> <li>• This method will always be available.</li> </ul> </div> </div> </div>	Choose <b>[Relative]</b>		or <b>[Absolute]</b> measuring method.	
Choose <b>[Relative]</b>					
or <b>[Absolute]</b> measuring method.					



All values are continuously measured and presented on the screen.

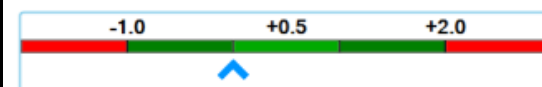
Green numbers mean the measured value is within the limits in the vehicle definition.

Red numbers mean that the measured value is outside the limits in the vehicle definition.

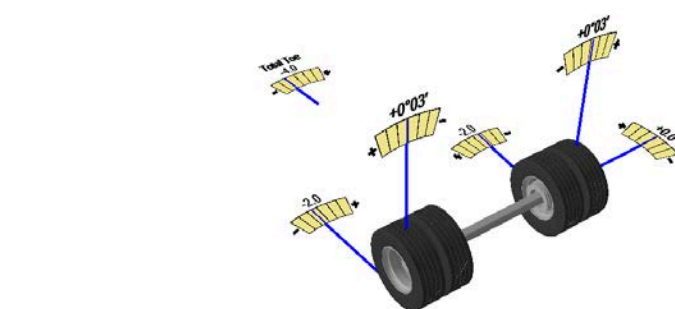
Black numbers mean there are no limits to compare against.

If no colors are visible it means that no limits have been added in the vehicle definition

The indicator bar shows the measured value relative to the limits.



3.



If more than two rigid axles are measured, a parallelism view can be selected.



Clicking **[Adjust 3D]** will show a 3D-representation of the axle with live values.



4.


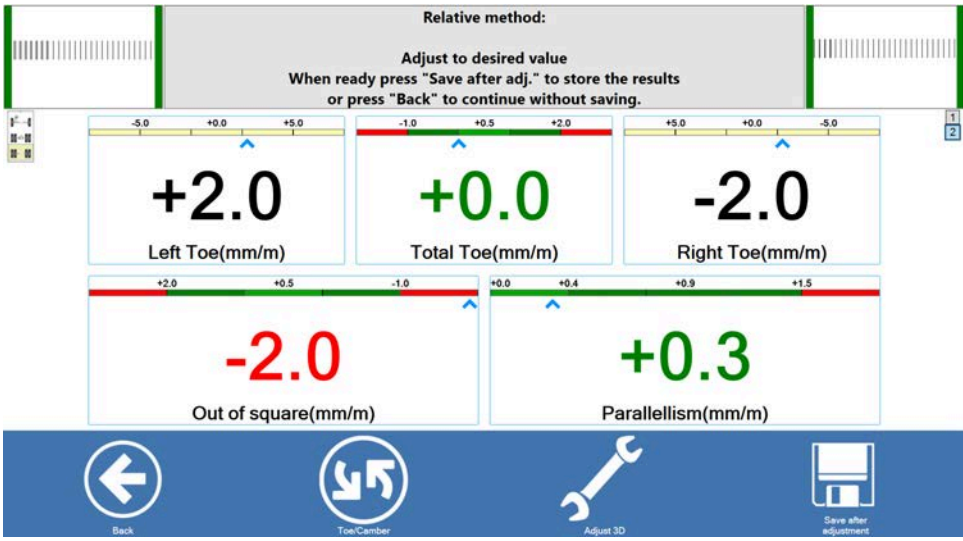


Adjust to the desired values.



5.	Click <b>[Back]</b> to exit without saving.	
	Click <b>[Save after adjustment]</b> to store the measurement results.	

The program will then return to the Cam-aligner main window. All measured values will be displayed on the measured axle.


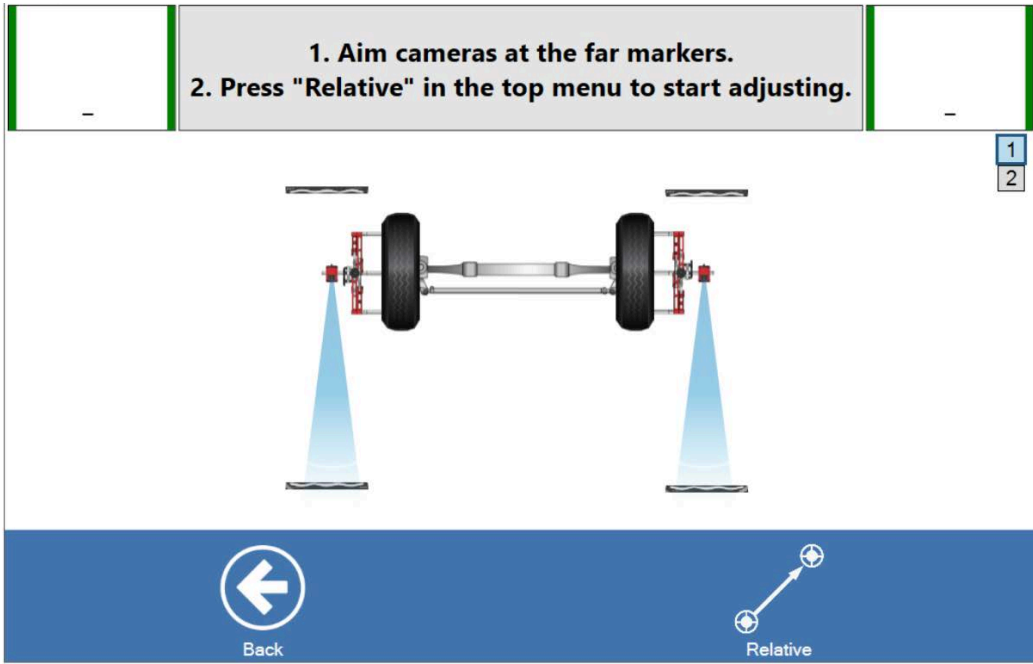



## 12.2 Adjust parallelism

1.	See <a href="#">12.1 "Adjust toe, camber, out of square", page 61</a> Follow the steps for Adjust toe, camber, out of square, then click <b>[Parallelism]</b>	
2.	 <p>Adjust to the desired values.</p>	
3.	Click <b>[Back]</b> to exit.	
4.	Click <b>[Save after adjustment]</b> to store the measurement results.	

## 12.3 Adjust caster (steering axles)



The Caster adjust window will not be accessible until a Toe/Camber and Maximum turn/ caster/ KPI measurement has been performed.

1.	To enter caster adjustment, press <b>[Caster]</b> in the main Cam-aligner window.	
2.	<div><div><div>1. Aim cameras at the far markers. 2. Press "Relative" in the top menu to start adjusting.</div></div><div></div></div> <div>Aim cameras at the far markers.</div>	<div><div>1</div><div>2</div></div> 
3.	<div><div></div><div>Brake the wheels.</div></div>	


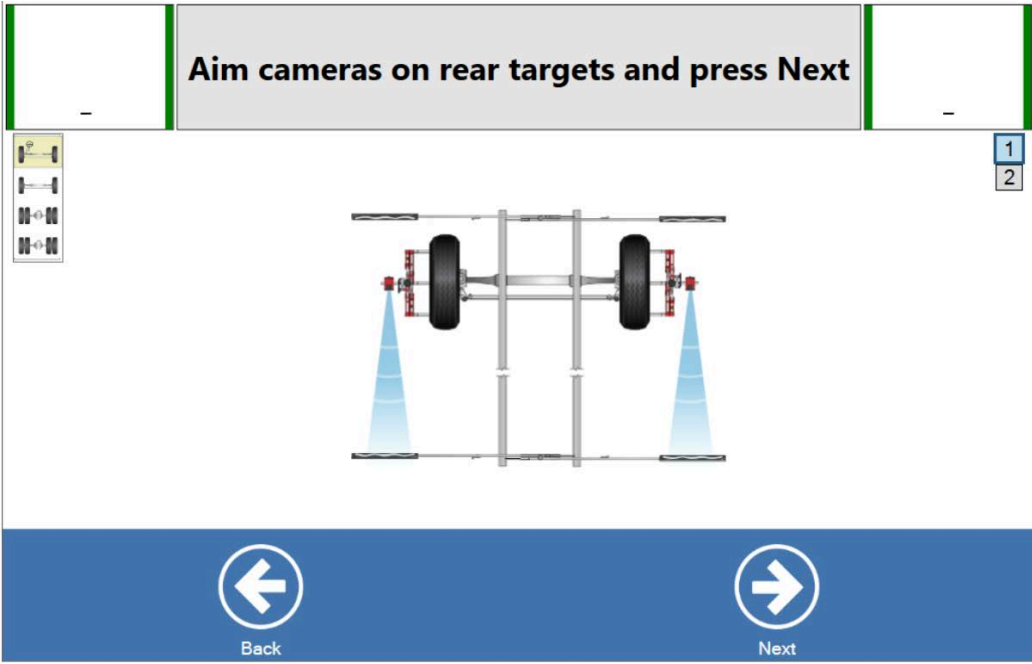

4.	<div><div>Relative method:</div><div>Adjust to desired value When ready press "Save after adj." to store the results or press "Back" to continue without saving.</div><div><div><div>+0°00'</div><div>Left caster</div><div><div><div>-5</div><div>0</div><div>5</div></div></div></div><div><div>+0°00'</div><div>Right caster</div><div><div><div>5</div><div>0</div><div>-5</div></div></div></div><div><div>+1°48'</div><div>Left Camber</div></div><div><div>+2°00'</div><div>Right Camber</div></div><div><div><div><div>←</div></div>Back</div><div><div><div>Save after adjustment</div></div></div></div></div><div>All values are continuously measured and presented on the screen.</div></div>	
5.	Adjust to the desired values.	
6.	Either click <b>[Back]</b> to exit without saving.	<div><div>←</div><div>Back</div></div>
	Or, click <b>[Save after adjustment]</b> to store the measurement results and exit.	<div><div>Save after adjustment</div></div>

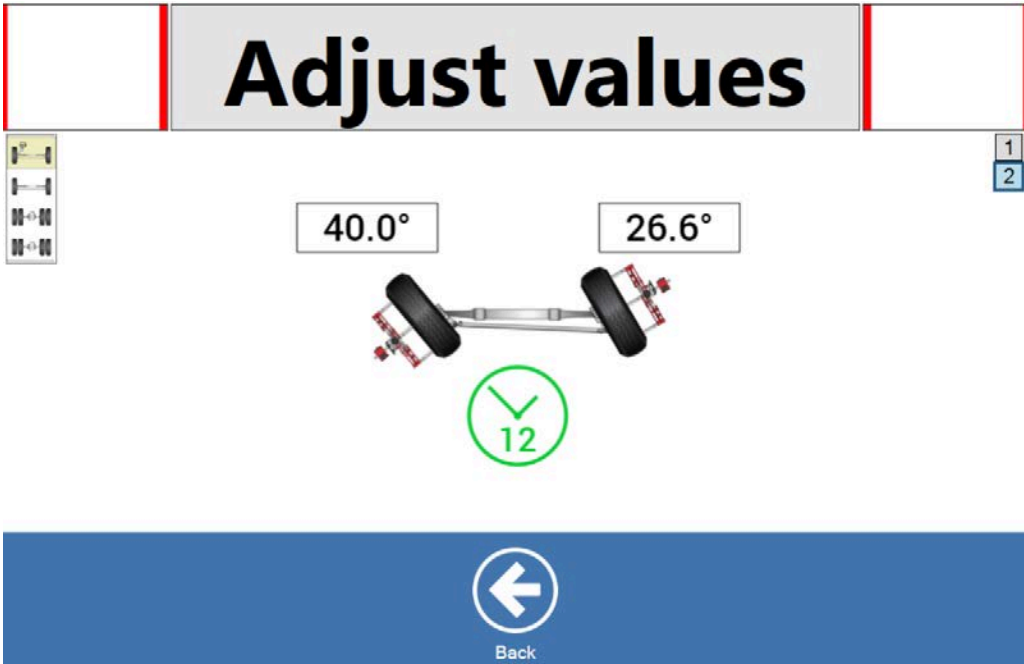

The program will then return to the Cam-aligner main window. All measured values will be displayed on the measured axle.

## 12.4 Adjust max turn



The Adjust Max Turn window will not be accessible until a Maximum turn/caster/KPI measurement has been performed.

1.	To enter max turn adjustment, press <b>[Adjust Max Turn]</b> in the main Cam-aligner window.	
2.	<div data-bbox="271 481 1308 1142">  </div> <p>Aim cameras at the rear markers.</p>	
3.	Press <b>[Next]</b>	

4.	<div data-bbox="231 201 1260 862">  </div> <p>The screen will display live values during adjustment for a time frame of 15 seconds, after which you will have to return to <math>\pm 10^\circ</math> of the straight ahead position to update angle calibration data. After returning to <math>\pm 10^\circ</math> of the straight ahead position, and the markers are in view of the cameras, you can turn the wheels again to continue adjustments.</p> <p>When 5 seconds remain, the clock will turn yellow. After that the 15 second time frame is up, displayed by the 'time out' indicator turning red, and the live values disappear from the screen.</p>
5.	<p>When the adjustments are complete, click <b>[Back]</b> to switch back to the main Cam-aligner window.</p> <div data-bbox="1141 1086 1260 1160">   Back         </div>



Since no measurement values are stored, Max Turn has to be measured again after adjustment. See 10.6 Caster / KPI / Maximum Turn, toe out on turns (TOOT) page 52

## 12.5 Adjust twinsteer



The twinsteer adjustment window will not be accessible until a Toe/Camber measurement has been performed on the primary steering axle and the twinsteer axle.



Measure and adjust toe on both axles and steering gear before adjusting twinsteer.

There are two methods of twinsteer alignment:

### Relative

After toe/camber roll, see [10.3 "Toe & Camber – rolling one axle", page 42](#)

### Absolute

After runout. This is the recommended method. See [10.2 "Procedure when measuring toe/camber after runout", page 39](#).



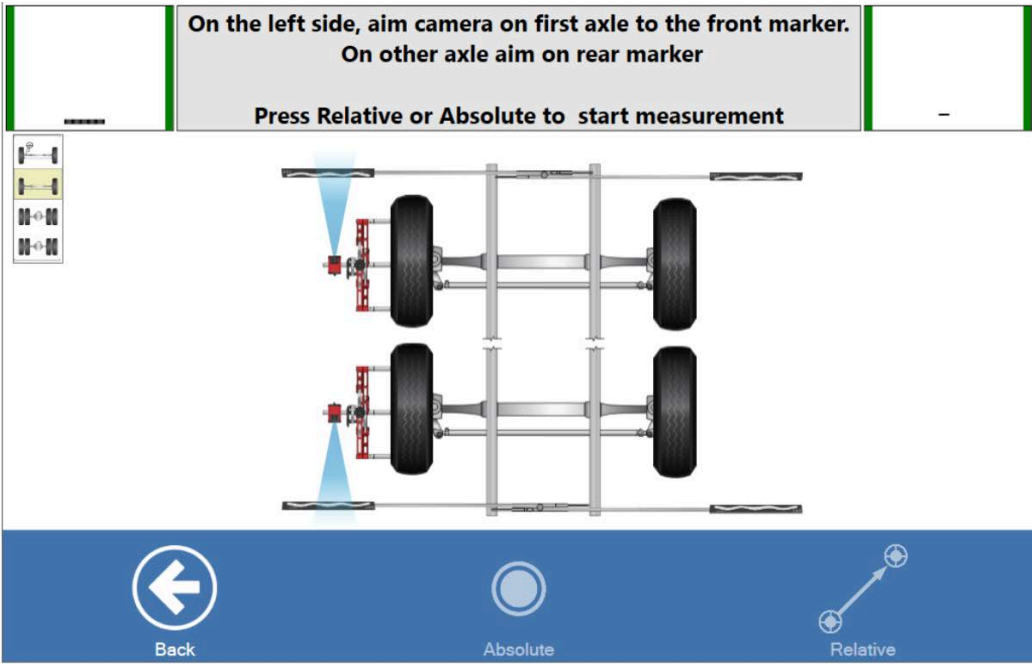






It is recommended to jack up both axles and use Absolute adjustment method when adjusting twinsteer.

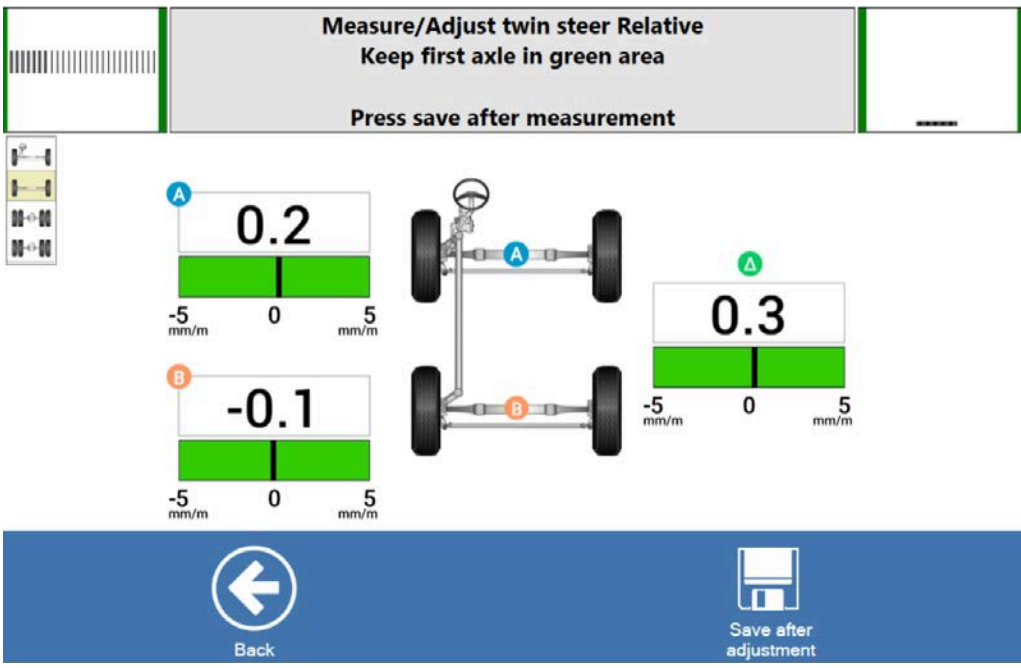



The software will adapt according to the chosen method.

To enter twinsteer adjustment, you need to select a non-primary steering axle in the Cam-aligner main window. If the primary steering axle is selected, the Adjust twinsteer icon will not be visible.



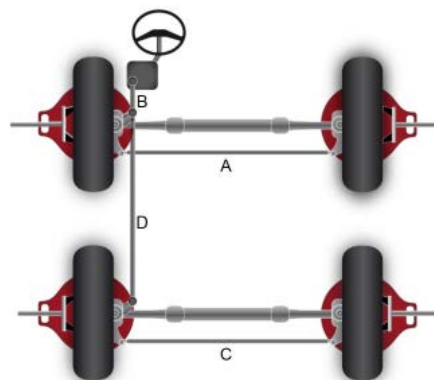
Then press **[Adjust Twinsteer]**

1.	<div data-bbox="271 1075 1308 1736">  <p>On the left side, aim camera on first axle to the front marker. On other axle aim on rear marker</p> <p>Press Relative or Absolute to start measurement</p> <p>Back Absolute Relative</p> </div> <p>Aim the camera on the steering side of the front axle at the front marker. Aim the camera on the steering side of the rear axle at the rear marker.</p>				
2.	<table border="1"> <tr> <td data-bbox="256 1834 1173 1926">Press <b>[Relative]</b></td><td data-bbox="1173 1834 1444 1926">  </td></tr> <tr> <td data-bbox="256 1926 1173 2018">or <b>[Absolute]</b> measuring method.</td><td data-bbox="1173 1926 1444 2018">  </td></tr> </table>	Press <b>[Relative]</b>		or <b>[Absolute]</b> measuring method.	
Press <b>[Relative]</b>					
or <b>[Absolute]</b> measuring method.					

3.	<div data-bbox="231 197 1257 862">  </div> <p data-bbox="231 913 837 952">Turn the steering wheel until the bar displays green.</p>	
4.	<p data-bbox="231 969 1295 1003">Adjust the draglink, while keeping the steering wheel centered, until the bar displays green.</p> <div data-bbox="231 1003 327 1070">  </div>	
5.	<p data-bbox="231 1108 710 1142">Either click <b>[Back]</b> to exit without saving.</p>	<div data-bbox="1145 1093 1264 1160">  <p data-bbox="1189 1142 1220 1153">Back</p> </div>
	<p data-bbox="231 1193 1072 1249">Or, click <b>[Save after adjustment]</b> to store the measurement results and then exit.</p>	<div data-bbox="1145 1187 1264 1254">  <p data-bbox="1189 1236 1220 1247">Save after adjustment</p> </div>

The program will then return to the Cam-aligner main window. All measured values will be displayed on the measured axle.

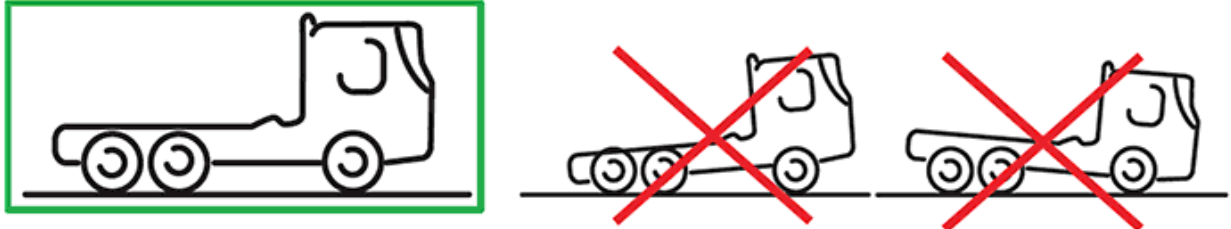
When adjusting twinsteer, start by adjusting total toe (A), steering box position (B), total toe (C) and the draglink between the two steering axles (D).



## 13 ACC/AICC calibration for radar unit with mirror

### 13.1 Measurement preparations

#### Vehicle check



Always check, and if necessary correct, the following:

- The vehicle must be in correct ride height throughout the complete measurement sequence.
- The vehicle tire pressure must be according to specifications.
- Check that the out of square angle of the main driven axle is within specification from the vehicle manufacturer. If this is not the case, please adjust the out of square angle of the main driven axle according to manufacturer's specifications before proceeding with the ACC/AICC radar alignment.



#### Warning

**Hazard:** A Class 2 laser is used throughout this procedure. For safety of operator and others, please see "Important safety information" on page 80. Never look directly into the laser beam!

Risk: Can damage your eyes.

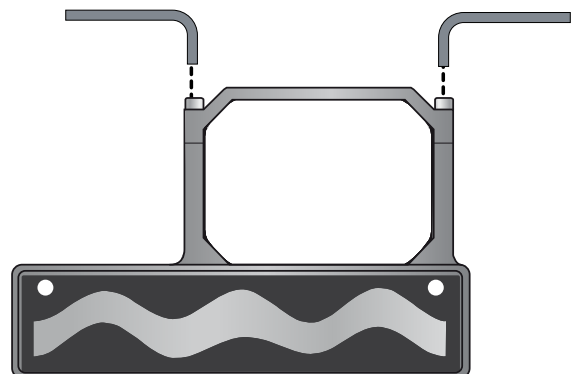
How to avoid: Never look directly into the laser beam!

### 13.2 Mounting asymmetric camera markers

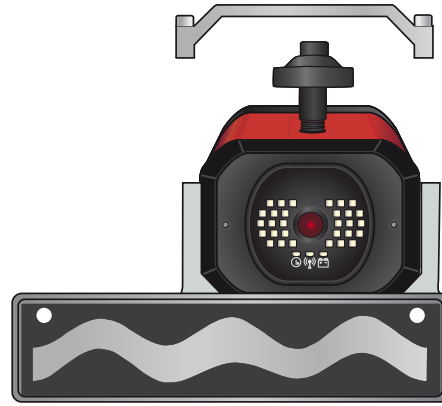
The following equipment is used to calibrate the radar.

To mount the asymmetric camera marker TC-217-50 to the camera sensor CA1010 you need a 3mm Allen key.

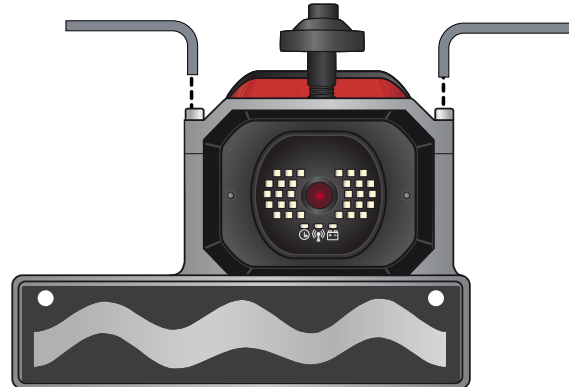
- 1 Loosen the two Allen screws to separate the two parts of the camera marker.



- 2 Fit the marker around the camera sensor, make sure the top part is placed so that the LEDs of the camera sensor are still clearly visible in the cavity.



- 3 Tighten the screws to make sure the marker fits securely on the camera sensor. Repeat for both camera sensors.



## 13.3 Mounting of AZOF/ELOF scale

Choose an appropriate AZOF/ELOF scale. A list of which scale is appropriate for which vehicle brand and make is available in chapter 4 "Technical data", page 7.



### Caution

**Hazard:** Make sure that the laser unit is switched off before proceeding, to avoid any risk for eye damage due to laser irradiation. For safety of operator and others, please see "Important safety information" on page 80.

Risk: Damage to the eye

How to avoid: Make sure that the laser unit is switched off before proceeding.

The scale has one magnet and two centring pins. The magnet is mounted in the screw in the middle and the pins into the protection rubber.





## 13.4 Important safety information

### **Mechanical**

Always use the handle when tilting and moving the CA1005 radar stand. Moving or tilting the radar stand in any other way may cause damage to equipment and/or health of operator.

### **Laser device**

This system uses a Class 2 laser. For safety of operator and others, please always carefully follow any safety measures described.

Laser devices require general considerations:

- Never look directly into the laser beam.
- Define laser beam paths accurately. Use laser absorbing means to avoid stray laser irradiation. Hazardous reflections are particularly caused by reflecting and shining surfaces.
- Switch off laser unit after operation.

More information can be found in the international standard document IEC 60825-1 Amendment 2 / 2001 on safety of laser products.

## 13.5 Measurement, radar with mirror



A wheel alignment of the drive axle must be performed before starting measurement.



It is crucial to the accuracy of the following measurements that a run-out compensation on the rear axle has been performed before continuing with the ACC/AICC radar measurement sequence.

1.

Mount a TC-217-50 camera marker on one camera, and then place this camera on the radar stand rod. The other camera is mounted on the wheel adapter. The camera with marker attached (on the radar stand rod) will act as the far marker in the procedure described in the standard run-out instructions.

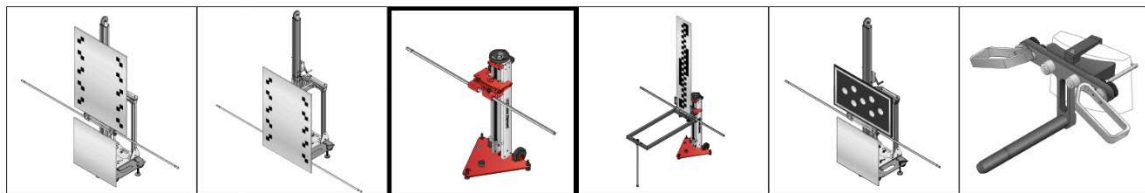
2.



Choose **[Adas]** from the Cam-aligner main window.


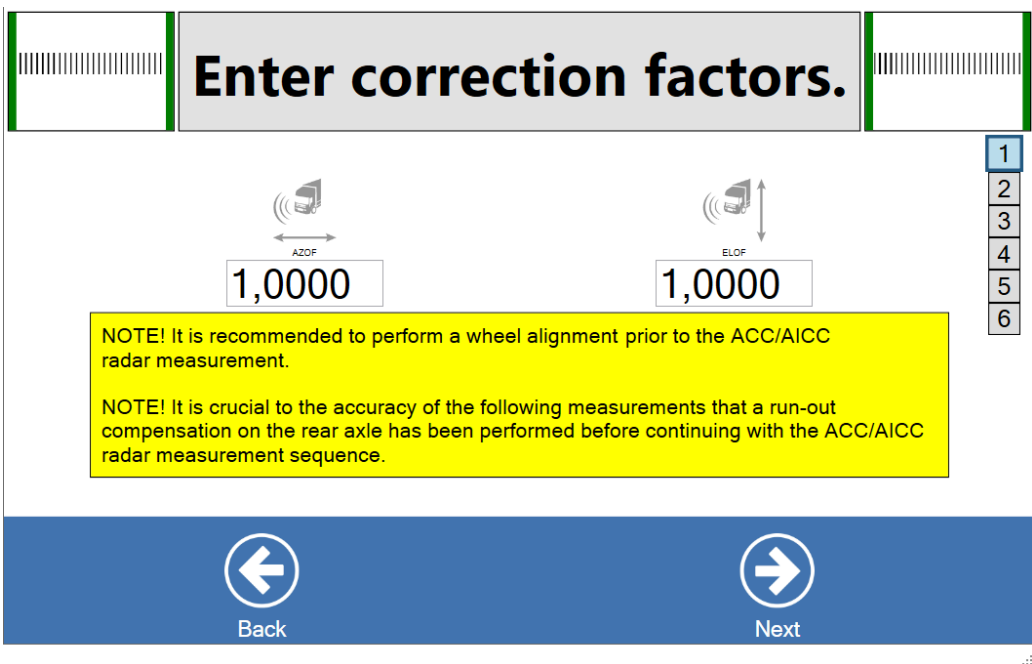

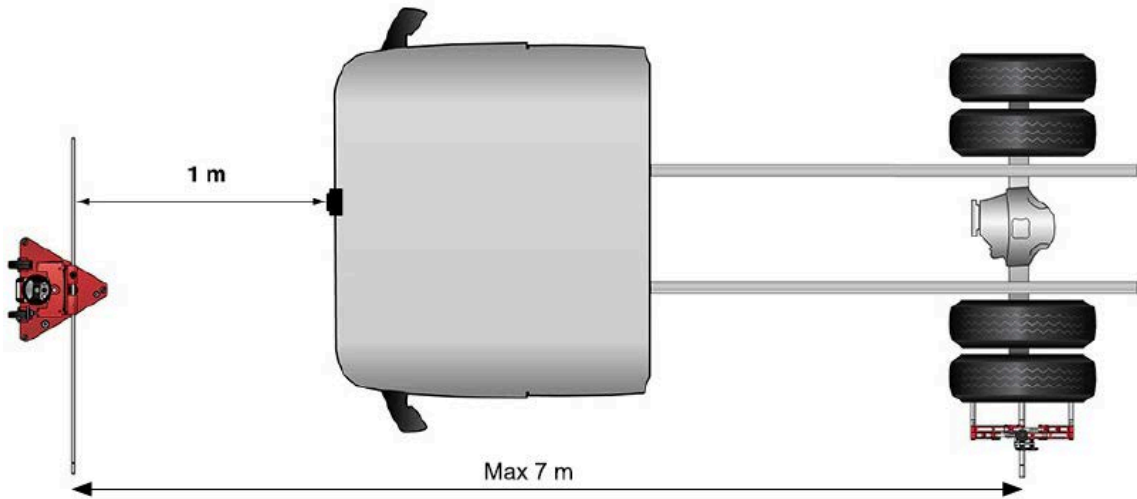


3.



Click on the applicable ACC/AICC radar measurement function.



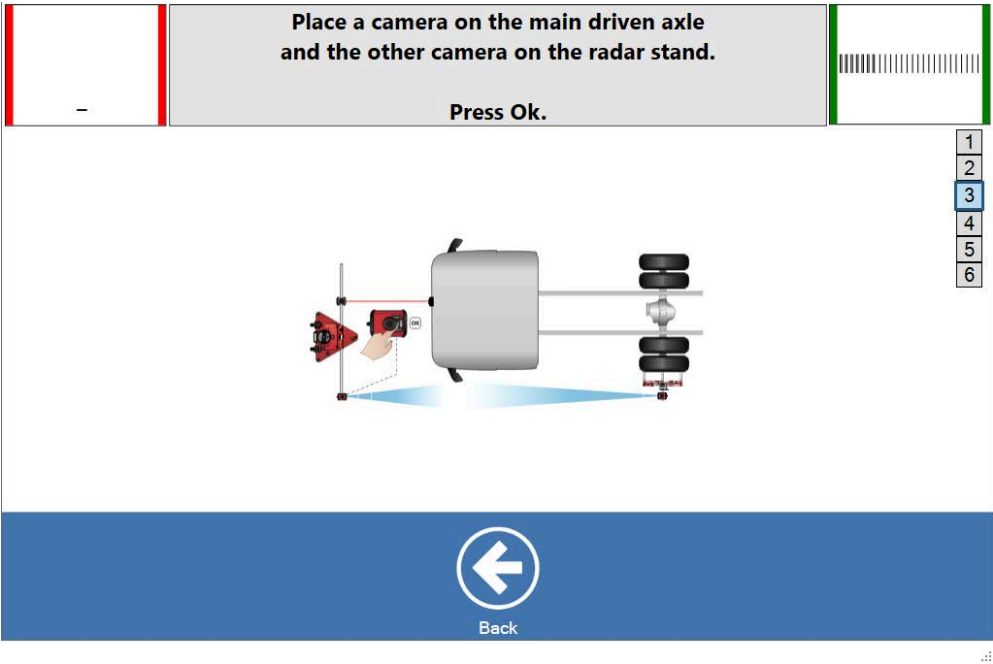
4.	Then click <b>[Radar Mirror]</b> .	
5.	Perform a run-out on the rear axle, if it hasn't been made already. <a href="#">10.1 See "Runout", page 33.</a>	
6.	 <p>Enter the correction factors of the radar unit mirror into the software. These factors can be found on the back side of the ACC/AICC radar unit itself and/or in the vehicle service computer.</p>	
7.	Then click <b>[Next]</b>	
8.	 <p>Place the radar stand 1 m in front of the radar unit.</p>	

9.



Mount the appropriate AZOF ELOF scale to the front side of the laser and mount camera markers on both cameras. See [13.3 "Mounting of AZOF/ELOF scale", page 73](#).

10.



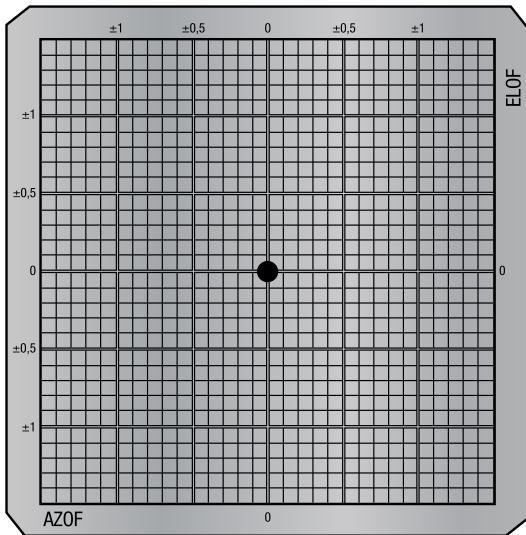
Place one camera on the main driven axle and the other camera on the radar stand. Make sure the cameras are facing each other and that the radar stand rod is on the same height as the wheel adapter spindle. Place the laser unit on the radar stand rod, switch it on and aim it to the mirror of the ACC/AICC radar unit.

11.

Press **OK** on the camera placed on the radar stand rod.

12.	<div data-bbox="268 197 1262 846"> <div data-bbox="272 203 427 324"> </div> <div data-bbox="432 203 1098 324"> <p>1. Adjust parallelism to zero. 2. Mount the laser horizontally on the radar stand and adjust height and side position so the laser beam hits the mirror of the radar. 3. Press OK on the camera placed on the radar stand.</p> </div> <div data-bbox="1102 203 1257 324"> </div> <div data-bbox="411 427 566 607"> </div> <div data-bbox="576 427 715 607"> </div> <div data-bbox="730 427 869 607"> </div> <div data-bbox="890 450 1129 622"> <div>AZOF 1.000° ELOF 1.000°</div> <div>0.0°</div> </div> <div data-bbox="1225 331 1257 488"> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> </div> <div data-bbox="268 712 1262 846"> </div> </div> <p>Adjust the angle of the radar stand rod by turning the adjustment wheel on the radar stand until the bar graph on the computer screen displays zero.</p> <div data-bbox="272 958 363 1048"> </div> <div data-bbox="384 958 1433 1048"> <p>The radar stand rod is now parallel with the rear axle, and needs to remain parallel to the axle throughout the rest of the measurement sequence.</p> </div>
13.	<div data-bbox="284 1093 646 1585"> </div> <div data-bbox="730 1131 1198 1574"> </div> <p>Level the laser unit horizontally using the built-in spirit level. Adjust the radar stand rod up/down (turn the height adjustment wheel on top of the radar stand) until the laser beam hits the mirror on the AICC/ACC unit.</p> <div data-bbox="272 1720 363 1809"> </div> <div data-bbox="384 1720 1433 1809"> <p>Make sure the laser unit stays horizontally level and that the bar graph on the computer screen is still set to zero.</p> </div>
14.	<p>Press <b>OK</b> on the camera placed on the radar stand.</p>


15.



Read the values for AZOF and ELOF off of the scale on the laser unit, by checking the values of the intersecting scale lines where the laser point hits the scale.


16.

**Read the radar scale and enter the values for AZOF and ELOF.**



AZOF

**1.0000**



ELOF

**1.0000**

← Back
Next →

Enter the values into the software and click **[Next]**




17.

**Measurement successful!**




Press "Back" to exit measurements or press "Adjust" to adjust the radar AZOF/ELOF correction factor.

AZOF		ELOF	
<b>1,0000</b>	<b>1,0000</b>		
Measured value	Measured value		
<b>1,0000</b>	<b>1,0000</b>		
Radar misalignment	Radar misalignment		
<b>0.0000</b>	<b>0.0000</b>		

← Back
Adjust →
 Print

The measured values will be displayed on the computer screen. Continue by choosing either:



18.	Click either <b>[Back]</b> to end the measurement.	
	Or, <b>[Adjust]</b> and enter adjustment	
	Or, <b>[Print]</b> End measurement without saving and print a report	

# 13.6 Adjustment, radar with mirror




## Warning

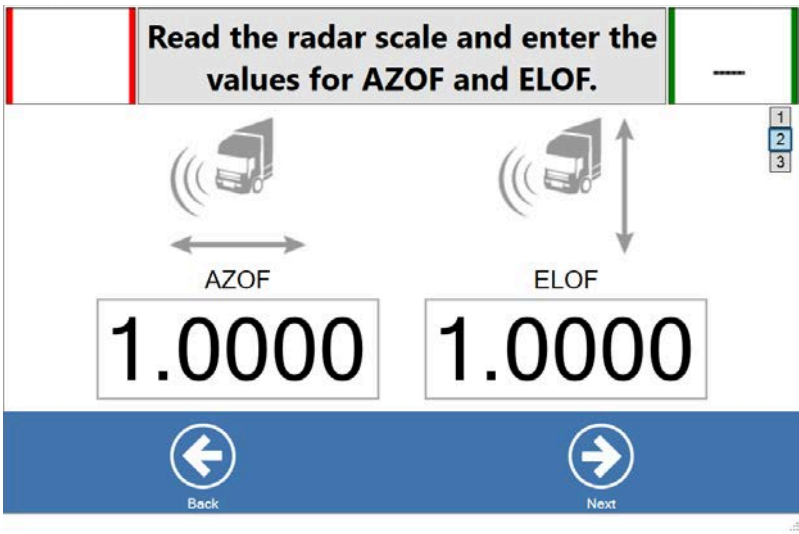

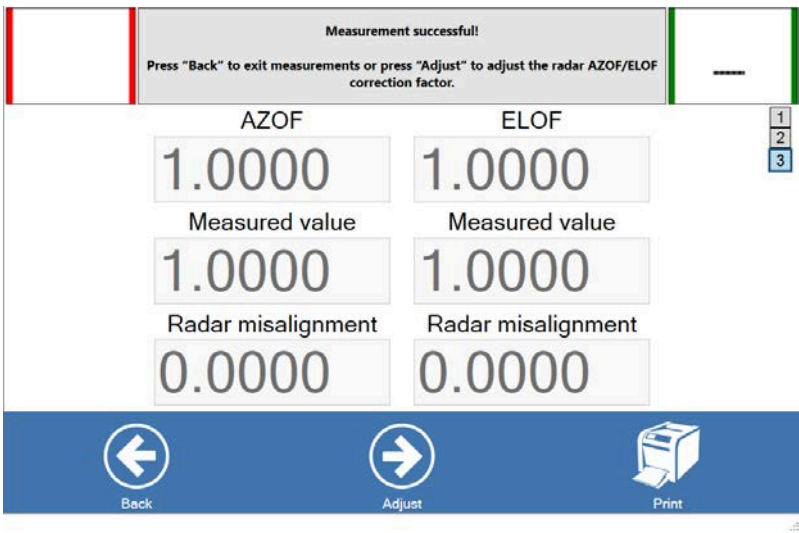



**Hazard:** A Class 2 laser is used throughout this procedure. For safety of operator and others, please see "Important safety information" on page 80. Never look directly into the laser beam!

**Risk:** Can damage your eyes.

**How to avoid:** Never look directly into the laser beam!

1.	Complete the 13.5 "Measurement, radar with mirror", page 75 sequence and choose <b>[Adjust]</b>	
2.	<div><div><div><div>1. Keep parallelism at zero.</div><div>2. Adjust the radar unit to the AZOF/ELOF correction factors.</div><div>3. Press OK on the camera placed on the radar stand.</div></div><div><div><div><div><div>1</div><div>2</div><div>3</div></div><div><div>AZOF</div><div>1.000°</div></div><div><div>ELOF</div><div>1.000°</div></div><div><div>-0.1°</div></div><div><div>-10</div><div>-5</div><div>0</div><div>5</div><div>10</div></div></div></div><div><div><div><div>1</div><div>2</div></div><div><div><div><div>Back</div></div></div></div></div></div></div><div>Keep parallelism at zero.</div><div><div><div>i</div><div>Make sure the laser unit stays horizontally level during the whole adjustment sequence, and that the bar graph on the computer screen remains on zero. If these values change, the complete measurement and alignment cycle needs to be restarted from the beginning to ensure the accuracy of the measurement results.</div></div></div></div></div>	
3.	<div><div><div><div><div><div></div></div></div><div><div><div></div></div></div></div><div><div><div><div>AZOF</div><div>ELOF</div></div></div></div></div><div>Adjust the ACC/AICC unit until the laser beam hits the AZOF ELOF scale on the intersecting point of the values obtained in the first step of the measuring sequence. Then press <b>[OK]</b> on the camera on the radar stand bar.</div></div>	

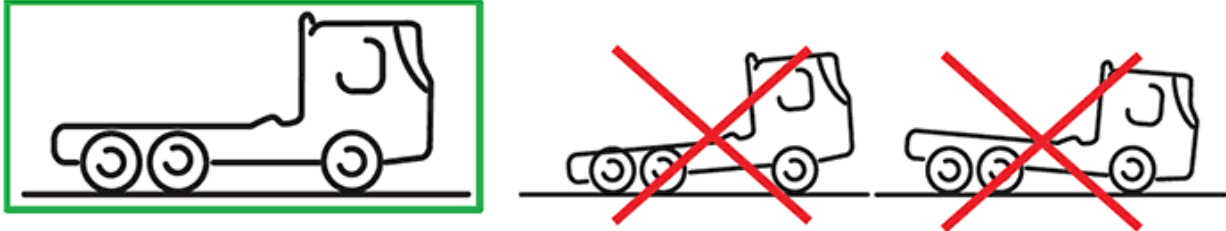


4.	 <p>Read the values for AZOF and ELOF from the radar scale and enter them into the program.</p>	
5.	Click <b>[Next]</b>	
6.	 <p>The measured values will be displayed on the computer screen.</p>	
7.	Continue by choosing either: <b>[Back]</b> End the measurement	
	<b>[Adjust]</b> Enter adjustment	
	<b>[Print]</b> End measurement without saving and print a report	

## 14 ACC/AICC calibration for Wabco radar

### 14.1 Measurement preparations

#### Vehicle check



Always check, and if necessary correct, the following:

- The vehicle must be in correct ride height throughout the complete measurement sequence.
- The vehicle tire pressure must be according to specifications.
- Check that the out of square angle of the main driven axle is within specification from the vehicle manufacturer. If this is not the case, please adjust the out of square angle of the main driven axle according to manufacturer's specifications before proceeding with the ACC/AICC radar alignment.

### 14.2 Important safety information

#### Mechanical

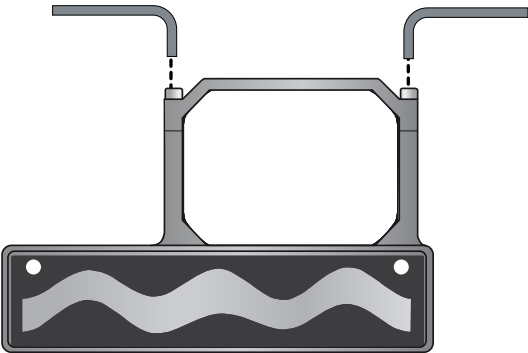
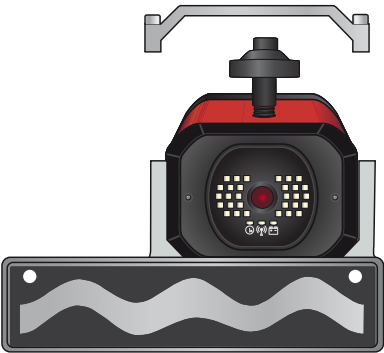
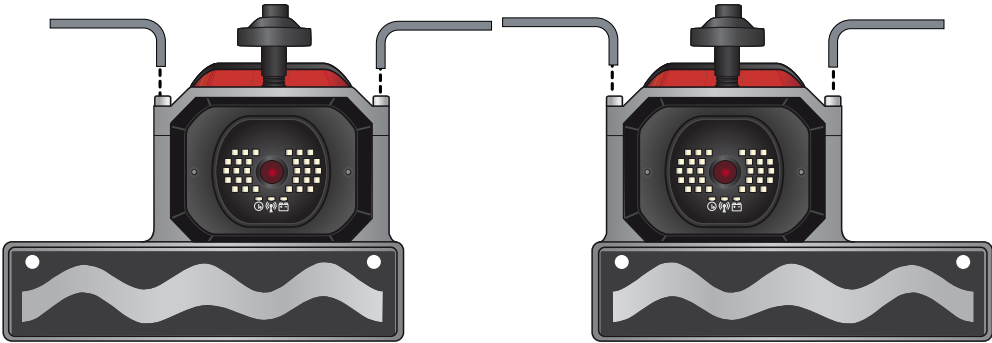
Always use the handle when tilting and moving the CA1005 radar stand. Moving or tilting the radar stand in any other way may cause damage to equipment and/or health of operator.

### 14.3 Mounting asymmetric camera markers

The following equipment is used to calibrate the radar.

To mount the asymmetric camera marker TC-217-50 to the camera sensor CA1010 you need a 3mm Allen key.



1.	 <p>Loosen the two Allen screws to separate the two parts of the camera marker.</p>
2.	 <p>Fit the marker around the camera sensor, make sure the top part is placed so that the LEDs of the camera sensor is still clearly visible in the cavity.</p>
3.	 <p>Tighten the screws to make sure the marker fits securely on both the camera sensors.</p>

## 14.4 Measurement, Wabco radar unit

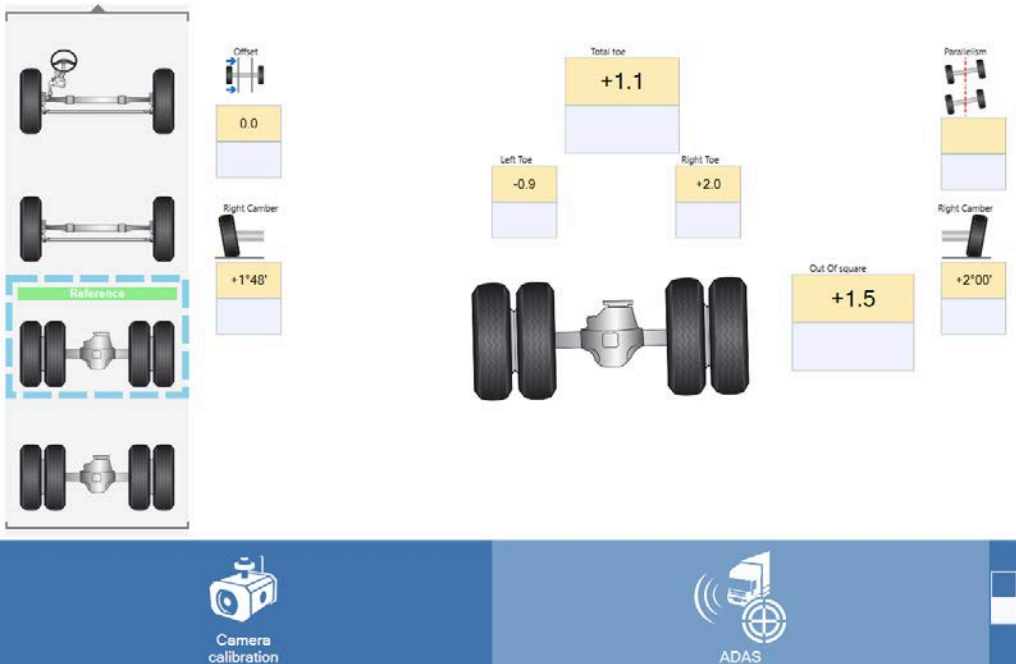

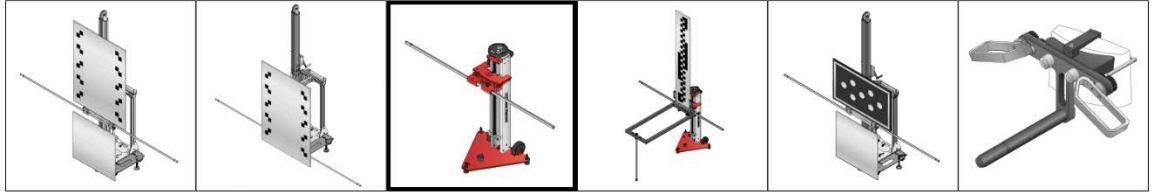







A wheel alignment of the drive axle must be performed before starting measurement.

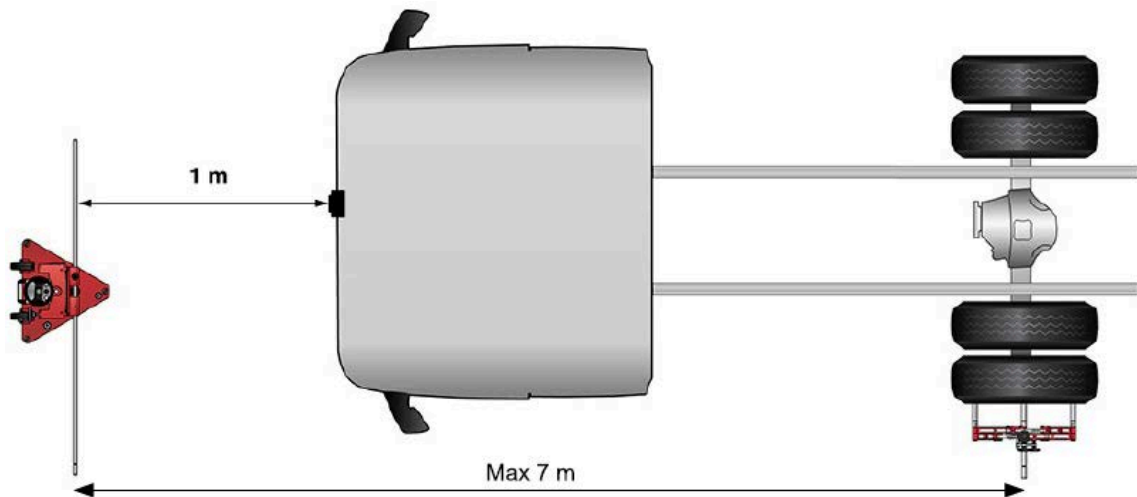


It is crucial to the accuracy of the following measurements that a run-out compensation on the rear axle has been performed before continuing with the ACC/AICC radar measurement sequence.

There is no need to mount the frame gauges with standard reflective targets to perform the run-out in this case. The most convenient method is to mount a TC-217-50 camera marker on one camera, and then place this camera on the radar stand rod. The other camera is mounted on the wheel adapter. The camera with marker attached (on the radar stand rod) will act as the far marker in the procedure described in the standard run-out instructions.

1.	
	<p>Choose <b>[Adas]</b> from the Cam-aligner main window.</p> 
2.	 <div data-bbox="271 1433 1428 1556">  Back          Radar calibration          Radar Mirror          Radar Reference       </div>
	<p>Click on the applicable ACC/AICC radar measurement function. Then click <b>[Radar Reference]</b></p> 
3.	<p>Perform a calibration of the Wabco radar adapter before using for the first time, see <a href="#">20.3 "Calibrate Wabco radar adapter", page 160</a></p>
4.	<p>Perform a run-out on the rear axle, if it hasn't been made already. See <a href="#">10.1 Runout", page 33</a>.</p>

5.



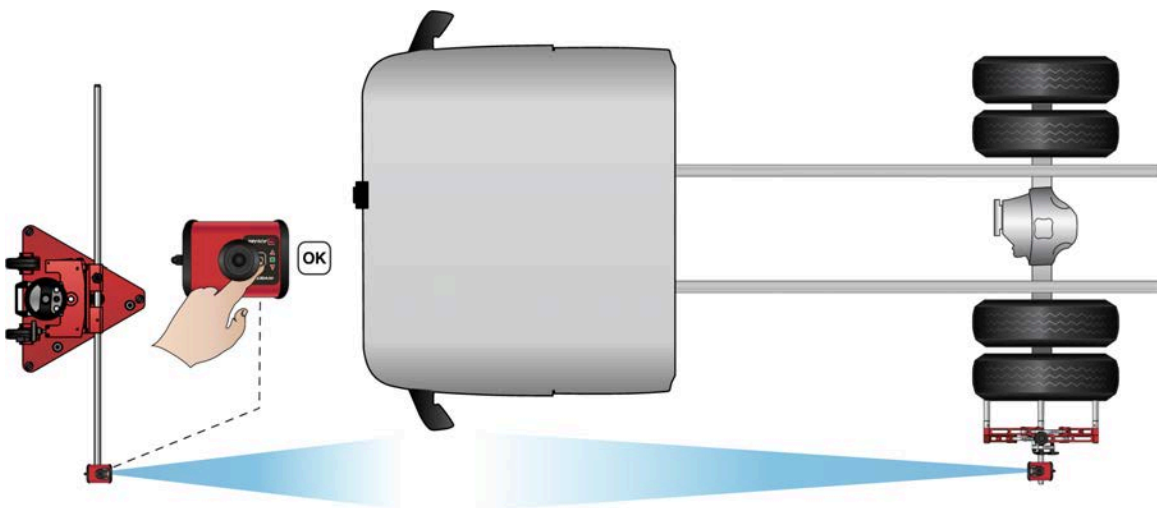
Place the radar stand 1 m in front of the radar unit.

6.

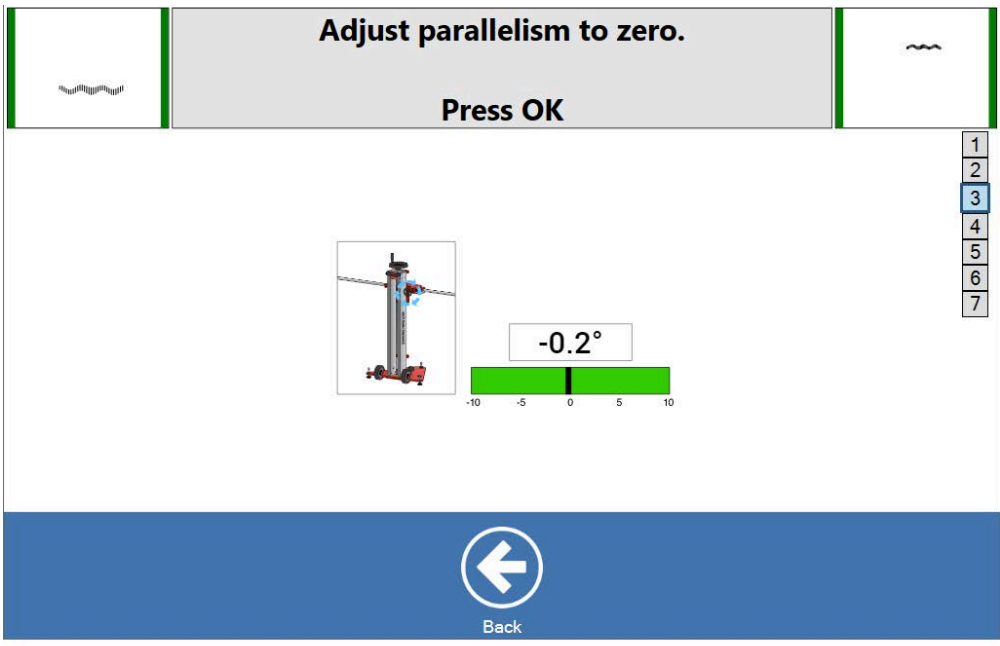

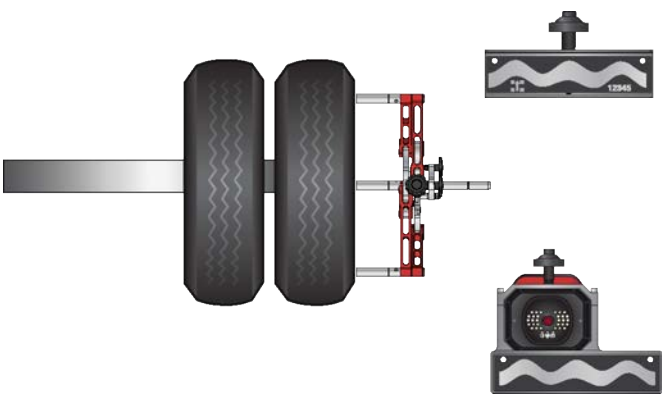




Mount camera markers on both cameras. For mounting instructions, see [13.2 "Mounting asymmetric camera markers"](#), [page 72](#).


7.




Place one camera on the main driven axle and one on the radar stand. Press **OK** on the camera on the radar stand.



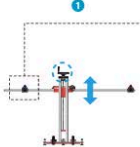
8.	<div data-bbox="268 197 1273 840">  </div> <p>Adjust the angle of the radar stand rods by turning the adjustment wheel on the radar stand until the bar graph on the computer screen shows zero. Press <b>OK</b>.</p> <div data-bbox="268 952 1433 1041">  <p>The radar stand rod is now parallel with the rear axle, and needs to remain parallel to the axle throughout the rest of the measurement sequence.</p> </div>
9.	 <p>Replace the camera on the rear axle with the TC-229 parallelism target. Before mounting the parallelism target, remove the reference blocks if they are still assembled to the wheel adapter.</p>
10.	<p>Press <b>OK</b> on the camera facing the parallelism target.</p> <div data-bbox="268 1601 1433 1691">  <p>It is very important that the radar stand rods remain parallel to the rear axle throughout the procedure. If the radar stand rods are moved in any way that will affect its parallelism to the rear axle, the complete measurement sequence will need to be restarted</p> </div>
11.	 <p>Mount the Wabco adapter on to the ACC/AICC radar unit on the vehicle.</p>
12.	<p>Mount the camera that was previously mounted on the rear axle on to the radar stand rod.</p>
13.	<p>Aim at the Wabco adapter. Make sure the parallelism is still zero.</p>

14.



1. Place the camera from the drive axle on the radar stand.  
2. Aim the camera to the radar adapter  
3. Check that parallelism is still zero.  
4. Press OK on the camera aiming towards the radar adapter.





-0.2°


-10

-5

0

5

10



Back

Press the **OK** button on the camera to measure the position of the radar unit.

15.

Measurement successful!

Press "Save before adj." or "Save after adj." in the menu to store the values or press "Back" to continue without saving.

-2° -0.3° 0.0° 0.3° 2°


-1.1°

Horizontal


-2° -0.3° 0.0° 0.3° 2°

+1.6°

Vertical



Back



Adjust

The measured values will be displayed on the computer screen. Continue by choosing either:

[Back] to end the measurement



Or, [Adjust] to go to adjustment (see [14.5 "Adjustment, Wabco radar unit", page 90](#))









## 14.5 Adjustment, Wabco radar unit



Make sure the ACC/AICC radar stand remains parallel to the main driven axle throughout the complete adjustment sequence. This is displayed on the lower the bar graph on the computer screen. This value should at all times remain on zero.

If this value changes, adjust it back to zero by turning the adjustment knob on the radar stand. However, if the change is significant the complete measurement and alignment cycle needs to be restarted from the beginning to ensure the accuracy of the measurement results.

1.	<div data-bbox="268 499 1273 1137"> <div>Adjust radar to desired values</div> <div>Press "Save before adj." or "Save after adj." in the menu to store the values or press "Back" to continue without saving.</div> <div> <div> <div>0.1°</div> <div>Horizontal</div> </div> <div> <div>-0.1°</div> <div>Vertical</div> </div> <div> <div>0°</div> <div>Parallelism</div> </div> </div> <div> <div>Back</div> <div>Next</div> </div> </div> <p>Adjust the ACC/AICC unit on the truck until the bar graphs on the computer screen display zero.</p>				
2.	<p>Continue by choosing either:</p> <table border="1"> <tr> <td data-bbox="256 1272 1173 1444"> <p><b>[Back]</b> To end the adjustment</p> </td><td data-bbox="1173 1272 1436 1444">  Back </td></tr> <tr> <td data-bbox="256 1444 1173 1612"> <p><b>[Next]</b> To display the result</p> </td><td data-bbox="1173 1444 1436 1612">  Next </td></tr> </table>	<p><b>[Back]</b> To end the adjustment</p>	 Back	<p><b>[Next]</b> To display the result</p>	 Next
<p><b>[Back]</b> To end the adjustment</p>	 Back				
<p><b>[Next]</b> To display the result</p>	 Next				

## 15 LDWS measurement

### 15.1 Measurement preparations

See 8 "Wheel alignment preparations"., page 22

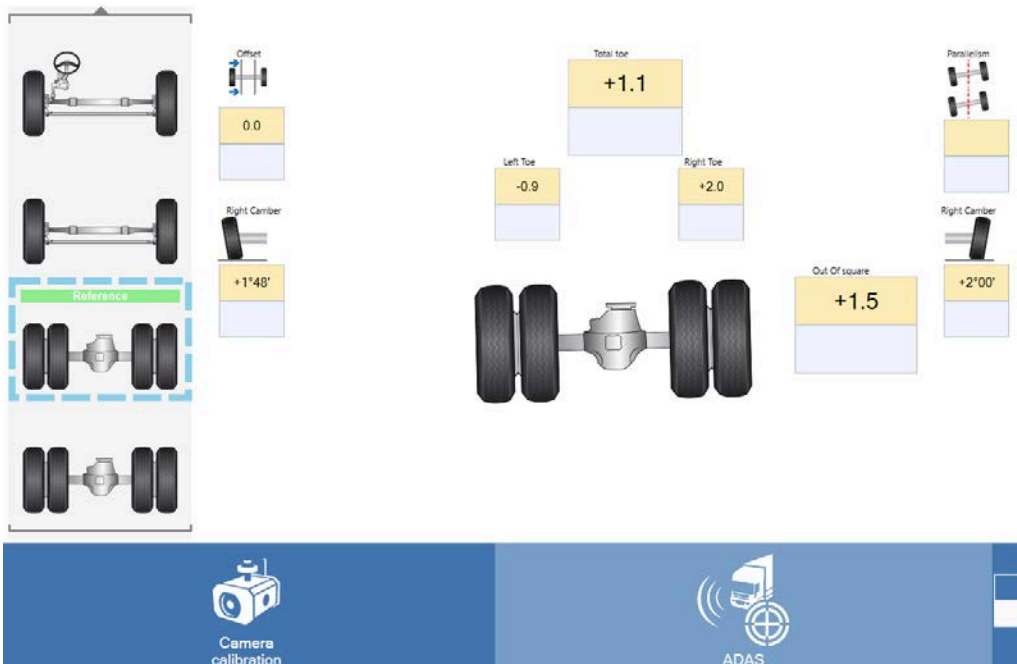


A wheel alignment of the drive axle must be performed before starting measurement.




Remove the wheel adapters before starting measurement.

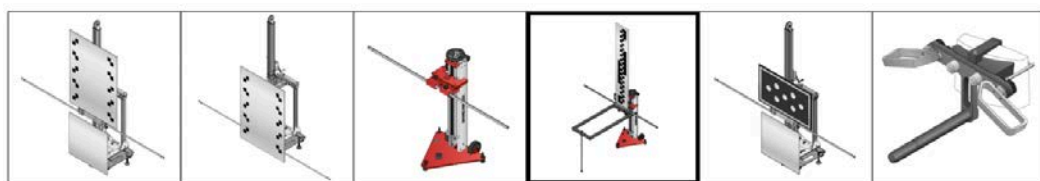
1.




Choose **[ADAS]** from the Cam-aligner main window.




2.





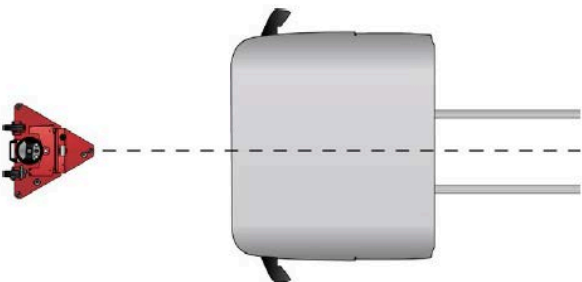

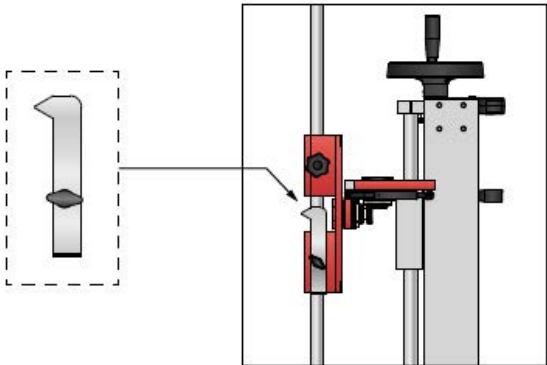
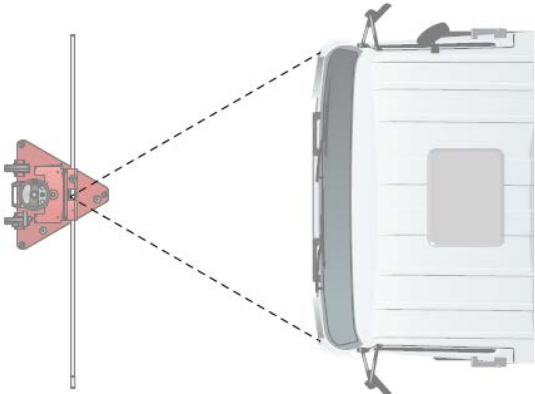


Back

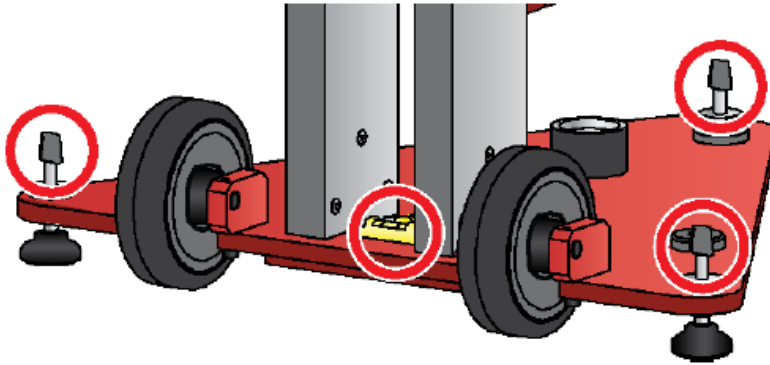


Next

Choose calibrate **[LDWS]** (Lane Departure Warning System).

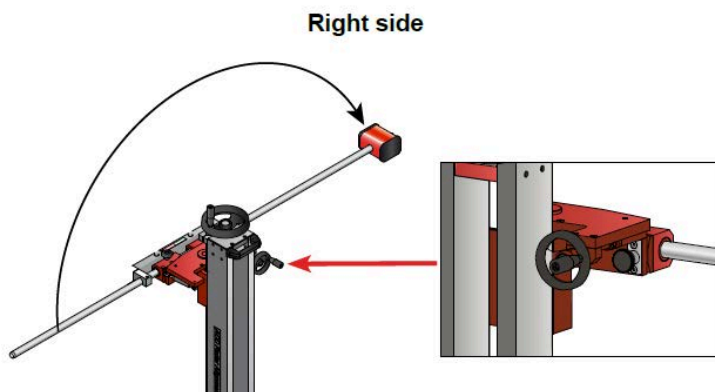
3.	<div data-bbox="268 241 411 273" data-label="Text">Click <b>[Next]</b></div> <div data-bbox="416 197 529 266" data-label="Image">  </div> <div data-bbox="268 288 363 380" data-label="Image">  </div> <div data-bbox="379 293 1393 356" data-label="Text"> <p>Before parking the vehicle, check the suspension level and make sure that the vehicle has proper ride height.</p> </div>
4.	<div data-bbox="284 445 868 725" data-label="Image">  </div> <div data-bbox="976 421 1385 748" data-label="Image">  </div> <div data-bbox="268 772 1431 889" data-label="Text"> <p>Place the stand in front of the vehicle. Align the stand with the centreline of the vehicle at a distance of 270 cm from the LDWS camera. Use tape measure to measure the distance between the camera and the vertical rod. This distance should be measured before tilting the calibration rod horizontally.</p> </div>
5.	<div data-bbox="304 936 853 1299" data-label="Image">  </div> <div data-bbox="268 1317 1402 1377" data-label="Text"> <p>Make sure that the plate with pointer is mounted correctly on the calibration stand and is pointing away from the stand.</p> </div>
6.	<div data-bbox="272 1406 809 1798" data-label="Image">  </div> <div data-bbox="268 1805 1425 1892" data-label="Text"> <p>Ensure that the calibration stand is placed as centred and perpendicular to the vehicle as possible. Verify the placement by performing a diagonal measurement check to each head light from the stand.</p> </div>

7.



Calibrate the base plate by adjusting the three knobs until the spirit level indicates that the base plate is level.

8.



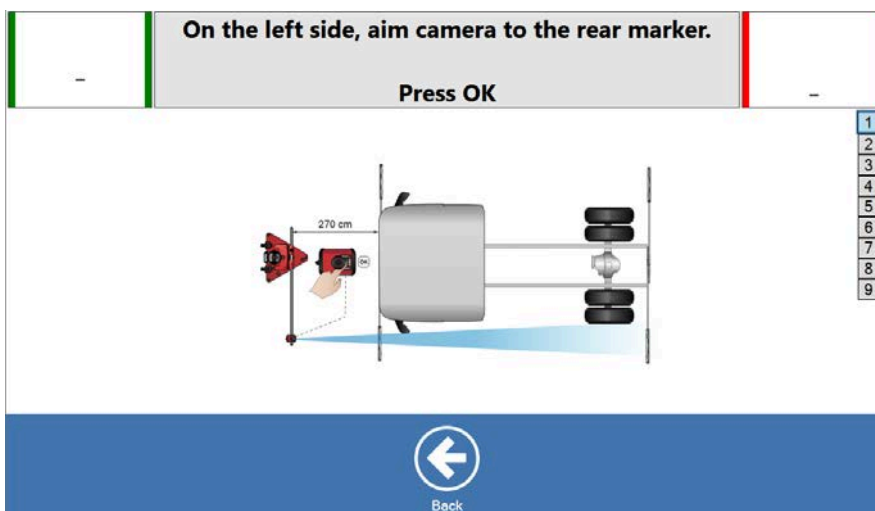
Loosen the wheel that secures the calibration rod, and swing the calibrating rod to your right.

9.

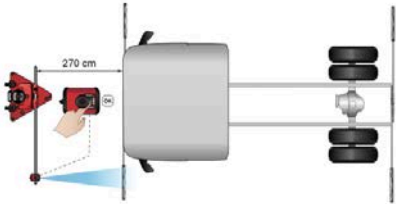
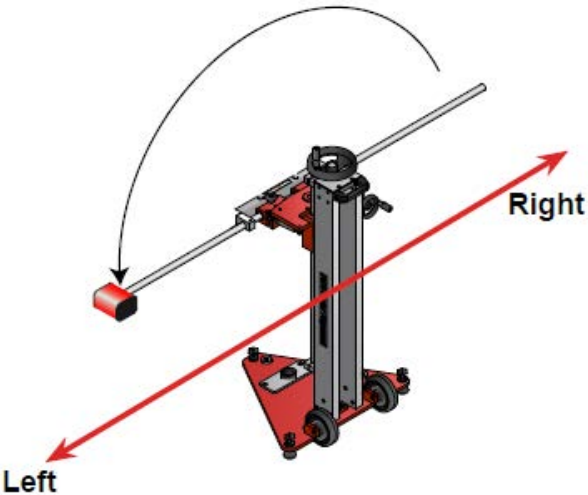
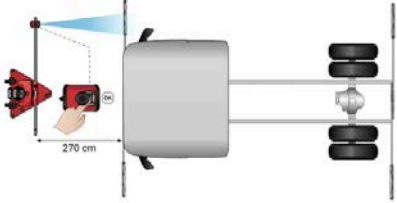
Assemble the camera to the calibration rod. When assembling the camera to the rod make sure that the securing pin on the camera is firmly lodged in the groove of the axle. Tighten the securing screw just enough so that the camera sits firmly on the axle but can still be rotated around the axle.

10. Check that the calibration rod is firmly secured.

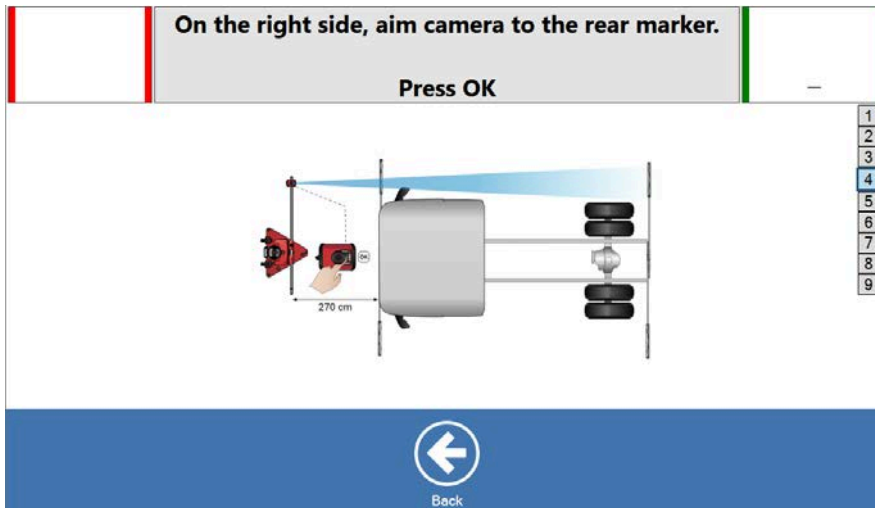
11.



Aim the camera at the left rear marker and press **OK**.

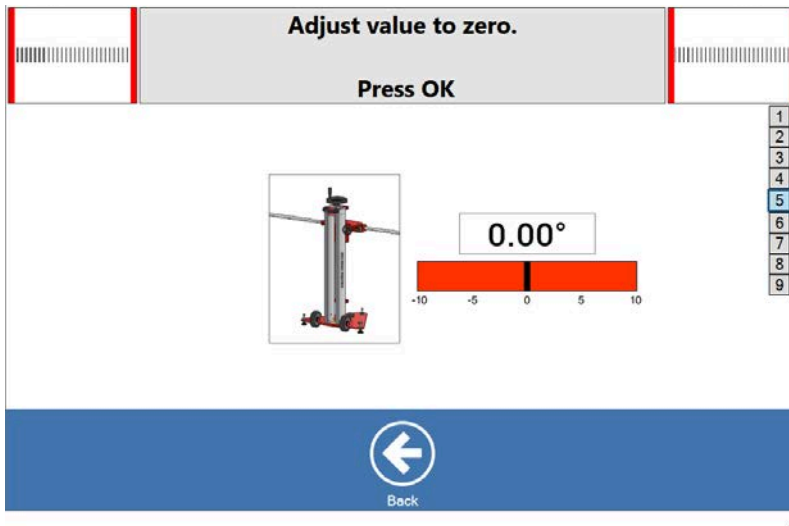
12.	<div data-bbox="268 197 1158 707"> <div>On the left side, aim camera to the front marker.</div> <div>Press OK</div>  </div> <p>Aim the camera at the left front marker and press <b>OK</b>.</p>
13.	 <p>Loosen the securing screw of the calibration rod and swing the rod with camera to the left.</p>
14.	<p>Check that the calibration rod is firmly secured.</p>
15.	<div data-bbox="268 1435 1158 1946"> <div>On the right side, aim camera to the front marker.</div> <div>Press OK</div>  </div> <p>Aim the camera at the right front marker and press <b>OK</b>.</p>

16.

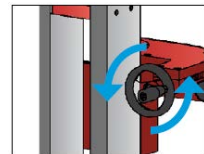


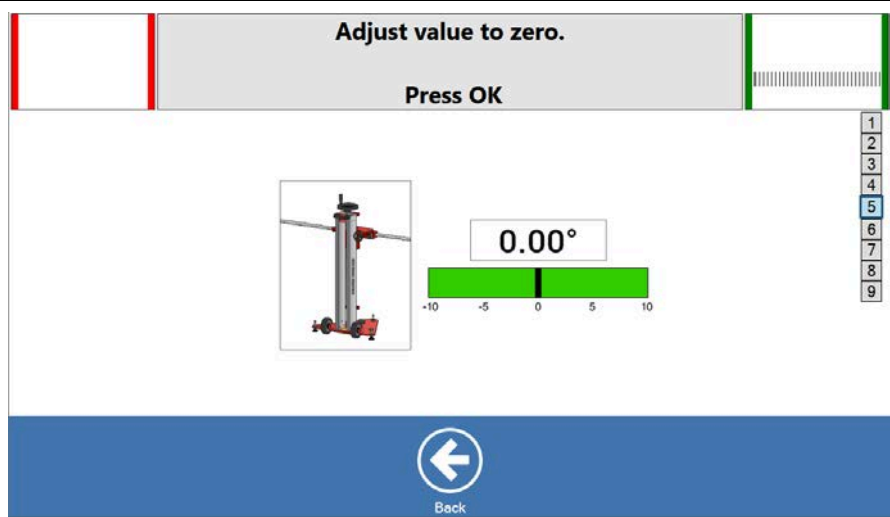
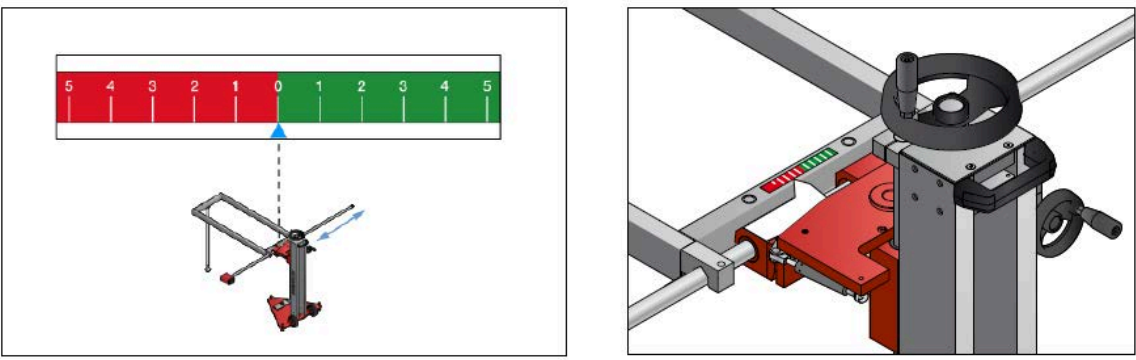

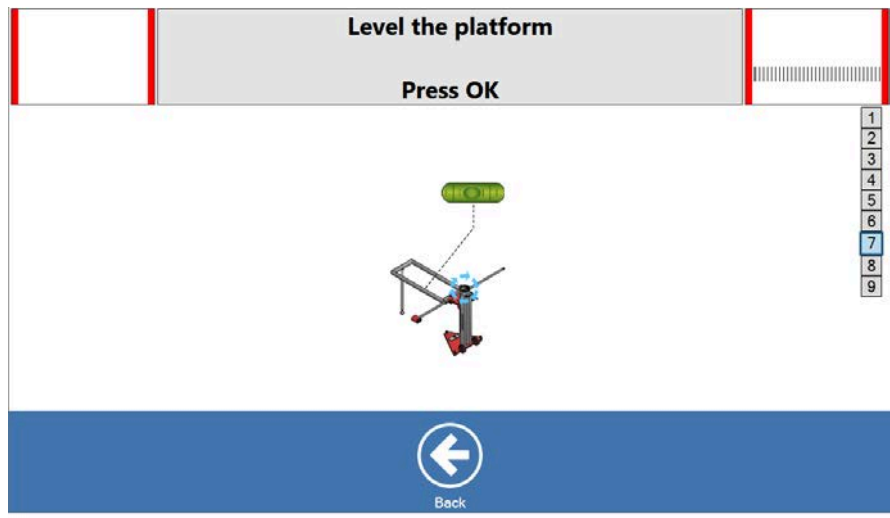
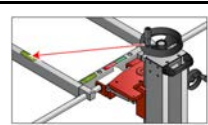
Aim the camera at the right rear marker and press **OK**.

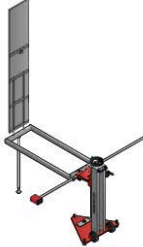

17.



Adjust to value zero by rotating the small wheel.



18.	 <p>The bar colour will change to green when the value zero is reached.</p>
19.	 <p>Assemble the positioning frame according to the scale shown on the screen. Lock in to place using the handles. Press <b>OK</b>.</p> <div style="border: 1px solid blue; padding: 5px; margin-top: 10px;">  <p>When assembling the positioning frame, make sure to extend the calibration rod far enough from the holder to be able to securely attach the positioning frame.</p> </div>
20.	 <div style="margin-top: 20px;">  </div> <p>Level the positioning frame by rotating the big wheel until the bubble on the spirit levels indicate that the positioning frame is level.</p>

21.	<div data-bbox="236 203 1342 831"> <div>Mount target in first position</div>  <div>1 2 3 4 5 6 7 8 9</div> <div>Back</div> </div> <p>Place the target into the positioning frame in the first position (170 cm).</p>
22.	Connect the OEM diagnostic tool to the truck and follow the instructions.
23.	<div data-bbox="236 985 1342 1612"> <div>Mount target in second position</div>  <div>1 2 3 4 5 6 7 8 9</div> <div>Back</div> </div> <p>Move the target to the second position and re-enter calibration with the OEM diagnostic tool.</p>
24.	Calibration is now finalized.

# 16 ADAS safety system for Volvo/Renault

## 16.1 Measurement preparations

See 8 "Wheel alignment preparations", page 22



### Caution

**Hazard:** Floor obstacles, uneven floor and wind gusts can make the calibration stand unstable. Be cautious when handling the calibration stand near a service pit.

**Risk:** Tip risk

**How to avoid:** Be cautious when handling the calibration stand near a service pit.

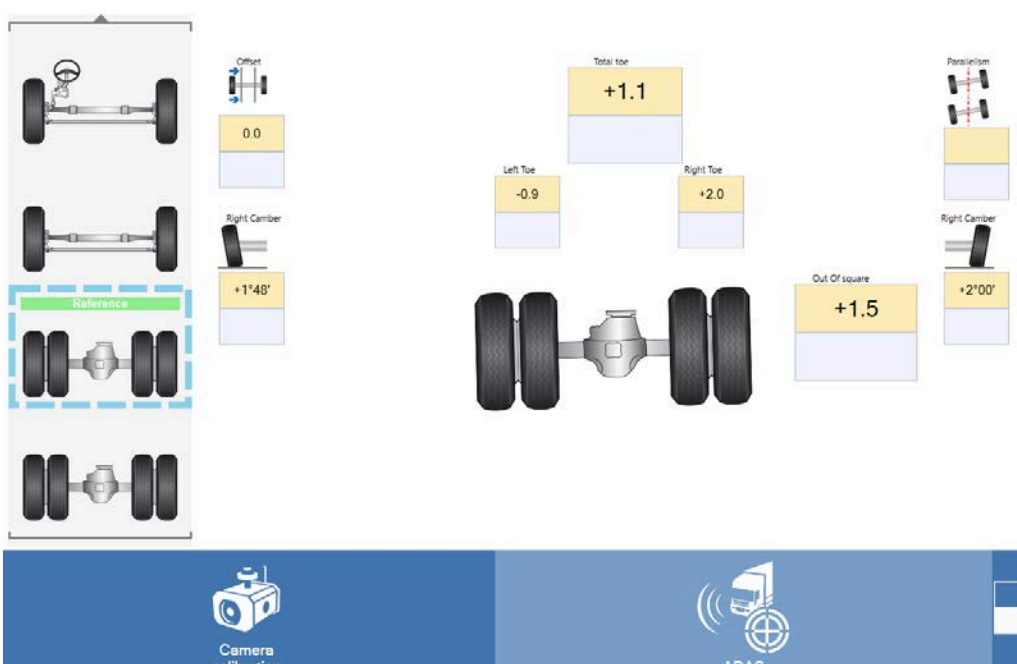

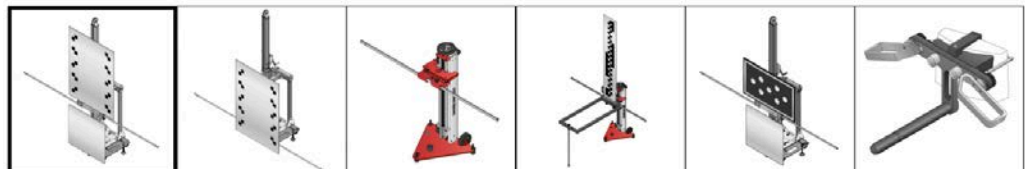




For calibration of FLS/LPOS, the multi-bracket adapters are used to obtain the correct distance, as provided by the software. See product sheet 11:75 for more information regarding which multi-bracket adapter to use for the truck model in question.

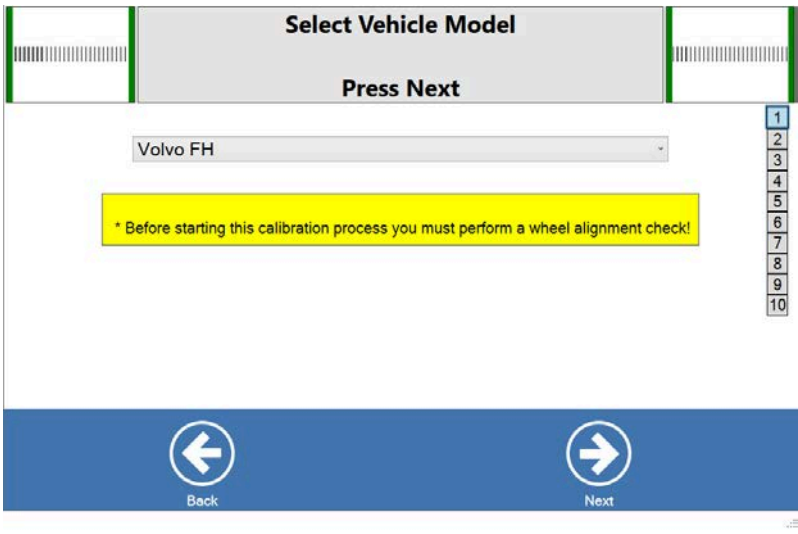

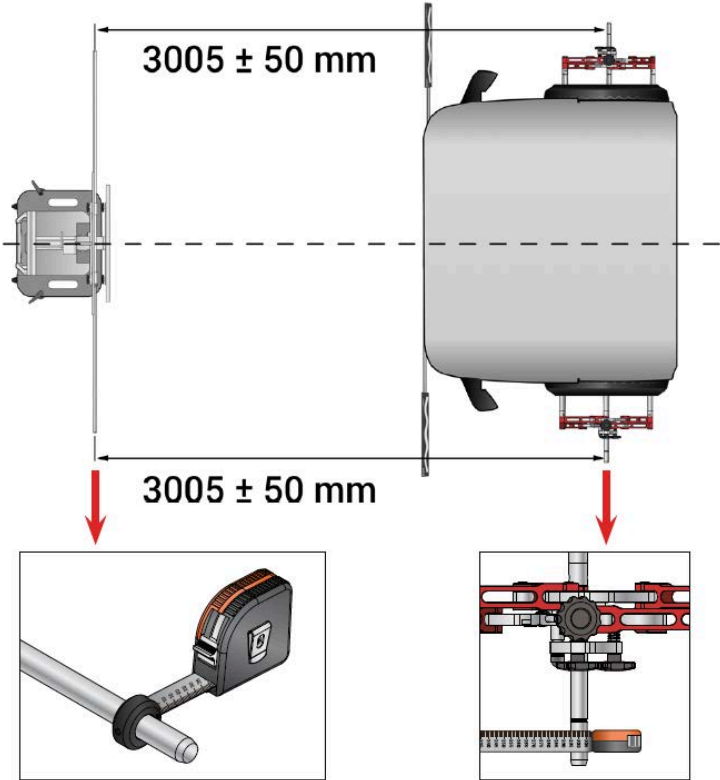


## 16.2 Measurement with dual board calibration stand

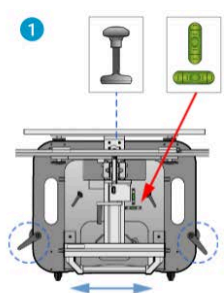
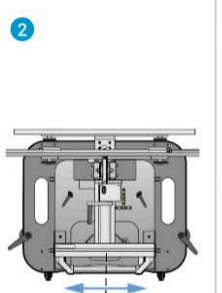
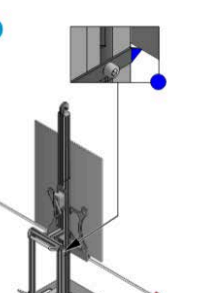


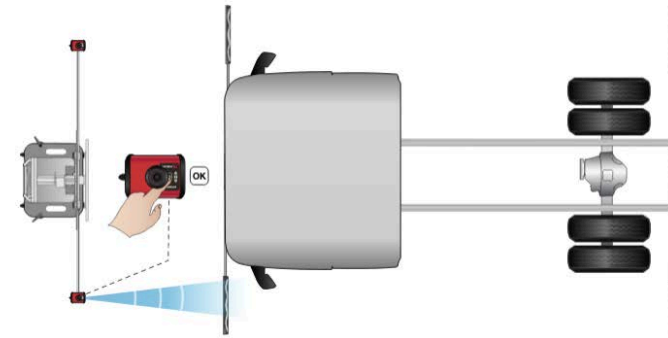




A wheel alignment of the drive axle must be performed before starting measurement.

1.	
	<p>In the Cam-aligner main window, click on <b>[Adas]</b></p> 
2.	 <div style="display: flex; justify-content: space-around; align-items: center; background-color: #0056b3; color: white; padding: 10px; margin-top: 20px;"> <span>← Back</span> <span>→ Next</span> </div>
	<p>Choose calibrate <b>[FLS/LPOS]</b> and press <b>[Next]</b></p> <div style="display: flex; align-items: center;"> <div style="flex: 1;">  <p>Make sure that the rods are fully extended until they hit the stop rings. If not done correctly the measurement will be incorrect.</p> </div> <div style="flex: 0.2; text-align: center;">  </div> </div>



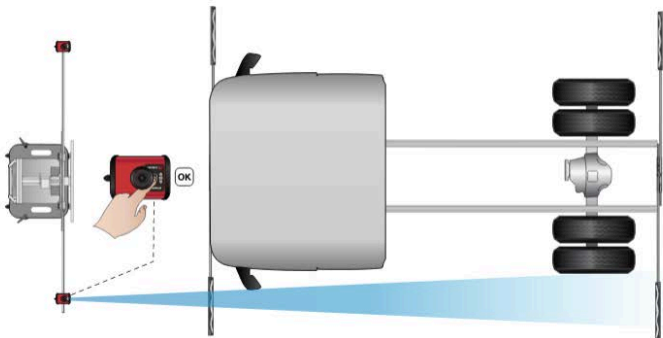
3.		
	Select vehicle model and press <b>[Next]</b>	
4.		
5.	<p>Place the target in front of the vehicle cab, perpendicular to the vehicle's centre line.</p> <p>Attach the tape measure holders to the calibration rods and measure the distance from the calibration rod to the centre of the reference axle on the wheel adapter.</p> <div data-bbox="268 1778 363 1872">  </div> <p>For buses and UD trucks, measurements are to be taken between the front bumper and the calibration rod.</p>	
6.	Press <b>[Next]</b>	

7.	<div style="border: 1px solid black; padding: 10px;"> <div style="text-align: center; background-color: #f0f0f0; padding: 5px;"> <p>1. Level the unit. 2. Set sideways adjustment to zero. 3. Adjust height to blue arrow.</p> <p>Press Next button to continue</p> </div> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>1</p>  </div> <div style="text-align: center;"> <p>2</p>  </div> <div style="text-align: center;"> <p>3</p>  </div> </div> <div style="text-align: center; background-color: #0056b3; color: white; padding: 10px; margin-top: 10px;"> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  Back                 </div> <div style="text-align: center;">  Next                 </div> </div> </div> </div> <div style="position: absolute; right: 10px; top: 140px;"> <div style="border: 1px solid black; padding: 2px; text-align: center;">1</div> <div style="border: 1px solid black; padding: 2px; text-align: center;">2</div> <div style="border: 1px solid black; padding: 2px; text-align: center; background-color: #0056b3; color: white;">3</div> <div style="border: 1px solid black; padding: 2px; text-align: center;">4</div> <div style="border: 1px solid black; padding: 2px; text-align: center;">5</div> <div style="border: 1px solid black; padding: 2px; text-align: center;">6</div> <div style="border: 1px solid black; padding: 2px; text-align: center;">7</div> <div style="border: 1px solid black; padding: 2px; text-align: center;">8</div> <div style="border: 1px solid black; padding: 2px; text-align: center;">9</div> <div style="border: 1px solid black; padding: 2px; text-align: center;">10</div> </div>
8.	<p>Assemble the cameras to the calibration rods.</p>
9.	<div style="border: 1px solid black; padding: 10px;"> <div style="text-align: center; background-color: #f0f0f0; padding: 5px;"> <p>On the left side on the vehicle, aim camera to the front marker.</p> <p>Press OK</p> </div> <div style="display: flex; justify-content: space-around; align-items: center;">  </div> <div style="text-align: center; background-color: #0056b3; color: white; padding: 10px; margin-top: 10px;"> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  Back                 </div> <div style="text-align: center;">  Next                 </div> </div> </div> </div> <div style="position: absolute; right: 10px; top: 490px;"> <div style="border: 1px solid black; padding: 2px; text-align: center;">1</div> <div style="border: 1px solid black; padding: 2px; text-align: center;">2</div> <div style="border: 1px solid black; padding: 2px; text-align: center;">3</div> <div style="border: 1px solid black; padding: 2px; text-align: center; background-color: #0056b3; color: white;">4</div> <div style="border: 1px solid black; padding: 2px; text-align: center;">5</div> <div style="border: 1px solid black; padding: 2px; text-align: center;">6</div> <div style="border: 1px solid black; padding: 2px; text-align: center;">7</div> <div style="border: 1px solid black; padding: 2px; text-align: center;">8</div> <div style="border: 1px solid black; padding: 2px; text-align: center;">9</div> <div style="border: 1px solid black; padding: 2px; text-align: center;">10</div> </div>
10.	<p>Rotate the front markers so that they are lying flat and not obstructing the path of the camera signal to the rear markers.</p>

11.

**On the left side on the vehicle, aim camera to the rear marker.**

**Press OK**



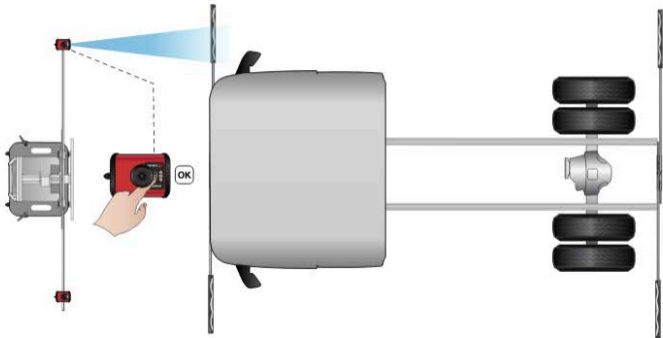
Back

1
2
3
4
5
6
7
8
9
10

12.

**On the right side on the vehicle, aim camera to the front marker.**

**Press OK**



Back

1
2
3
4
5
6
7
8
9
10

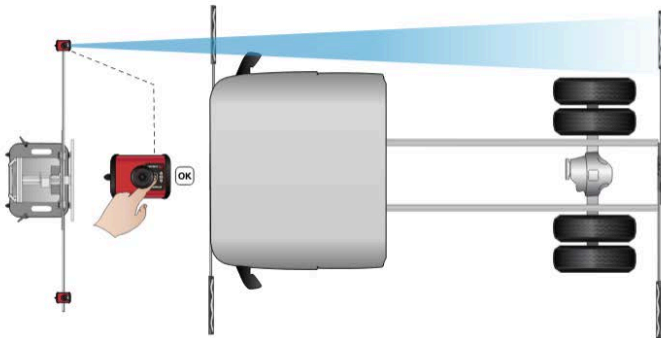
Aim the camera to the rear left marker, when the green diode lights up and the red bars in the camera view turns green, press **OK**.  
The green diode will light up and the red frame around the square will turn to green.


Aim the camera at the front right marker, when the green diode lights up and the red bars in the camera view turns green, press **OK**.  
The green diode on the camera will light up and the red frame around the square will turn to green.

13.

On the right side on the vehicle, aim camera to the rear marker.

Press OK



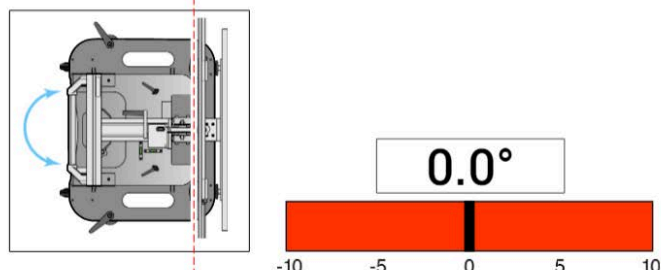
  
Back


Aim the camera at the rear right marker, when the green diode lights up and the red bars in the camera view turns green, press **OK**.  
The green diode on the camera will light up.

14.

Adjust value to zero.



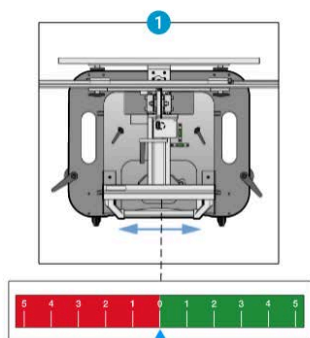




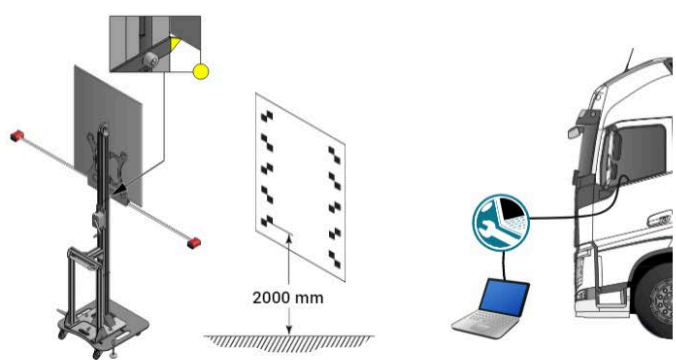


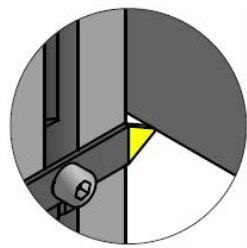

Press OK



  
Back

Adjust the values until the bar is green and press **OK**. It is recommended to adjust to 0.

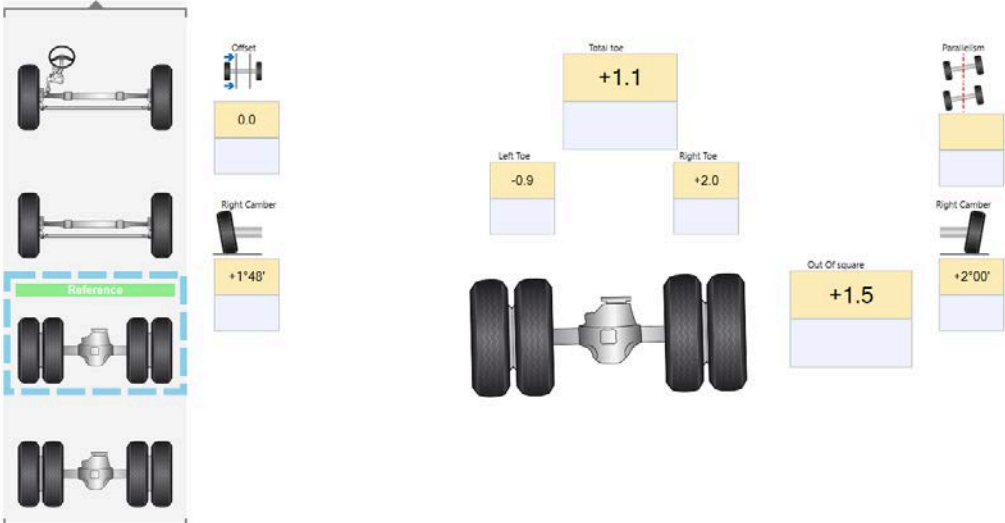














15. Press **OK**.

16.	<div data-bbox="271 190 1268 840"> <div data-bbox="279 201 430 324">  </div> <div data-bbox="438 201 1101 324"> <p>Move the platform sideways according the value below.</p> <p>Press OK</p> </div> <div data-bbox="1109 201 1260 324">  </div> <div data-bbox="502 336 813 672">  </div> <div data-bbox="1220 324 1260 593"> 1 2 3 4 5 6 7 8 9 10 </div> <div data-bbox="470 705 566 828">  <p>Back</p> </div> <div data-bbox="965 705 1061 828">  <p>Next</p> </div> </div>	
17.	<div data-bbox="271 918 1268 1568"> <div data-bbox="279 929 430 1052">  </div> <div data-bbox="438 929 1101 1052"> <p>1. Set right height on target, see vehicle specification for which height. 2. Remove the front frame gauge 3. Start Tech Tool and follow the instructions</p> <p>Press Home button</p> </div> <div data-bbox="1109 929 1260 1052">  </div> <div data-bbox="438 1064 1117 1422">  </div> <div data-bbox="1220 1052 1260 1321"> 1 2 3 4 5 6 7 8 9 10 </div> <div data-bbox="470 1433 566 1556">  <p>Back</p> </div> <div data-bbox="965 1433 1061 1556">  <p>Next</p> </div> </div>	
	<div data-bbox="271 1612 1173 1859"> <p>Set the height on target according to the vehicle's configurations given in Tech Tool.</p> <p>When setting the height make sure that the yellow or blue arrow is level with the lower edge of the calibrating target.</p> </div> <div data-bbox="1181 1612 1428 1859">  </div>	
18.	<div data-bbox="271 1881 1428 2027"> <div data-bbox="279 1892 367 2027">  </div> <div data-bbox="375 1892 1428 2027"> <p>If not removed, the frame gauges will become an obstacle in the calibration process and may result in incorrect calibration values.</p> </div> </div>	
19.	<div data-bbox="271 2049 1428 2083"> <p>Positioning complete. Tech Tool can now be initiated.</p> </div>	

## 16.3 Measurement with single board calibration stand



A wheel alignment of the drive axle must be performed before starting measurement.

1.	<div><div><div></div><div><div> Camera calibration</div><div> ADAS</div></div></div></div>	
	In the Cam-aligner main window, click on <b>[Adas]</b>	<div> Adas</div>
2.	<div><div><div></div><div></div><div></div><div></div><div></div><div></div></div><div><div> Back</div><div> FLS/LPOS</div><div> FLR/FLC</div></div><p>Click on ADAS calibration stand (single board)</p></div>	
3.	Choose calibrate: <b>[FLS/LPOS]</b> or	<div> FLS/LPOS</div>
	<b>[FLR/FLC]</b>	<div> FLR/FLC</div>

## 16.3.1 FLS/LPOS

Choose calibrate **[FLS/LPOS]** and press **[Next]**



Make sure that the rods are fully extended until they hit the stop rings. If not done correctly the measurement will be incorrect.

**Select Vehicle Model**  
**Press Next**

Volvo FH

\* Before starting this calibration process you must perform a wheel alignment check!

1

2

3

4

5


6


7

8

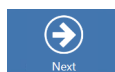
9

10

  
 Back

  
 Next

Select vehicle model and press **[Next]**




### 16.3.1.1 FLS

**Select sensor to calibrate, Camera(LPOS) or Radar(FLS)**  
**Press Next button to continue**

LPOS ☐

FLS ☒



1

2

3

4

5

6


7


8

9


10

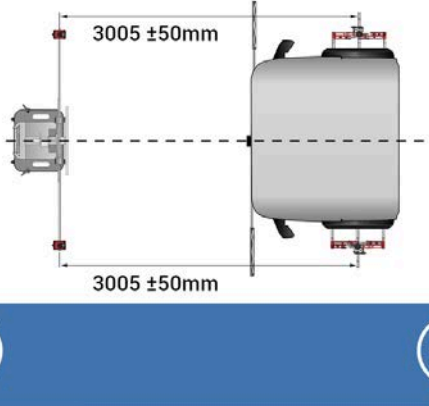


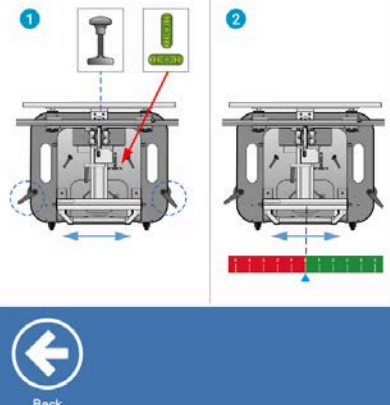
11

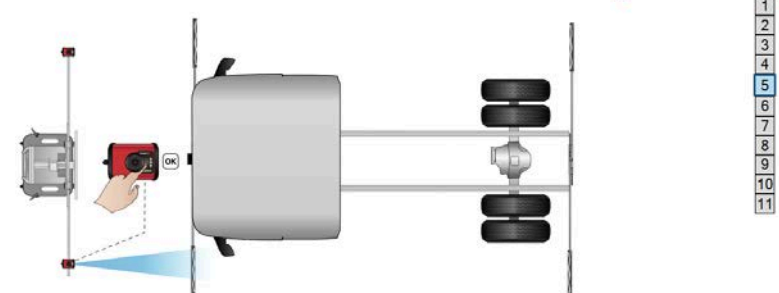

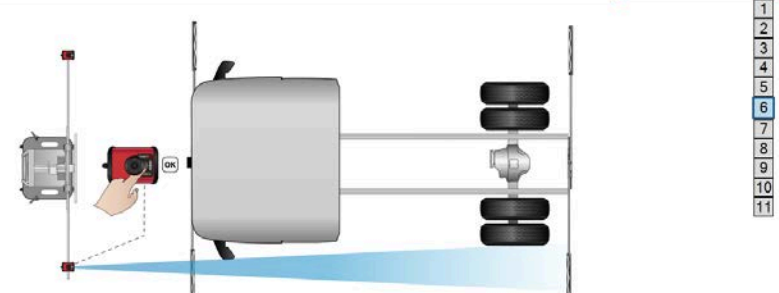

  
 Back

  
 Next

Choose calibrate **[FLS]** and press **[Next]**

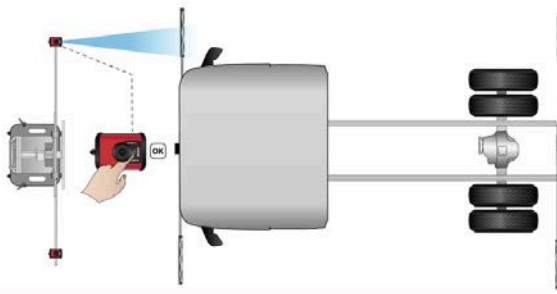



2.	<div data-bbox="231 197 1204 734"> <p style="text-align: center;"><b>Center unit in front of the Radar.</b>  <b>Set distance according to instructions</b>  <b>Press Next button to continue</b></p>  </div> <p>Place the target in front of the vehicle cab, perpendicular to the vehicle's centre line.</p>
3.	<div data-bbox="231 862 327 958">  </div> <p>For buses and UD trucks, measurements are to be taken between the front bumper and the calibration rod.</p>
4.	<div data-bbox="231 996 391 1041"> <p>Press <b>[Next]</b></p> </div> <div data-bbox="1141 981 1260 1052">  </div>
5.	<div data-bbox="231 1075 1204 1612"> <p style="text-align: center;">1. Level the unit.  2. Set sideways adjustment to zero.  3. Adjust height to blue arrow.</p> <p style="text-align: center;">Press Next button to continue</p>  </div> <p>Level the target. Then sideshift it and adjust to zero.</p>
6.	<p>Assemble the cameras to the calibration rods.</p>

7.	<div data-bbox="271 201 1244 302"> <div>On the left side on the vehicle, aim camera to the front marker.</div> <div>Press OK</div> </div> <div data-bbox="462 313 1244 604">  </div> <div data-bbox="271 627 1244 728">  </div> <p>Aim the camera at the front left marker, when the green diode lights up and the red bars in the camera view turns green, press <b>OK</b>.</p>
8.	<p>Rotate the front markers so that they are lying flat and not obstructing the path of the camera signal to the rear markers.</p>
9.	<div data-bbox="271 896 1244 996"> <div>On the left side on the vehicle, aim camera to the rear marker.</div> <div>Press OK</div> </div> <div data-bbox="462 1008 1244 1299">  </div> <div data-bbox="271 1321 1244 1422">  </div> <p>Aim the camera to the rear left marker, when the green diode lights up and the red bars in the camera view turns green, press <b>OK</b>. The green diode will light up and the red frame around the square will turn to green.</p>

10.

On the right side on the vehicle, aim camera to the front marker.
Press OK



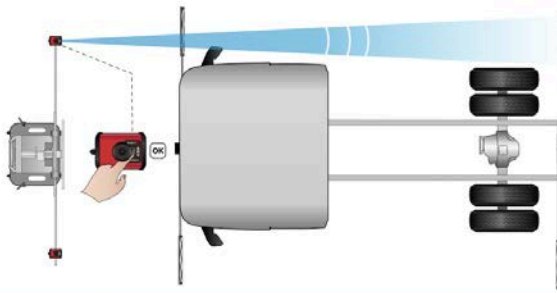



Back

Aim the camera at the front right marker, when the green diode lights up and the red bars in the camera view turns green, press **OK**.  
The green diode on the camera will light up and the red frame around the square will turn to green.

11.

On the right side on the vehicle, aim camera to the rear marker.
Press OK



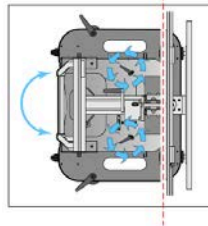



Back

Aim the camera at the rear right marker, when the green diode lights up and the red bars in the camera view turns green, press **OK**.  
The green diode on the camera will light up.

12.


Adjust value to zero.
Press OK





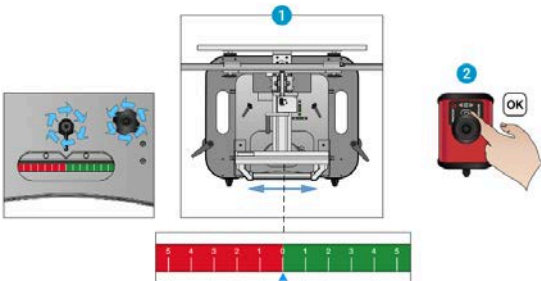
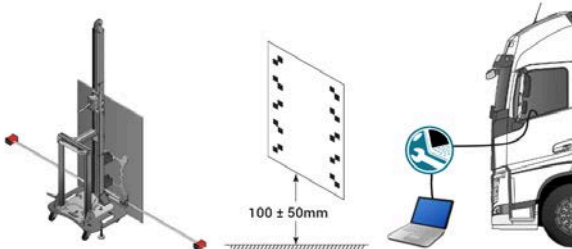
0.0°

-10-50510




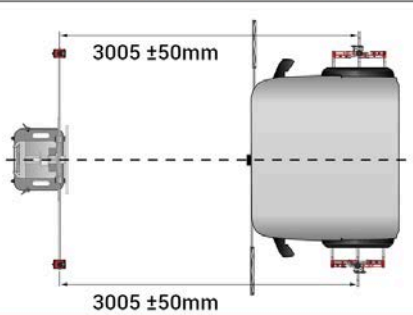
Back

Adjust the values until the bar is green and press **OK**. It is recommended to adjust to 0.

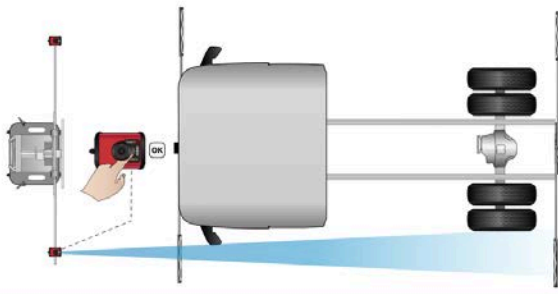

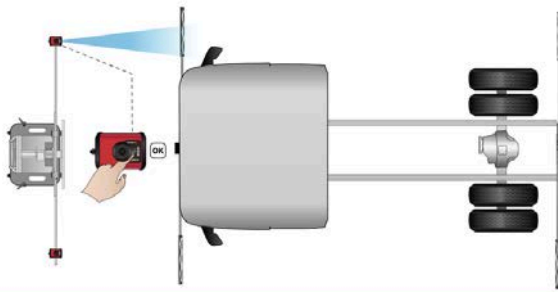

13.	Press <b>OK</b> .
14.	<div> <div> <div>Move the platform sideways according the value below.</div> <div>Press <b>OK</b></div> </div> <div>  </div> <div> <div>10</div> <div>11</div> </div> </div> <div> <div>Back</div> </div> <p>Slide the platform sideways until the set value is reached. Press <b>OK</b>.</p>
15.	<div> <div> <div>1.Set height of target to the value indicated below.</div> <div>2.Remove the front frame gauge</div> <div>3.Start Tech Tool and follow the instructions</div> </div> <div>Press Home button</div> </div> <div>  </div> <div> <div>10</div> <div>11</div> </div>

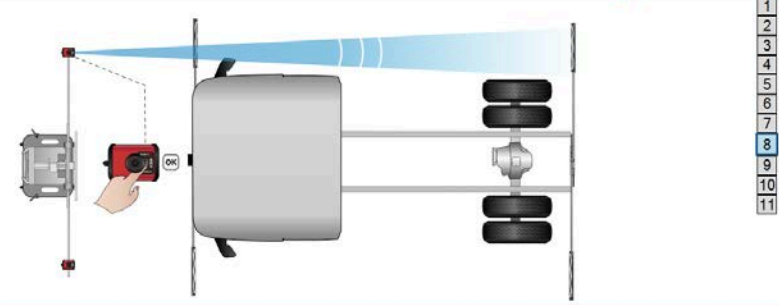

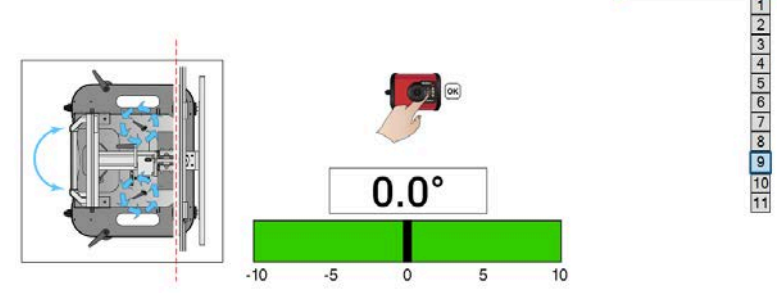

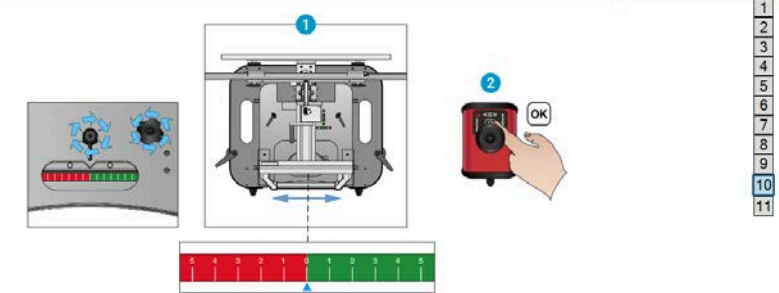

Back

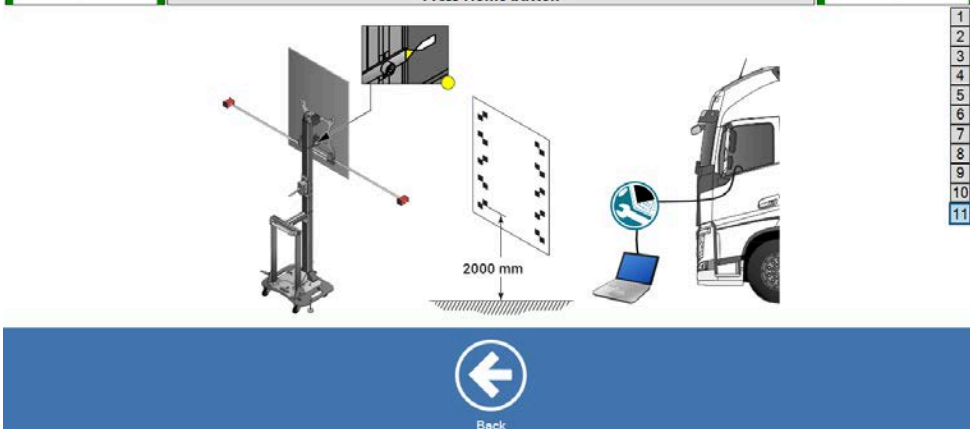
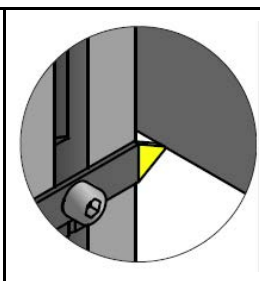

### 16.3.1.2 LPOS

1.	<div data-bbox="231 250 1117 784"> <p>Select sensor to calibrate, Camera(LPOS) or Radar(FLS) Press Next button to continue</p> <div data-bbox="478 403 845 672"> <p>LPOS <input checked="" type="checkbox"/></p> <p>FLS <input type="checkbox"/></p>  </div> <div data-bbox="414 683 941 772"> <p>Back Next</p> </div> </div>
	<div data-bbox="231 806 1260 884"> <p>Choose calibrate <b>[LPOS]</b> and press <b>[Next]</b></p> <p>Next</p> </div>
2.	<div data-bbox="231 907 1204 1467"> <p>Center unit in front of the Radar. Set distance according to instructions Press Next button to continue</p> <div data-bbox="510 1008 925 1321">  </div> <div data-bbox="430 1332 1005 1433"> <p>Back Next</p> </div> <p>Place the target in front of the vehicle cab, perpendicular to the vehicle's centre line.</p> </div>
3.	<div data-bbox="231 1489 1388 1668"> <p>Attach the tape measure holders to the calibration rods and measure the distance from the calibration rod to the centre of the reference axle on the wheel adapter.</p> <div data-bbox="231 1568 327 1668"> <p><b>i</b></p> </div> <p>For buses and UD trucks, measurements are to be taken between the front bumper and the calibration rod.</p> </div>
4.	<div data-bbox="231 1680 1260 1758"> <p>Press <b>[Next]</b></p> <p>Next</p> </div>

5.	<div data-bbox="271 201 1244 739"> <div> <div>1. Level the unit. 2. Set sideways adjustment to zero. 3. Adjust height to blue arrow.</div> <div>Press Next button to continue</div> <div> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> <div>8</div> <div>9</div> <div>10</div> <div>11</div> </div> </div> <div> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> <div>8</div> <div>9</div> <div>10</div> <div>11</div> </div> <div> <div>←</div> <div>Back</div> <div>→</div> <div>Next</div> </div> </div> <p>Level the target. Then sideshift it and adjust to zero.</p>
6.	Assemble the cameras to the calibration rods.
7.	<div data-bbox="271 840 1244 1366"> <div>On the left side on the vehicle, aim camera to the front marker.</div> <div>Press OK</div> <div> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> <div>8</div> <div>9</div> <div>10</div> <div>11</div> </div> </div> <div> <div>←</div> <div>Back</div> </div> <p>Aim the camera at the front left marker, when the green diode lights up and the red bars in the camera view turns green, press <b>OK</b>.</p>
8.	Rotate the front markers so that they are lying flat and not obstructing the path of the camera signal to the rear markers.

<p>9.</p>	<div data-bbox="231 190 1204 302"> <p>On the left side on the vehicle, aim camera to the rear marker.</p> <p>Press OK</p> </div> <div data-bbox="438 324 997 616">  </div> <div data-bbox="231 627 1204 728">  </div> <p>Aim the camera to the rear left marker, when the green diode lights up and the red bars in the camera view turns green, press <b>OK</b>. The green diode will light up and the red frame around the square will turn to green.</p>
<p>10.</p>	<div data-bbox="231 840 1204 952"> <p>On the right side on the vehicle, aim camera to the front marker.</p> <p>Press OK</p> </div> <div data-bbox="438 974 997 1265">  </div> <div data-bbox="231 1276 1204 1377">  </div> <p>Aim the camera at the front right marker, when the green diode lights up and the red bars in the camera view turns green, press <b>OK</b>. The green diode on the camera will light up and the red frame around the square will turn to green.</p>

11.	<div data-bbox="271 201 1244 302"> <p>On the right side on the vehicle, aim camera to the rear marker.</p> <p>Press OK</p> </div> <div data-bbox="462 313 1244 616">  </div> <div data-bbox="271 627 1244 728">  </div> <p>Aim the camera at the rear right marker, when the green diode lights up and the red bars in the camera view turns green, press <b>OK</b>. The green diode on the camera will light up.</p>
12.	<div data-bbox="271 851 1244 952"> <p>Adjust value to zero.</p> <p>Press OK</p> </div> <div data-bbox="462 963 1244 1254">  </div> <div data-bbox="271 1265 1244 1377">  </div> <p>Adjust the values until the bar is green and press <b>OK</b>. It is recommended to adjust to 0.</p>
13.	<p>Press <b>OK</b>.</p>
14.	<div data-bbox="271 1489 1244 1590"> <p>Move the platform sideways according the value below.</p> <p>Press OK</p> </div> <div data-bbox="462 1601 1244 1892">  </div> <div data-bbox="271 1904 1244 2016">  </div> <p>Slide the platform sideways until the set value is reached. Press <b>OK</b>.</p>

15.	<div data-bbox="231 190 1204 302"> <p>1.Set height of target to the value indicated below. 2.Remove the front frame gauge 3.Start Tech Tool and follow the instructions</p> <p>Press Home button</p> </div> <div data-bbox="231 302 1204 728">  </div>	<div data-bbox="1204 302 1396 526"> <p>1 2 3 4 5 6 7 8 9 10 11</p> </div>
16.	<p>When setting the height make sure that the yellow or blue arrow is level with the lower edge of the calibrating target.</p>	
17.	<p>Remove the frame gauges.</p> <div data-bbox="231 1108 327 1209">  </div> <p>If not removed, the frame gauges will become an obstacle in the calibration process and may result in incorrect calibration values.</p>	
18.	<p>Positioning complete. Tech Tool can now be initiated.</p>	

## 16.3.2 FLR/FLC

Choose calibrate **[FLR/FLC]** and press **[Next]**



Make sure that the rods are fully extended until they hit the stop rings. If not done correctly the measurement will be incorrect.

**Select Vehicle Model**  
**Press Next**

Volvo FH

\* Before starting this calibration process you must perform a wheel alignment check!

1

2

3

4

5


6


7

8

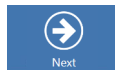
9

10






  
 Back

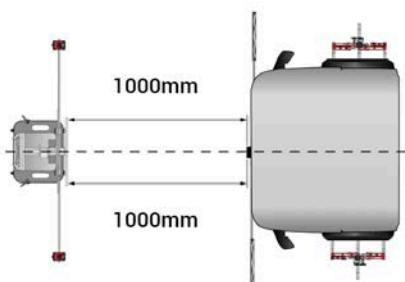

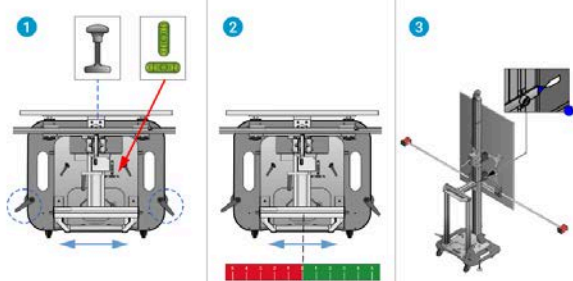
  
 Next

Select vehicle model and press **[Next]**



### 16.3.2.1 FLR

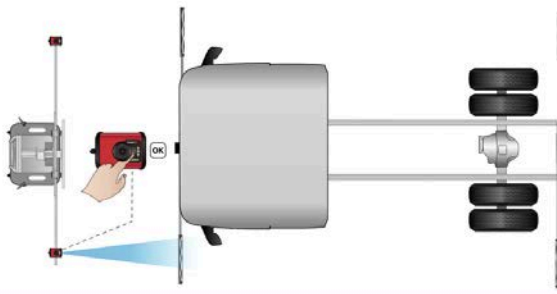
1.	<div data-bbox="231 253 1045 784"> <p>Select sensor to calibrate, Camera(FLC) or Radar(FLR) Press Next button to continue</p> <div data-bbox="502 414 853 660"> <p>FLC <input type="checkbox"/></p> <p>FLR <input checked="" type="checkbox"/></p>  </div> <div data-bbox="1013 358 1045 560"> 1 2 3 4 5 6 7 8 9 10 11 </div> <div data-bbox="231 683 1045 784"> <div>←</div> <div>→</div> <div>Back</div> <div>Next</div> </div> </div>	<div data-bbox="1145 806 1260 884">  </div>
2.	<div data-bbox="231 907 1045 1467"> <p>Measure distance from center of the Radar to ground. Enter value below Press Next to continue</p> <div data-bbox="446 1108 726 1153"> Distance to floor <input type="text" value="0"/> mm </div> <div data-bbox="726 1075 869 1254">  </div> <div data-bbox="1013 1008 1045 1232"> 1 2 3 4 5 6 7 8 9 10 11 12 </div> <div data-bbox="231 1332 1045 1433"> <div>←</div> <div>→</div> <div>Back</div> <div>Next</div> </div> </div>	<div data-bbox="1141 907 1348 1433">  </div>
3.	<div data-bbox="231 1500 1136 1568"> <p>Press <b>[Next]</b></p> </div>	<div data-bbox="1145 1489 1260 1568">  </div>


4.	<div data-bbox="268 197 1082 734"> <p style="text-align: center;"><b>Center unit in front of the Radar.</b>  <b>Set distance according to instructions</b>  <b>Press Next button to continue</b></p>  </div> <p>Place the target in front of the vehicle cab, perpendicular to the vehicle's centre line.</p>
5.	<p>Attach the tape measure holders to the calibration rods and measure the distance from the calibration rod to the centre of the reference axle on the wheel adapter.</p> <div data-bbox="268 862 1423 952">  <p>For buses and UD trucks, measurements are to be taken between the front bumper and the calibration rod.</p> </div>
6.	<div data-bbox="268 981 1244 1518"> <p style="text-align: center;">1. Level the unit.  2. Set sideways adjustment to zero.  3. Adjust height to blue arrow.</p> <p style="text-align: center;">Press Next button to continue</p>  </div> <p>Level the target. Then sideshift it and adjust to zero.</p>
7.	<p>Assemble the cameras to the calibration rods.</p>

8.

On the left side on the vehicle, aim camera to the front marker.

Press OK





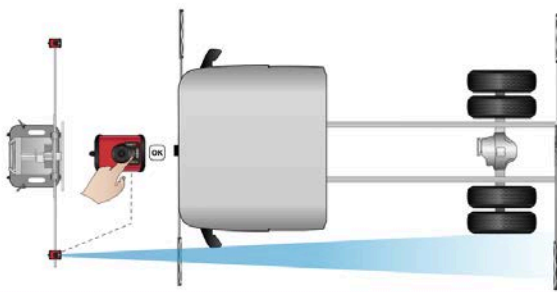
Aim the camera at the front left marker, when the green diode lights up and the red bars in the camera view turns green, press **OK**.


9.

Rotate the front markers so that they are lying flat and not obstructing the path of the camera signal to the rear markers.

On the left side on the vehicle, aim camera to the rear marker.

Press OK



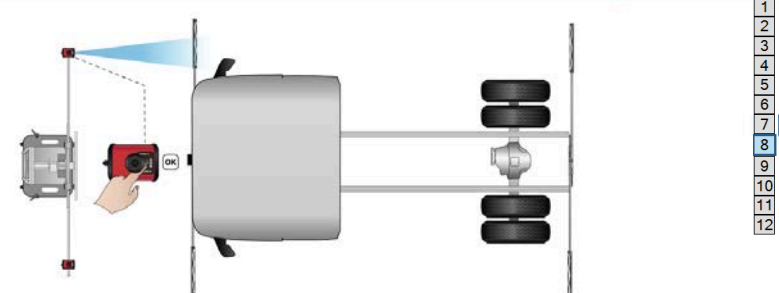
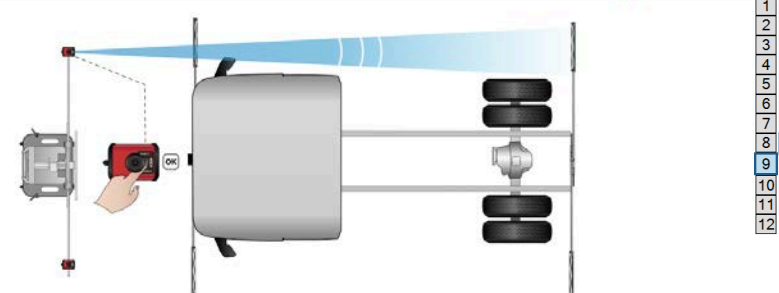
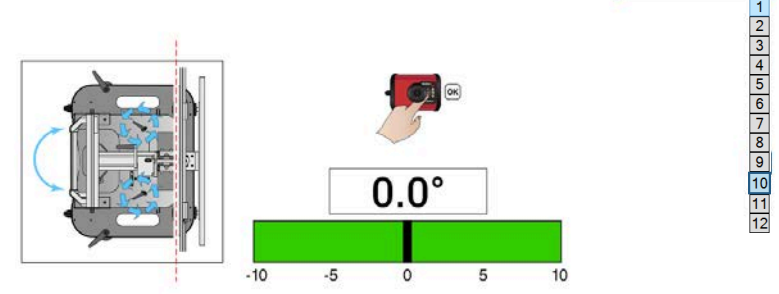


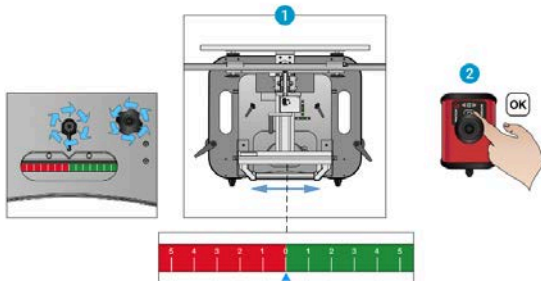
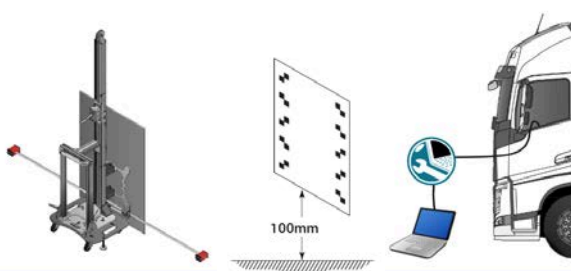
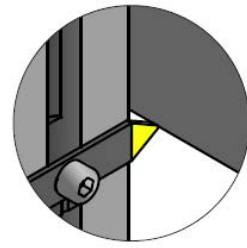

Aim the camera to the rear left marker and press **OK**.  
The green diode will light up and the red frame around the square will turn to green.

T 176 1 2501 – Rev B – en-GB



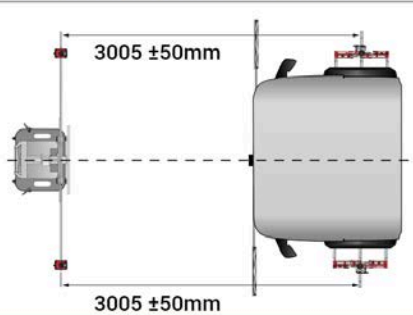


Operator Manual

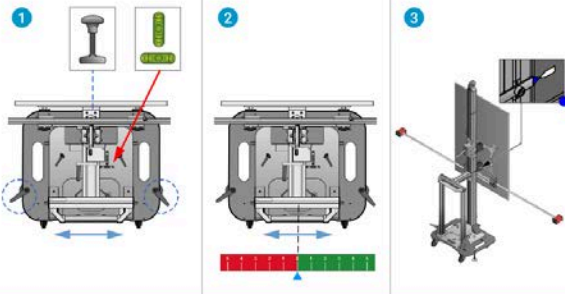


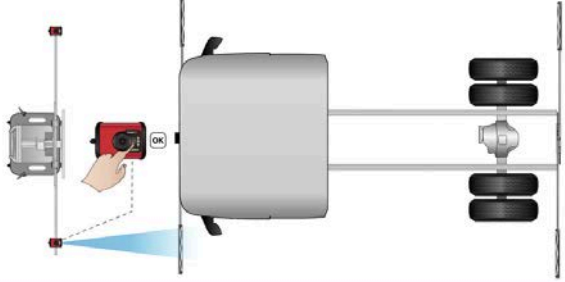

119

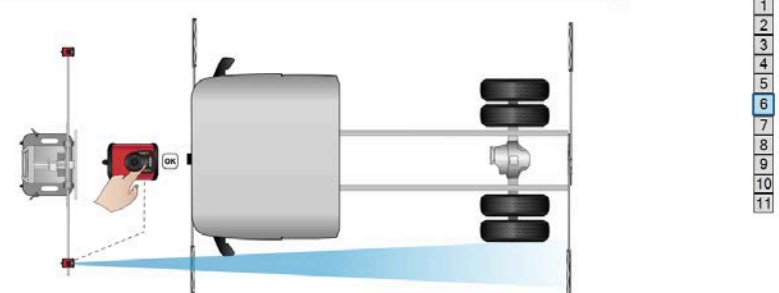
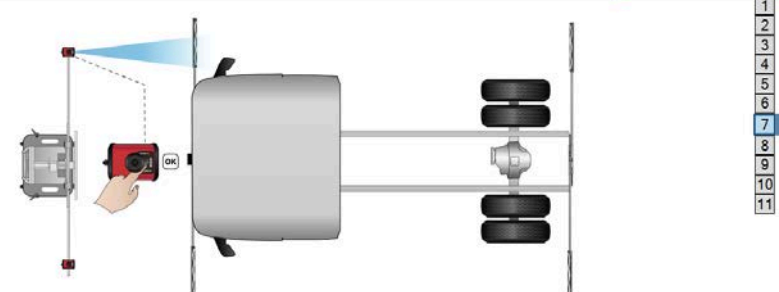
11.	<div data-bbox="271 201 1244 302"> <div>On the right side on the vehicle, aim camera to the front marker.</div> <div>Press OK</div> </div> <div data-bbox="462 313 1244 604">  </div> <div data-bbox="271 627 1244 728"> <div>←</div> <div>Back</div> </div> <p>Aim the camera at the front right marker, when the green diode lights up and the red bars in the camera view turns green, press <b>OK</b>. The green diode on the camera will light up and the red frame around the square will turn to green.</p>
12.	<div data-bbox="271 851 1244 952"> <div>On the right side on the vehicle, aim camera to the rear marker.</div> <div>Press OK</div> </div> <div data-bbox="462 963 1244 1254">  </div> <div data-bbox="271 1276 1244 1377"> <div>←</div> <div>Back</div> </div> <p>Aim the camera at the rear right marker, when the green diode lights up and the red bars in the camera view turns green, press <b>OK</b>. The green diode on the camera will light up.</p>
13.	<div data-bbox="271 1500 1244 1601"> <div>Adjust value to zero.</div> <div>Press OK</div> </div> <div data-bbox="462 1612 1244 1904">  </div> <div data-bbox="271 1926 1244 2027"> <div>←</div> <div>Back</div> </div> <p>Adjust the values until the bar is green and press <b>OK</b>. It is recommended to adjust to 0.</p>

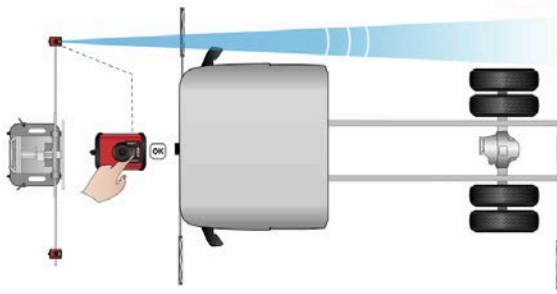

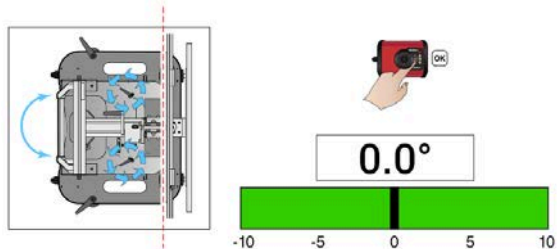

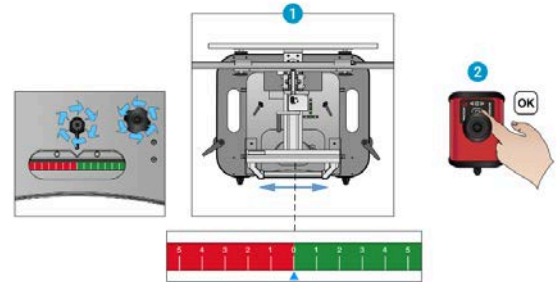

14.	Press <b>OK</b> .
15.	<div> <div> <div>Move the platform sideways according the value below.</div> <div>Press OK</div> <div>  </div> <div> <div>←</div> <div>Back</div> </div> </div> <p>Slide the platform sideways until the set value is reached. Press <b>OK</b>.</p> </div>
16.	<div> <div> <div>1.Set height of target to the value indicated below.</div> <div>2.Remove the front frame gauge</div> <div>3.Start Tech Tool and follow the instructions</div> <div>Press Home button</div> </div> <div>  </div> <div> <div>←</div> <div>Back</div> </div> </div> <p>Set the height on target according to the vehicle's configurations given in Tech Tool.</p>
17.	<p>When setting the height make sure that the yellow or blue arrow is level with the lower edge of the calibrating target.</p> 
18.	<p>Remove the frame gauges.</p> <div>  <p>If not removed, the frame gauges will become an obstacle in the calibration process and may result in incorrect calibration values.</p> </div>
19.	Positioning complete. Tech Tool can now be initiated.

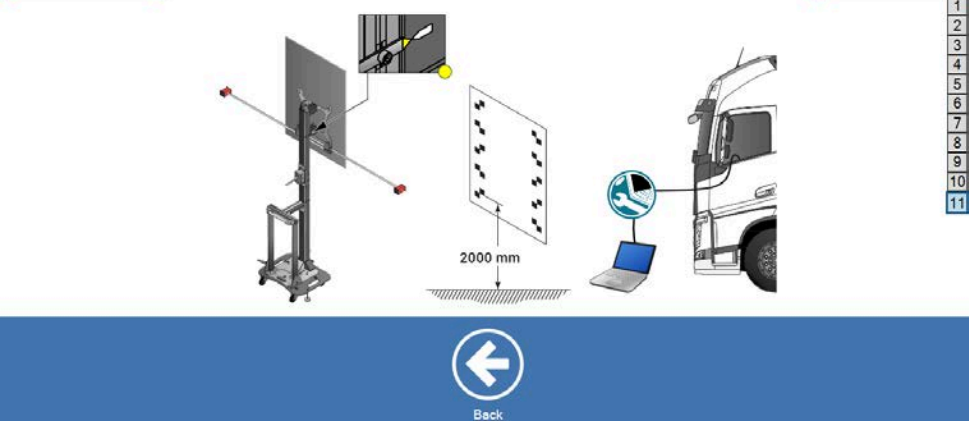
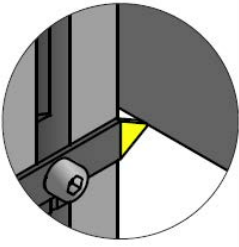

### 16.3.2.2 FLC

1.	<div data-bbox="271 246 1085 784"> <p>Select sensor to calibrate, Camera(FLC) or Radar(FLR) Press Next button to continue</p> <div data-bbox="542 403 893 672"> <p>FLC <input checked="" type="checkbox"/></p> <p>FLR <input type="checkbox"/></p>  </div> <div data-bbox="430 683 925 772"> <p>Back</p> <p>Next</p> </div> </div>	
	Choose calibrate <b>[FLC]</b> and press <b>[Next]</b>	
2.	<div data-bbox="271 896 1085 1456"> <p>Center unit in front of the Camera. Set distance according to instructions Press Next button to continue</p> <div data-bbox="510 1008 925 1321">  </div> <div data-bbox="430 1332 925 1422"> <p>Back</p> <p>Next</p> </div> </div> <p>Place the target in front of the vehicle cab, perpendicular to the vehicle's centre line.</p>	
3.	<p>Attach the tape measure holders to the calibration rods and measure the distance from the calibration rod to the centre of the reference axle on the wheel adapter.</p> <div data-bbox="271 1568 359 1657">  </div> <p>For buses and UD trucks, measurements are to be taken between the front bumper and the calibration rod.</p>	
4.	Press <b>[Next]</b>	

5.	<div data-bbox="231 201 1204 728"> <p>1. Level the unit. 2. Set sideways adjustment to zero. 3. Adjust height to blue arrow.</p> <p>Press Next button to continue</p>  <div>  Back          Next       </div> </div> <p>Level the target. Then sideshift it and adjust to zero.</p>
6.	<p>Assemble the cameras to the calibration rods.</p>
7.	<div data-bbox="231 840 1204 1377"> <p>On the left side on the vehicle, aim camera to the front marker.</p> <p>Press OK</p>  <div>  Back       </div> </div> <p>Aim the camera at the front left marker. The green diode on the camera will light up and the red bars in the camera view will turn green. Then press <b>OK</b>.</p>
8.	<p>Rotate the front markers so that they are lying flat and not obstructing the path of the camera signal to the rear markers.</p>

9.	<div data-bbox="271 190 1244 302"> <div>On the left side on the vehicle, aim camera to the rear marker.</div> <div>Press OK</div> </div> <div data-bbox="462 313 1244 604">  </div> <div data-bbox="271 616 1244 728"> <div>←</div> <div>Back</div> </div> <p>Aim the camera to the rear left marker, when the green diode lights up and the red bars in the camera view turns green, press <b>OK</b>. The green diode will light up and the red frame around the square will turn to green.</p>
10.	<div data-bbox="271 840 1244 952"> <div>On the right side on the vehicle, aim camera to the front marker.</div> <div>Press OK</div> </div> <div data-bbox="462 963 1244 1254">  </div> <div data-bbox="271 1265 1244 1377"> <div>←</div> <div>Back</div> </div> <p>Aim the camera at the front right marker, when the green diode lights up and the red bars in the camera view turns green, press <b>OK</b>. The green diode on the camera will light up and the red frame around the square will turn to green.</p>

11.	<div data-bbox="231 201 1204 302"> <p>On the right side on the vehicle, aim camera to the rear marker.</p> <p>Press OK</p> </div> <div data-bbox="438 324 997 616">  </div> <div data-bbox="1173 302 1204 526"> <table border="1"> <tr><td>1</td></tr> <tr><td>2</td></tr> <tr><td>3</td></tr> <tr><td>4</td></tr> <tr><td>5</td></tr> <tr><td>6</td></tr> <tr><td>7</td></tr> <tr><td>8</td></tr> <tr><td>9</td></tr> <tr><td>10</td></tr> <tr><td>11</td></tr> </table> </div> <div data-bbox="231 627 1204 728">  </div> <p>Aim the camera at the rear right marker, when the green diode lights up and the red bars in the camera view turns green, press <b>OK</b>. The green diode on the camera will light up.</p>	1	2	3	4	5	6	7	8	9	10	11
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12.	<div data-bbox="231 851 1204 952"> <p>Adjust value to zero.</p> <p>Press OK</p> </div> <div data-bbox="438 996 997 1243">  </div> <div data-bbox="1173 952 1204 1176"> <table border="1"> <tr><td>1</td></tr> <tr><td>2</td></tr> <tr><td>3</td></tr> <tr><td>4</td></tr> <tr><td>5</td></tr> <tr><td>6</td></tr> <tr><td>7</td></tr> <tr><td>8</td></tr> <tr><td>9</td></tr> <tr><td>10</td></tr> <tr><td>11</td></tr> </table> </div> <div data-bbox="231 1265 1204 1377">  </div> <p>Adjust the values until the bar is green and press <b>OK</b>. It is recommended to adjust to 0.</p>	1	2	3	4	5	6	7	8	9	10	11
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
13.	<p>Press <b>OK</b>.</p>											
14.	<div data-bbox="231 1489 1204 1590"> <p>Move the platform sideways according the value below.</p> <p>Press OK</p> </div> <div data-bbox="438 1612 997 1892">  </div> <div data-bbox="1173 1590 1204 1814"> <table border="1"> <tr><td>1</td></tr> <tr><td>2</td></tr> <tr><td>3</td></tr> <tr><td>4</td></tr> <tr><td>5</td></tr> <tr><td>6</td></tr> <tr><td>7</td></tr> <tr><td>8</td></tr> <tr><td>9</td></tr> <tr><td>10</td></tr> <tr><td>11</td></tr> </table> </div> <div data-bbox="231 1915 1204 2027">  </div> <p>Slide the platform sideways until the set value is reached. Press <b>OK</b>.</p>	1	2	3	4	5	6	7	8	9	10	11
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												

15.	<div data-bbox="271 201 1244 739"> <p>1.Set height of target to the value indicated below. 2.Remove the front frame gauge 3.Start Tech Tool and follow the instructions</p> <p>Press Home button</p>  <p>2000 mm</p> <p>Back</p> </div>	<div data-bbox="1212 291 1244 537"> 1 2 3 4 5 6 7 8 9 10 11 </div>
16.	<p>When setting the height make sure that the yellow or blue arrow is level with the lower edge of the calibrating target.</p>	
17.	<p>Remove the frame gauges.</p> <div data-bbox="271 1108 367 1209">  </div> <p>If not removed, the frame gauges will become an obstacle in the calibration process and may result in incorrect calibration values.</p>	
18.	<p>Positioning complete. Tech Tool can now be initiated.</p>	

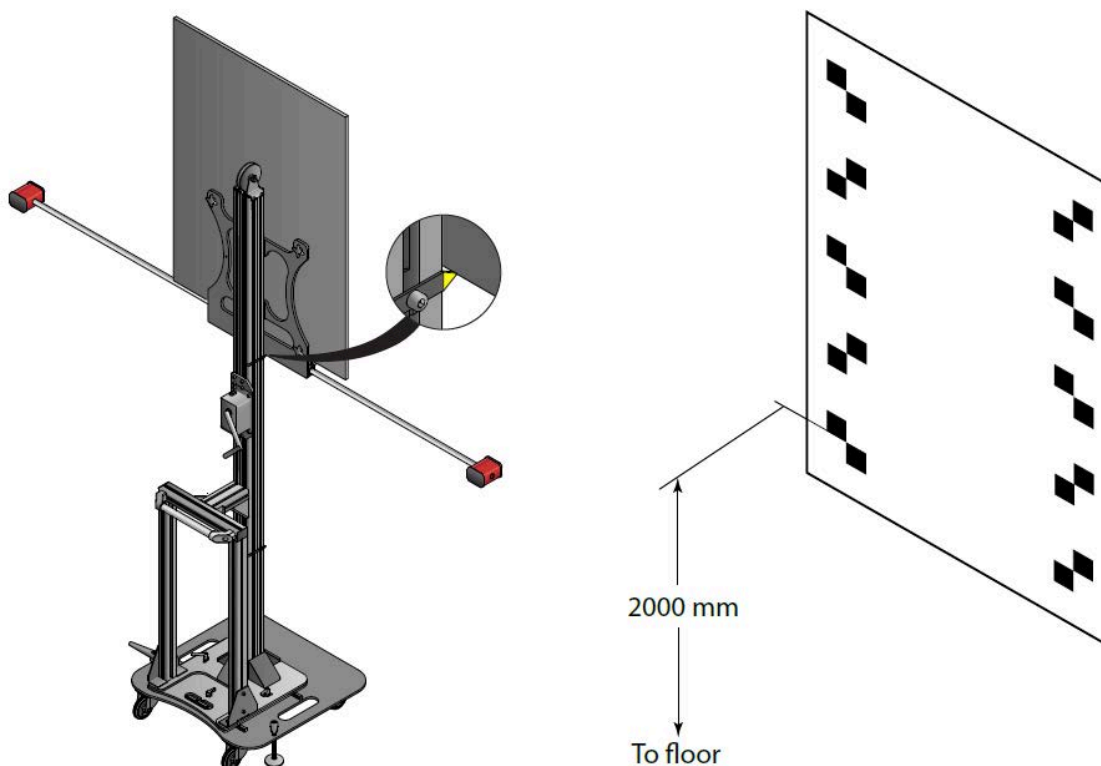
## 16.4 Calibration of target

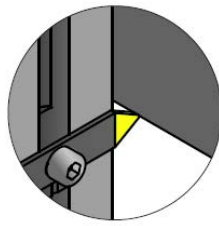
The target must be calibrated once a week or after a new installation on a levelled floor.

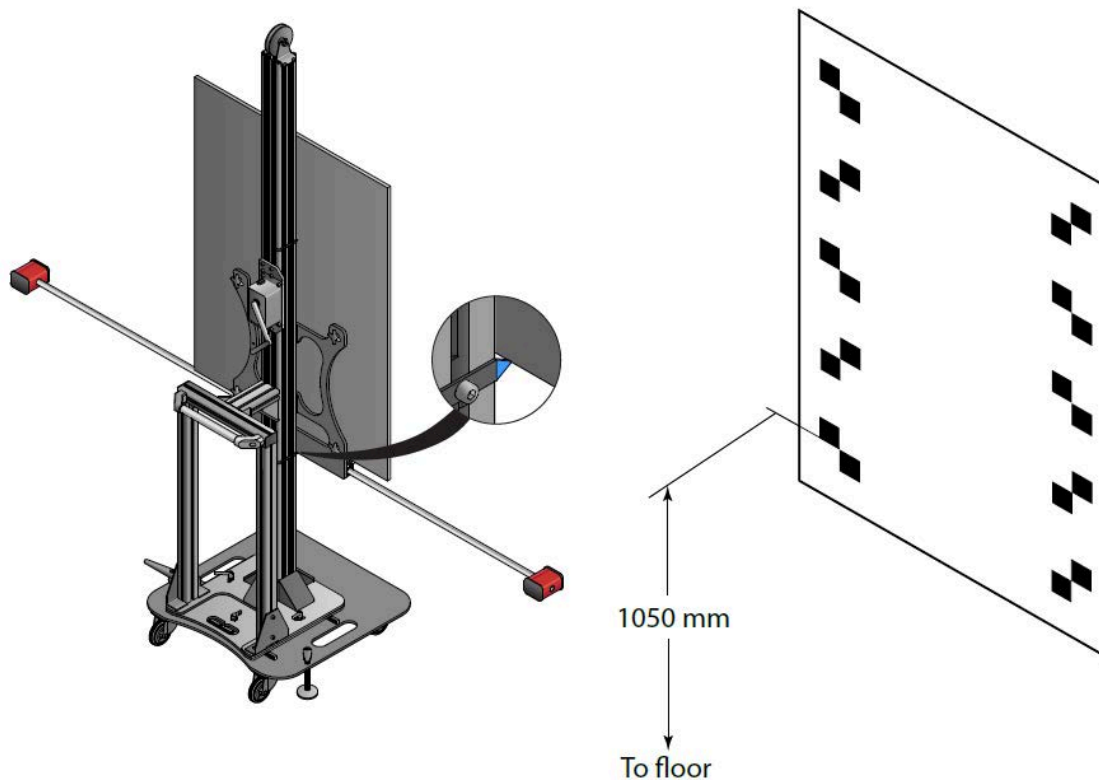


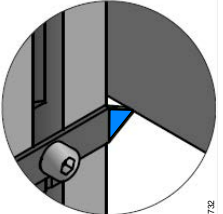
A wheel alignment of the driven axle must be performed before calibration.

### LPOS calibration with high setting (2000 mm)



1.	Adjust the height of the target by rotating the crank clockwise.	
2.	Adjust the height of the target until the little yellow arrow is exactly level with the bottom edge of the red target holder.	
3.	Check the height of the target by measuring from the bottom edge of the second to bottom black square on the target to the floor.	

**LPOS calibration with low setting (1050 mm)**


1.	Adjust the height of the target by rotating the crank counterclockwise.	
2.	Adjust the height of the target until the little blue arrow is exactly level with the bottom edge of the red target holder.	
3.	Check the height of the target by measuring from the bottom edge of the second to bottom black square on the target to the floor.	

## 17 ACC/LDWS measurement for Iveco



A wheel alignment of the drive axle must be performed before starting measurement.




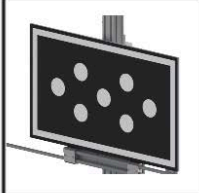
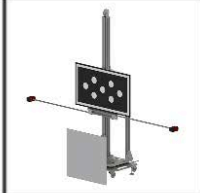

### Caution

**Hazard:** Floor obstacles, uneven floor and wind gusts can make the calibration stand unstable. Be cautious when handling the calibration stand near a service pit.

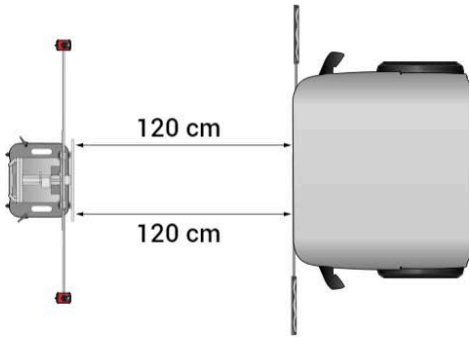



**Risk:** Tip risk

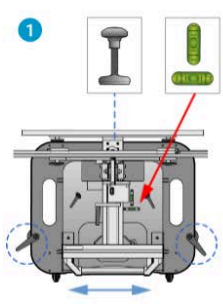
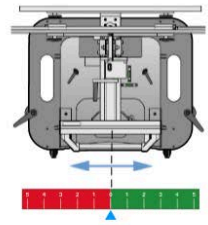
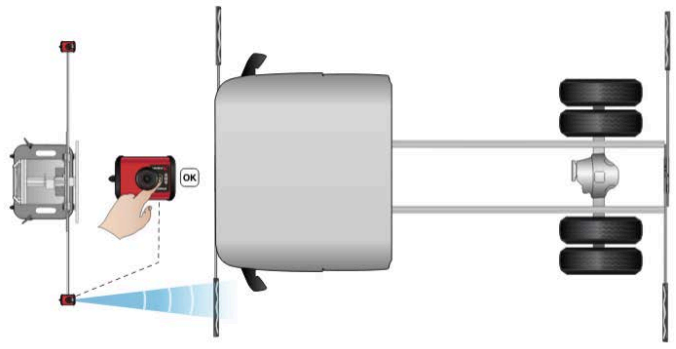
**How to avoid:** Be cautious when handling the calibration stand near a service pit.

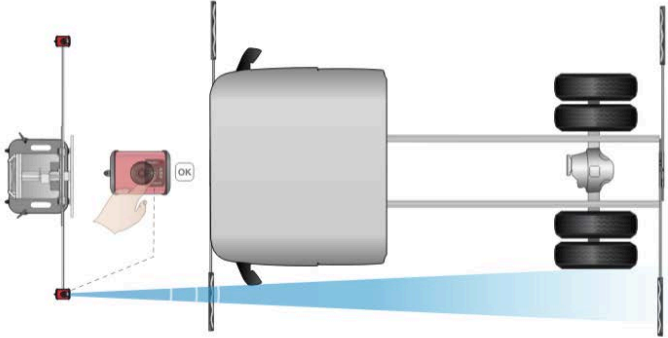
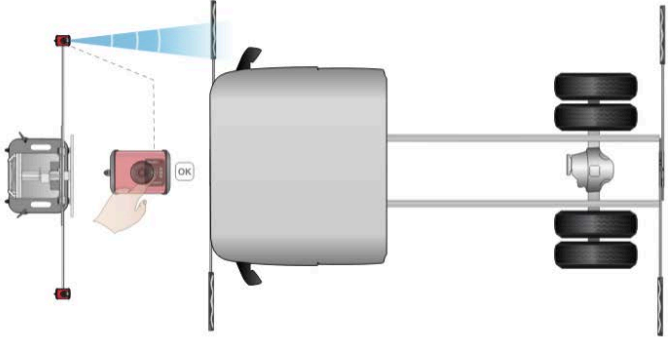
1.	
	<p>In the Cam-aligner main window, click on <b>[Adas]</b></p> <div style="text-align: right;">  </div>
2.	 <div style="text-align: center; margin-top: 20px;"> <div style="display: inline-block; width: 30%; text-align: center;">               Back         </div> <div style="display: inline-block; width: 30%; text-align: center;">               Next         </div> </div>
	<p>Choose calibrate <b>[ACC/LDWS]</b> and press <b>[Next]</b></p> <div style="text-align: right;">  </div>

3.	<div style="border: 1px solid black; padding: 10px; text-align: center;"> <b>Choose application</b>  <b>Press Next button to continue</b> </div> <div style="display: flex; justify-content: space-around; margin: 10px 0;">    </div> <div style="background-color: #4a7ebb; color: white; text-align: center; padding: 10px; margin-top: 10px;">   Back </div>
	<p>Choose what you want to measure. From left to right: ACC only, LDWS only, both ACC &amp; LDWS. The instruction below describes the complete sequence for measuring both ACC &amp; LDWS. For LDWS calibration, see <a href="#">17.2 "LDWS calibration"</a>, <a href="#">page 136</a>.</p>

## 17.1 ACC calibration

1.	<div style="border: 1px solid black; padding: 10px; text-align: center;"> <b>Place unit at the correct distance.</b>  <b>Press Next button to continue</b> </div> <div style="display: flex; align-items: center; justify-content: center; margin: 10px 0;">  <div style="margin-left: 10px;"> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">1</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">2</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">3</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">4</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">5</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">6</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">7</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">8</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">9</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">10</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">11</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">12</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">13</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">14</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">15</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">16</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">17</div> <div style="border: 1px solid black; padding: 2px; margin-bottom: 2px;">18</div> </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="background-color: #4a7ebb; color: white; text-align: center; padding: 10px; width: 45%;">   Back </div> <div style="background-color: #4a7ebb; color: white; text-align: center; padding: 10px; width: 45%;">   Next </div> </div>	
	<p>Place the target in front of the vehicle cab, perpendicular to the vehicle's centre line. Use tape measure to measure the distance from the vehicle's front to the measuring target.</p>	
2.	Press <b>[Next]</b>	<div style="background-color: #4a7ebb; color: white; text-align: center; padding: 10px; width: 50px; margin: 0 auto;">   Next </div>

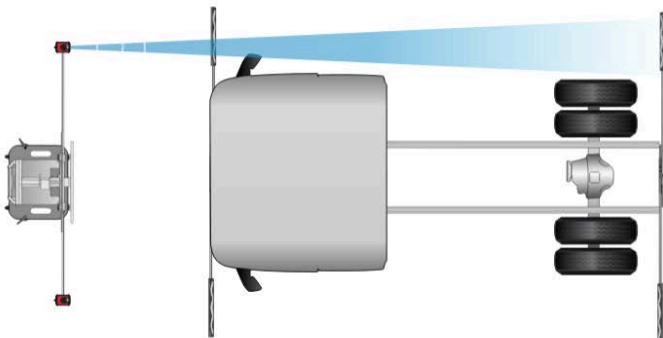
3.	<div data-bbox="271 190 1268 840"> <p><b>1. Level the unit.</b> <b>2. Set sideways adjustment to zero.</b></p> <p><b>Press Next button to continue</b></p> <div> <div> <p>1</p>  </div> <div> <p>2</p>  </div> </div> <div> <div>← Back</div> <div>→ Next</div> </div> </div> <p>Level the calibration stand. Then side shift it and adjust to zero.</p>
4.	<p>Assemble the cameras to the calibration rods.</p>
5.	<div data-bbox="271 963 1404 1612"> <p><b>On the left side on the vehicle, aim camera to the front marker.</b></p> <p><b>Press OK</b></p>  <div>← Back</div> </div> <p>Aim the camera at the front left marker and press <b>OK</b>.</p>
6.	<p>Rotate the left front marker so that it is lying flat and not obstructing the path of the camera signal to the rear markers.</p>

7.	<div data-bbox="236 203 1369 840"> <div> <div></div> <div>On the left side on the vehicle, aim camera to the rear marker.</div> <div>Press OK</div> </div> <div>  </div> <div> <div>1</div><div>2</div><div>3</div><div>4</div><div>5</div><div>6</div><div>7</div><div>8</div><div>9</div><div>10</div><div>11</div><div>12</div><div>13</div><div>14</div><div>15</div><div>16</div><div>17</div><div>18</div> </div> </div>
8.	<div data-bbox="236 927 1369 1563"> <div> <div></div> <div>On the right side on the vehicle, aim camera to the front marker.</div> <div>Press OK</div> </div> <div>  </div> <div> <div>1</div><div>2</div><div>3</div><div>4</div><div>5</div><div>6</div><div>7</div><div>8</div><div>9</div><div>10</div><div>11</div><div>12</div><div>13</div><div>14</div><div>15</div><div>16</div><div>17</div><div>18</div> </div> </div>
9.	<div data-bbox="236 1650 1369 1697"> <div>Rotate the right front marker so that it is lying flat and not obstructing the path of the camera signal to the rear markers.</div> </div>

10.

**On the right side on the vehicle, aim camera to the rear marker.**

**Press OK**



←  
Back

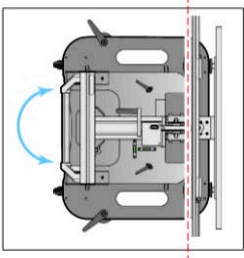
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18


Aim the camera at the rear right marker and press **OK**.

11.

**Adjust value to zero.**

**Press OK**





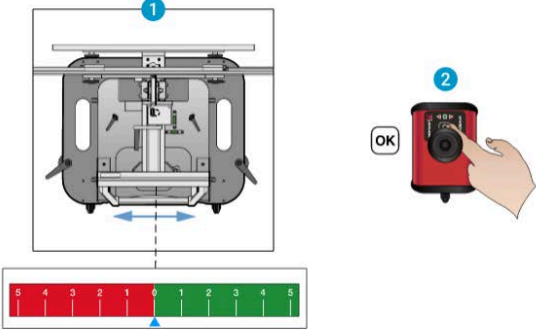

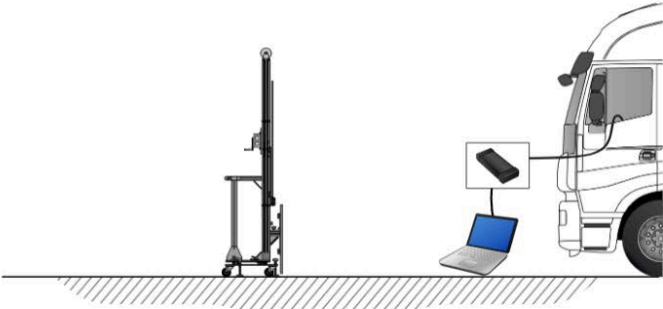

0.00°

-10-50510


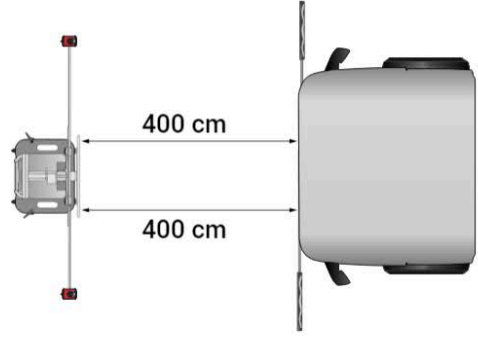


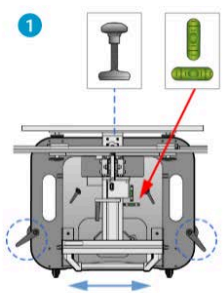
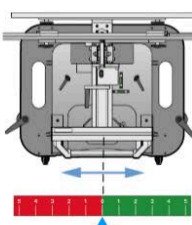
←  
Back

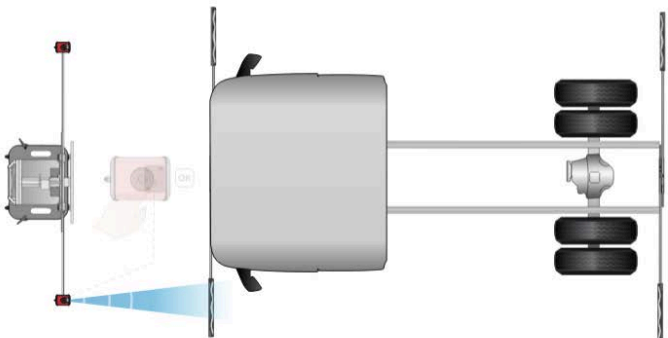

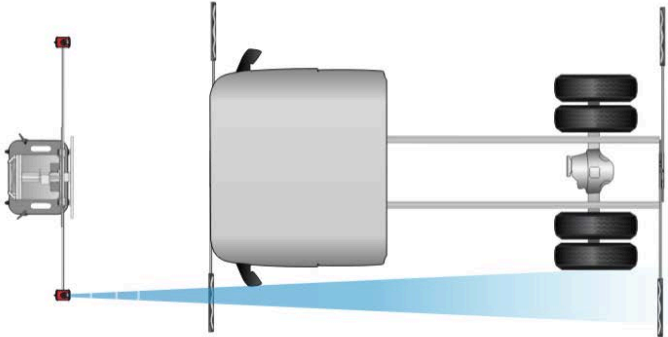

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18

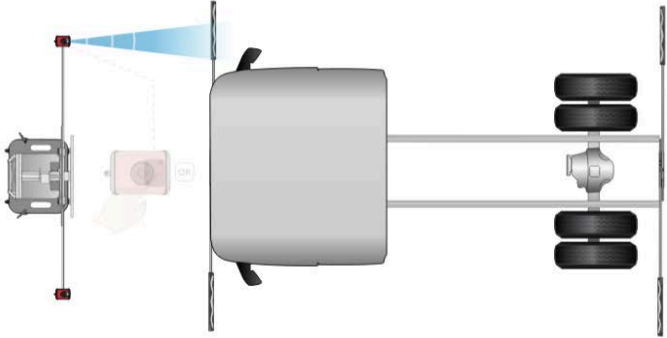
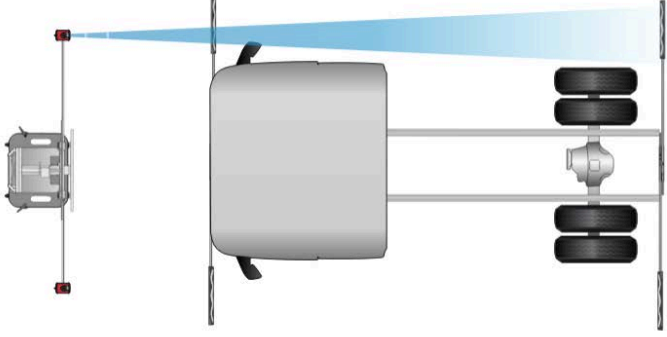
Adjust the values until the bar is green and press **OK**. It is recommended to adjust to 0.

12.	<div data-bbox="236 203 1369 835"> <div>Adjust value to zero.</div> <div>Press OK</div> <div>  </div> <div>Back</div> </div> <p>Slide the platform sideways until the set value is reached. Press <b>OK</b>.</p>
13.	<div data-bbox="236 976 323 1059">  </div> <div data-bbox="347 976 1377 1037"> <p>If not removed, the frame gauges will become an obstacle in the calibration process and may result in incorrect calibration values.</p> </div>
14.	<div data-bbox="236 1090 1369 1722"> <div>Start calibration of ACC</div> <div>When done press Next</div> <div>  </div> <div>Back      Next</div> </div> <p>Positioning complete. Use the vehicle calibration tool to calibrate the ACC equipment.</p>
15.	<div data-bbox="236 1818 1134 1877"> <p>When done, press <b>[Next]</b> to continue to LDWS calibration.</p> </div> <div data-bbox="1145 1809 1262 1877">  </div>

## 17.2 LDWS calibration

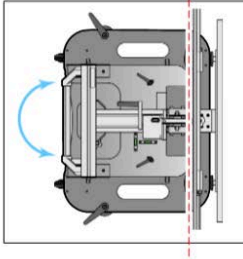
1.	<div data-bbox="271 268 1268 907"> <div>  </div> <div> <b>Place unit at the correct distance.</b>  <b>Press Next button to continue</b> </div> <div>  </div> <div> <div>← Back</div> <div>Next →</div> </div> </div> <p>Place the target in front of the vehicle cab, perpendicular to the vehicle's centre line. Use tape measure to measure the distance from the vehicle's front to the measuring target.</p>
2.	<div data-bbox="271 1019 1173 1097"> Press <b>[Next]</b> </div> <div data-bbox="1181 1019 1300 1097">  </div>
3.	<div data-bbox="271 1120 1268 1780"> <div>  </div> <div> <b>1. Level the unit.</b>  <b>2. Set sideways adjustment to zero.</b>  <b>Press Next button to continue</b> </div> <div> <div>  </div> <div>  </div> </div> <div> <div>← Back</div> <div>Next →</div> </div> </div> <p>Level the calibration stand. Then side shift it and adjust to zero.</p>
4.	Assemble the cameras to the calibration rods.


5.	<div data-bbox="236 203 1369 835"> <div> <div></div> <div>On the left side on the vehicle, aim camera to the front marker.</div> <div>Press OK</div> </div> <div>  <div>  <div>Back</div> </div> </div> </div> <div data-bbox="236 869 861 902">Aim the camera at the front left marker and press <b>OK</b>.</div>
6.	Rotate the left front marker so that it is lying flat and not obstructing the path of the camera signal to the rear markers.
7.	<div data-bbox="236 1005 1369 1637"> <div> <div></div> <div>On the left side on the vehicle, aim camera to the rear marker.</div> <div>Press OK</div> </div> <div>  <div>  <div>Back</div> </div> </div> </div> <div data-bbox="236 1671 857 1704">Aim the camera to the rear left marker and press <b>OK</b>.</div>

8.	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid black; margin-bottom: 5px;"> <span>—</span> <span>On the right side on the vehicle, aim camera to the front marker.</span> <span>—</span> </div> <div style="text-align: center; background-color: #cccccc; padding: 5px; margin-bottom: 5px;">Press OK</div> <div style="display: flex; align-items: center; justify-content: center;">  <div style="margin-left: 10px;"> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>1</td></tr><tr><td>2</td></tr><tr><td>3</td></tr><tr><td>4</td></tr><tr><td>5</td></tr><tr><td>6</td></tr><tr><td>7</td></tr><tr><td>8</td></tr><tr><td>9</td></tr><tr><td>10</td></tr><tr><td>11</td></tr><tr><td>12</td></tr><tr><td>13</td></tr><tr style="background-color: #007bff; color: white;"><td>14</td></tr><tr><td>15</td></tr><tr><td>16</td></tr><tr><td>17</td></tr><tr><td>18</td></tr> </table> </div> </div> <div style="background-color: #007bff; color: white; text-align: center; padding: 10px; margin-top: 10px;"> <span style="font-size: 2em;">←</span> Back         </div> </div>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			
13																			
14																			
15																			
16																			
17																			
18																			
9.	<p>Rotate the right front marker so that it is lying flat and not obstructing the path of the camera signal to the rear markers.</p>																		
10.	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid black; margin-bottom: 5px;"> <span>—</span> <span>On the right side on the vehicle, aim camera to the rear marker.</span> <span style="border-bottom: 1px solid black; width: 50px;"></span> </div> <div style="text-align: center; background-color: #cccccc; padding: 5px; margin-bottom: 5px;">Press OK</div> <div style="display: flex; align-items: center; justify-content: center;">  <div style="margin-left: 10px;"> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>1</td></tr><tr><td>2</td></tr><tr><td>3</td></tr><tr><td>4</td></tr><tr><td>5</td></tr><tr><td>6</td></tr><tr><td>7</td></tr><tr><td>8</td></tr><tr><td>9</td></tr><tr><td>10</td></tr><tr><td>11</td></tr><tr><td>12</td></tr><tr><td>13</td></tr><tr><td>14</td></tr><tr style="background-color: #007bff; color: white;"><td>15</td></tr><tr><td>16</td></tr><tr><td>17</td></tr><tr><td>18</td></tr> </table> </div> </div> <div style="background-color: #007bff; color: white; text-align: center; padding: 10px; margin-top: 10px;"> <span style="font-size: 2em;">←</span> Back         </div> </div>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			
13																			
14																			
15																			
16																			
17																			
18																			


11.

**Adjust value to zero.**  
**Press OK**






0.00°



-10
-5
0
5
10

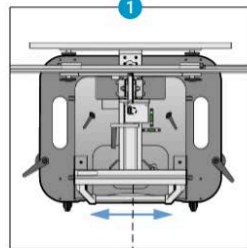
  
 Back


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18


Adjust the values until the bar is green and press **OK**. It is recommended to adjust to 0.


12.

**Adjust value to zero.**  
**Press OK**







  
 Back

Slide the platform sideways until the set value is reached. Press **OK**.

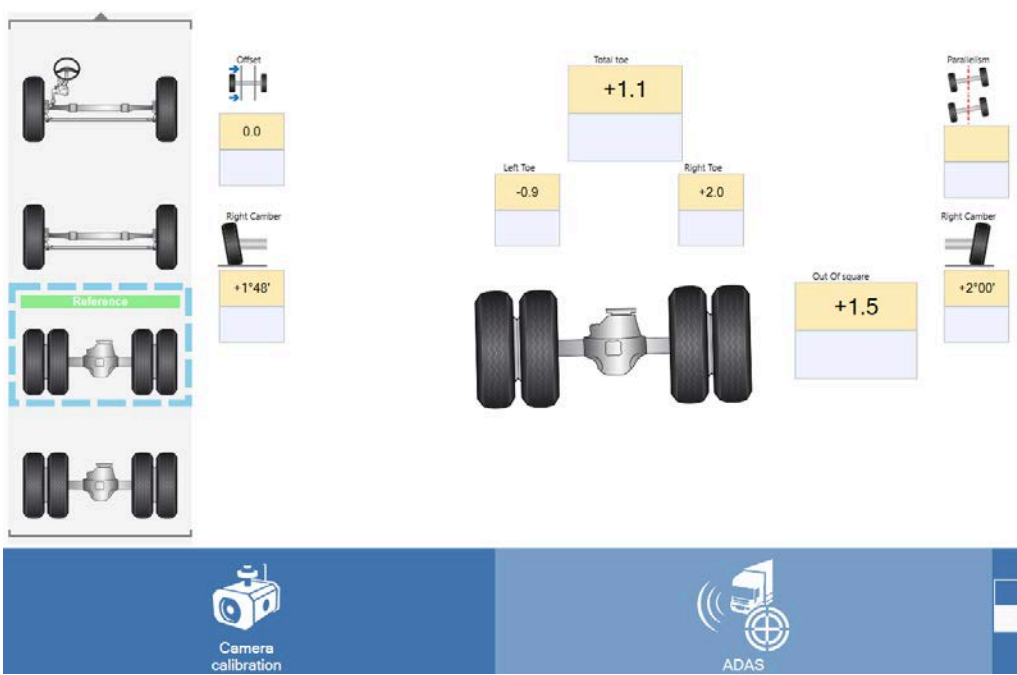

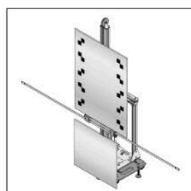
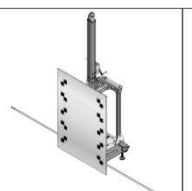

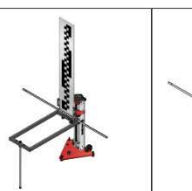
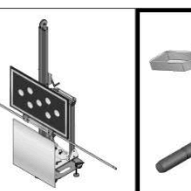
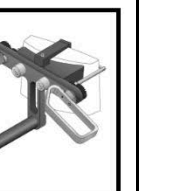



1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18

13.	<div data-bbox="272 203 1406 835"> <div data-bbox="470 219 1209 253">Please raise the target to the required height according to vehicle specification.</div> <div data-bbox="721 275 959 302">Start calibration of LDWS</div> <div data-bbox="497 349 1182 680"> </div> <div data-bbox="798 719 879 801"> </div> <div data-bbox="820 808 858 828">Back</div> </div> <p data-bbox="272 869 1011 898">Set the height on target according to the vehicle's specification.</p>
14.	Positioning complete. Use the vehicle calibration tool to calibrate the LDWS equipment.

## 18 Measurement and adjustment with Side radar tool



Calibration is not possible on all MAN vehicles, check OEM specifications.


1.	
	<p>Choose <b>[Adas]</b> from the Cam-aligner main window.</p> <div style="text-align: right;">  </div>
2.	<div style="display: flex; justify-content: space-around;">       </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="text-align: center;">  Back         </div> <div style="text-align: center;">  Next         </div> </div>
3.	<p>Click <b>[Next]</b></p> <div style="text-align: right;">  </div>



4.	<div data-bbox="272 203 1249 309"><div data-bbox="272 203 427 309"></div><div data-bbox="435 203 1082 309"><b>Select side radar position to calibrate</b> <b>Press Next</b></div><div data-bbox="1090 203 1249 309"></div></div> <div data-bbox="272 320 1249 622"><div data-bbox="272 320 427 622"></div><div data-bbox="435 320 1082 622"></div><div data-bbox="1090 320 1249 622"><div data-bbox="1225 309 1249 409"><div>1</div><div>2</div><div>3</div><div>4</div><div>5</div></div></div></div> <div data-bbox="272 633 1249 734"><div data-bbox="272 633 930 734"> Back</div><div data-bbox="938 633 1249 734"> Next</div></div> <p>Select side radar position to calibrate on the vehicle.</p>
5.	<div data-bbox="272 801 1249 907"><div data-bbox="272 801 427 907"></div><div data-bbox="435 801 1082 907"><b>On the rightside, aim camera to the near marker</b></div><div data-bbox="1090 801 1249 907"></div></div> <div data-bbox="272 918 1249 1220"><div data-bbox="272 918 427 1220"></div><div data-bbox="435 918 1082 1220"></div><div data-bbox="1090 918 1249 1220"><div data-bbox="1225 907 1249 1008"><div>1</div><div>2</div><div>3</div><div>4</div><div>5</div></div></div></div> <div data-bbox="272 1232 1249 1332"><div data-bbox="272 1232 1249 1332"> Back</div></div> <p>Aim the camera to the near marker on the rightside of the vehicle.</p>
6.	<div data-bbox="272 1395 1249 1500"><div data-bbox="272 1395 427 1500"></div><div data-bbox="435 1395 1082 1500"><b>On the rightside, aim camera to the far marker</b></div><div data-bbox="1090 1395 1249 1500"></div></div> <div data-bbox="272 1512 1249 1814"><div data-bbox="272 1512 427 1814"></div><div data-bbox="435 1512 1082 1814"></div><div data-bbox="1090 1512 1249 1814"><div data-bbox="1225 1500 1249 1601"><div>1</div><div>2</div><div>3</div><div>4</div><div>5</div></div></div></div> <div data-bbox="272 1825 1249 1926"><div data-bbox="272 1825 1249 1926"> Back</div></div> <p>Aim the camera to the far marker on the rightside of the vehicle.</p>

7.

Keep camera aimed at far marker  
Adjust value to Zero  
Press Ok or Next to proceed



Horizontal

**+0.0**

Vertical

**+0°00'**

← Back
OK ✓

Keep camera aimed at the far marker, adjust value to zero. Click **[OK]** to proceed.

8.

**Result**  
Press Ok or Next To Adjust another position  
or Press Back to Exit

	Before Adjustment	After Adjustment
Horizontal	<b>+0.0</b>	<b>+0.0</b>
Vertical	<b>+0°00'</b>	<b>+0°00'</b>

← Back
Next →

The result is now visible, click **[OK]** to adjust another position.

# 19 Frame measurement

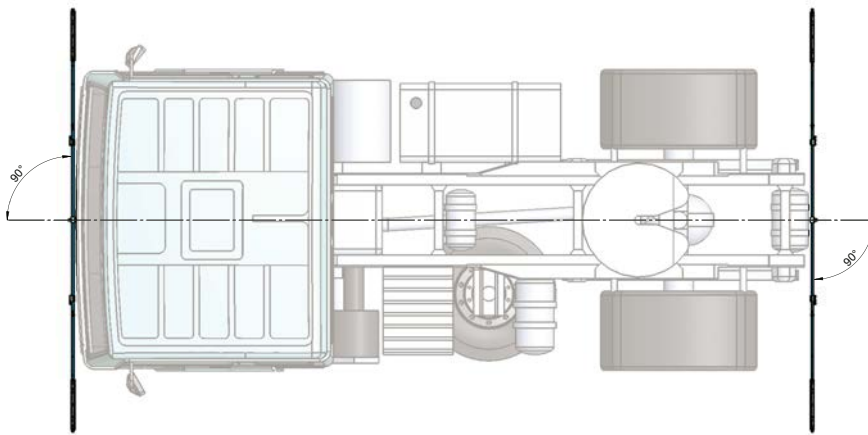
## 19.1 Measurement preparations

Before you start measuring the vehicle, please complete the following steps:

- Check tire pressure, tire size and inflate the tires to the specified pressure.
- Check if the floor surface or any other surfaces used as a measuring area are flat.

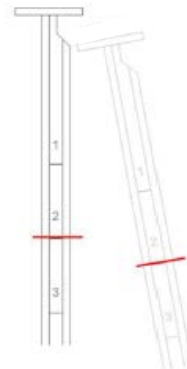
## 19.2 Frame check

### Mount frame gauges



Mount the self centering frame gauges as square as possible to the frame of the vehicle, one at the front, the other at the rear. When using more than two frame gauges, please hang the extra frame gauges on the positions of the frame or chassis which you want to measure.

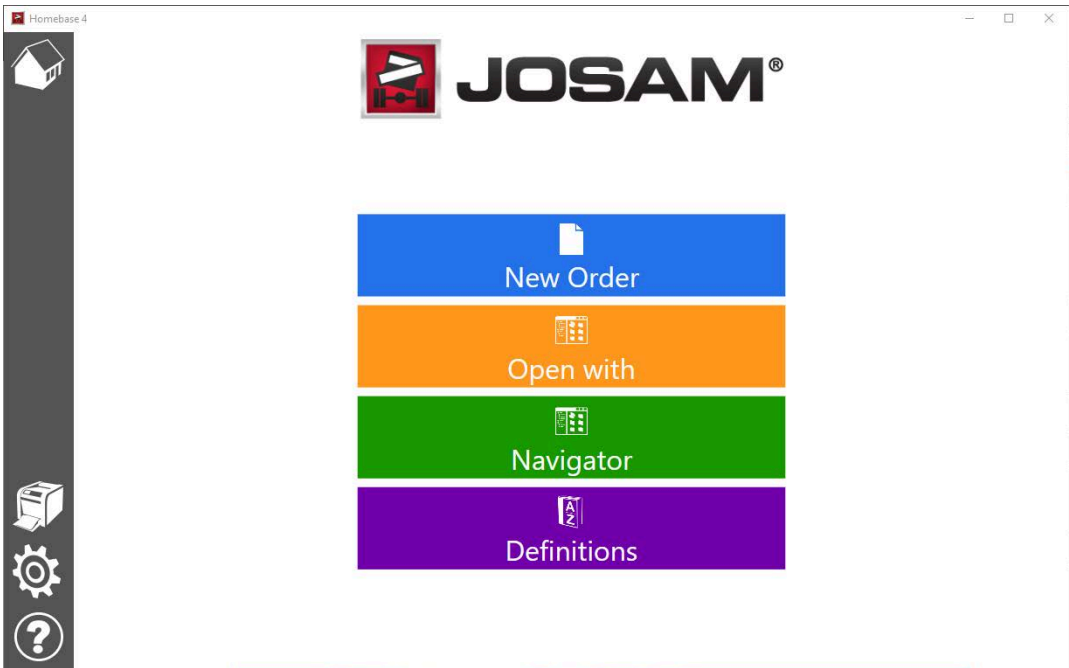

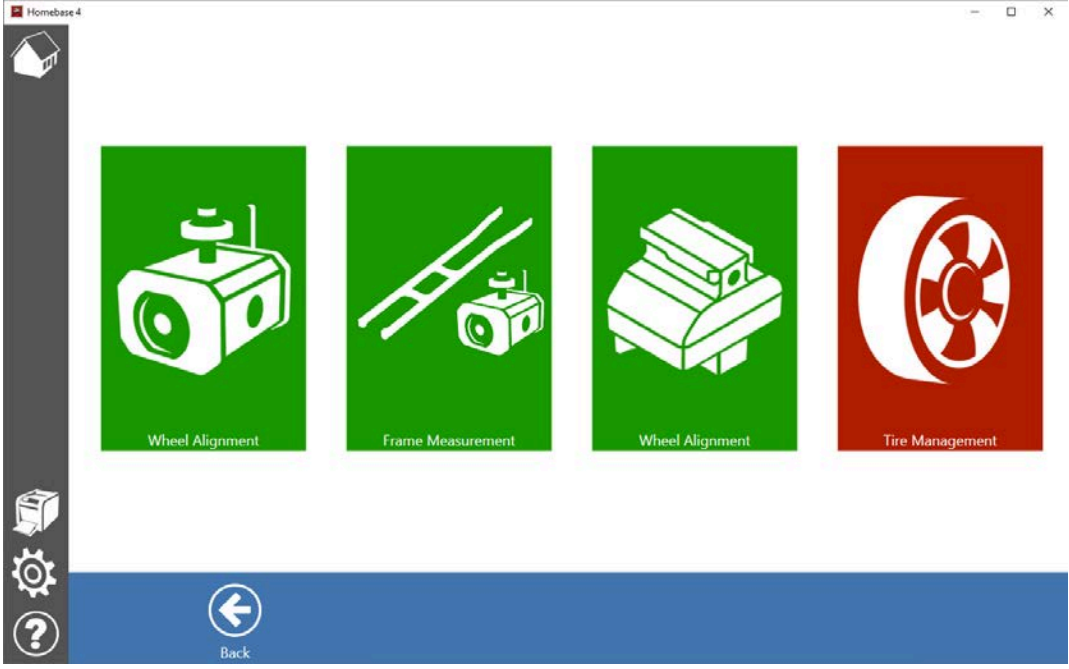


### Adjust height of frame gauges




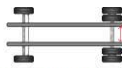



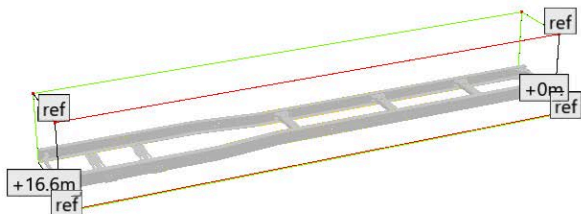


Adjust the frame gauges so that the frame markers are at the same height as the cameras. During measurement, neither the cameras nor the frame markers should be adjusted or rotated. Make sure the hangers for each frame gauge are at the same height; adjust the hangers so that the scale numbers on both hangers are equal.



Do not adjust by using the spirit level on the frame gauge!

1.		
	Start a new order by clicking on <b>[New order]</b> from the start screen.	
2.		
3.	Enter vehicle information and click on <b>[Save and start measure]</b>	

## Enter frame dimensions

1.	<div style="text-align: center;">   <b>Front frame width</b>  <input type="text" value="500"/> </div> <div style="text-align: center;">   <b>Rear frame width</b>  <input type="text" value="500"/> </div> <div style="text-align: center;">   <b>Distances between scales in mm</b>  <input type="text" value="2725"/> </div> <div style="text-align: center; background-color: #0056b3; color: white; padding: 10px; margin-top: 10px;">           Next       </div>	
2.	Press <b>[Next]</b>	<div style="text-align: center; background-color: #0056b3; color: white; padding: 10px;">           Next       </div>
3.	<div style="text-align: center; margin-bottom: 10px;"> <div style="display: flex; justify-content: space-around; font-size: 0.8em;"> <div>Tilt <input type="text" value="0 mm"/></div> <div>Twist <input type="text" value="0 mm"/></div> <div>Vehicle length <input type="text" value="16.6 m"/></div> </div> <div style="display: flex; justify-content: space-between; font-size: 0.7em; margin-top: 5px;"> <span>Vertical Bending in mm</span> <span>Side Bending in mm</span> </div>  </div> <div style="text-align: center; background-color: #0056b3; color: white; padding: 10px; margin-top: 10px;">           Measure       </div>	<div style="text-align: center; background-color: #0056b3; color: white; padding: 10px; margin-top: 10px;">           Measure       </div>


## Taking reference points

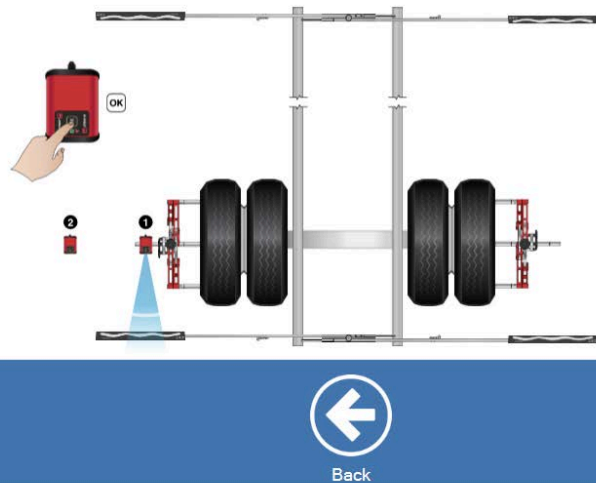
1.

-

Aim a camera with the securing screw up against closest marker.

Press OK





1

2

3

4

5

6

←

Back

Place the first camera (1) on the wheel adapter. Make sure the securing screw is on the upper side. Aim the camera towards the nearest marker and press **OK**.

2.

-

On the same wheel:

Aim the next camera with the securing screw up against same marker.

Press OK





1

2

3

4

5

6

←

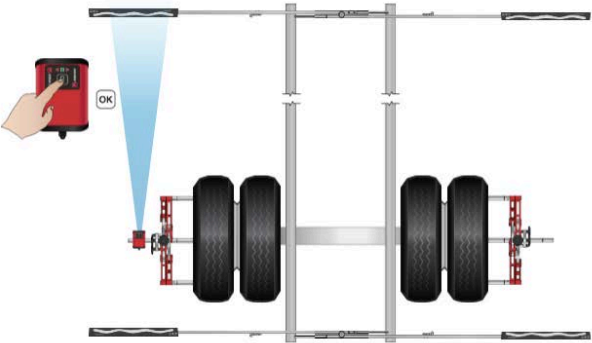
Back

Remove the first camera (1) and place the second camera (2) on the same wheel adapter. Make sure the securing screw is on the upper side. Aim the camera towards the nearest marker and press **OK**.

3.

**Aim same camera with the securing screw up at the far marker.**

**Press OK**



1
2
3
4
5
6

←

Back

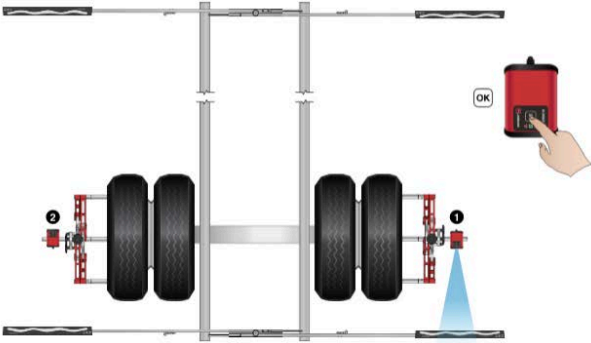
Remove the second camera (2) from the wheel adapter. Turn camera (2) 180 degrees (not upside-down). Put it back on the wheel adapter, still with the securing screw on its upper side, and aim the camera at the far marker. Then press **OK**.

4.

**On other side:**

**Aim next camera with the securing screw up against closest marker.**

**Press OK**



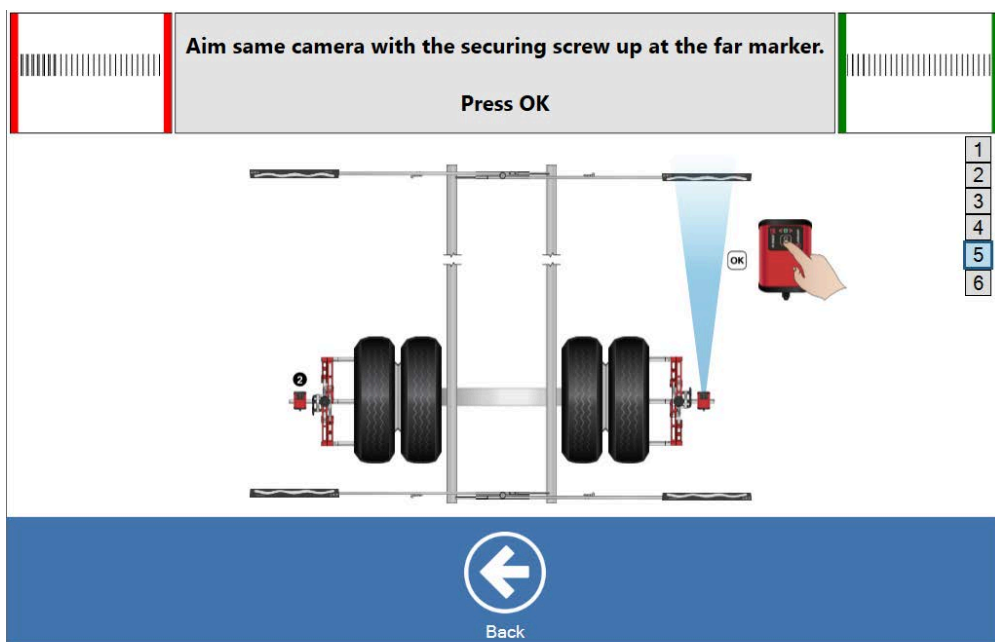
1
2
3
4
5
6

←

Back

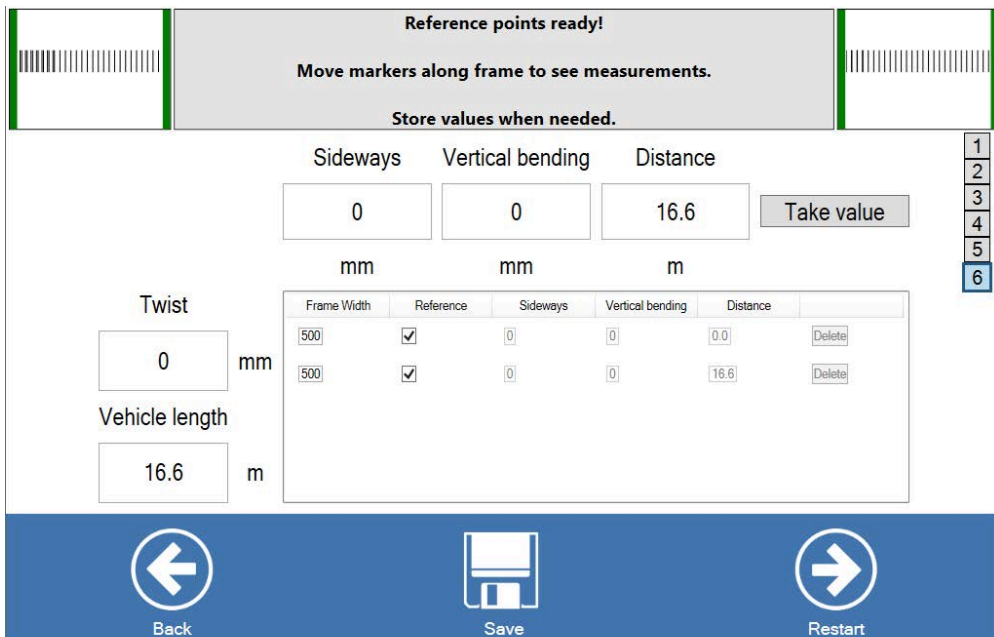
Place the first camera (1) on the wheel adapter on the opposite side of the vehicle. Make sure the securing screw is on the upper side. Aim the camera towards the nearest marker and press **OK**.

5.



Remove the first camera (1) from the wheel adapter. Turn the camera 180 degrees (not upside-down). Put it back on the wheel adapter, still with the securing screw on its upper side, and aim the camera at the far marker. Then press **OK**.

6.



Frame Width	Reference	Sideways	Vertical bending	Distance	Delete
500	<input checked="" type="checkbox"/>	0	0	0.0	Delete
500	<input checked="" type="checkbox"/>	0	0	16.6	Delete

The program has now taken four reference points of the frame, the data of which is now displayed on the computer screen. The screen displays the distance between the scales in the front and the back of the frame. On the left side you can see the twist of the frame, which in this example is 0 mm, and the length of the vehicle which in the example is 16.6 meters.

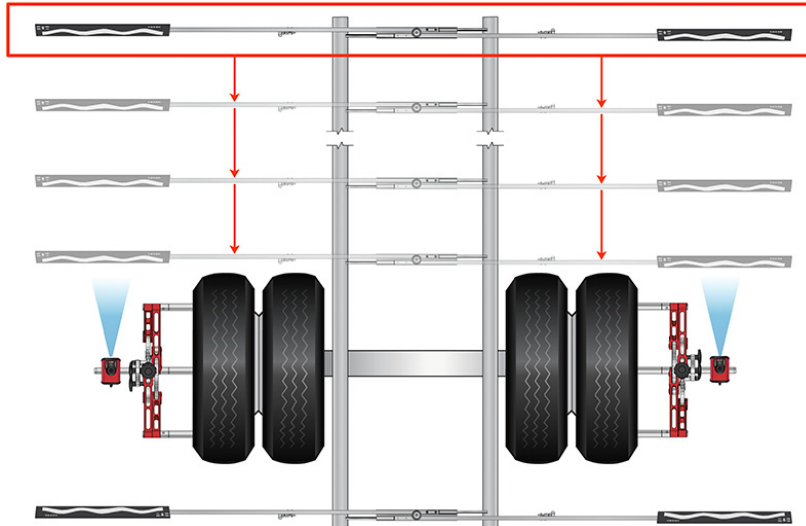
### Taking frame measurement points



Do not touch or move the cameras as they are now in measurement position. Any movement will result in measurement errors and the measurement will need to be started over again.

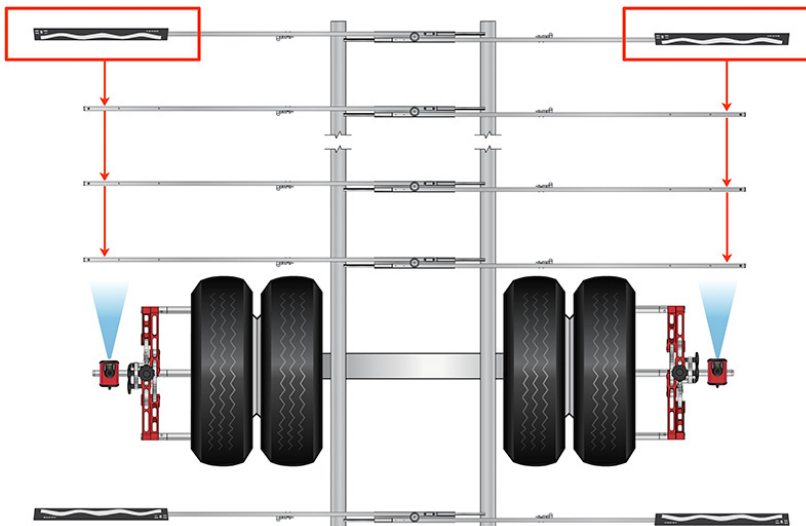
Move the camera markers by using one of the two methods described below.

#### Method 1: Using two frame gauges



When you are using two frame gauges, you need to move the whole frame gauge (on the far side) including the markers to the next point of the frame you want to measure. Store the values at each step, see "Storing values" below.



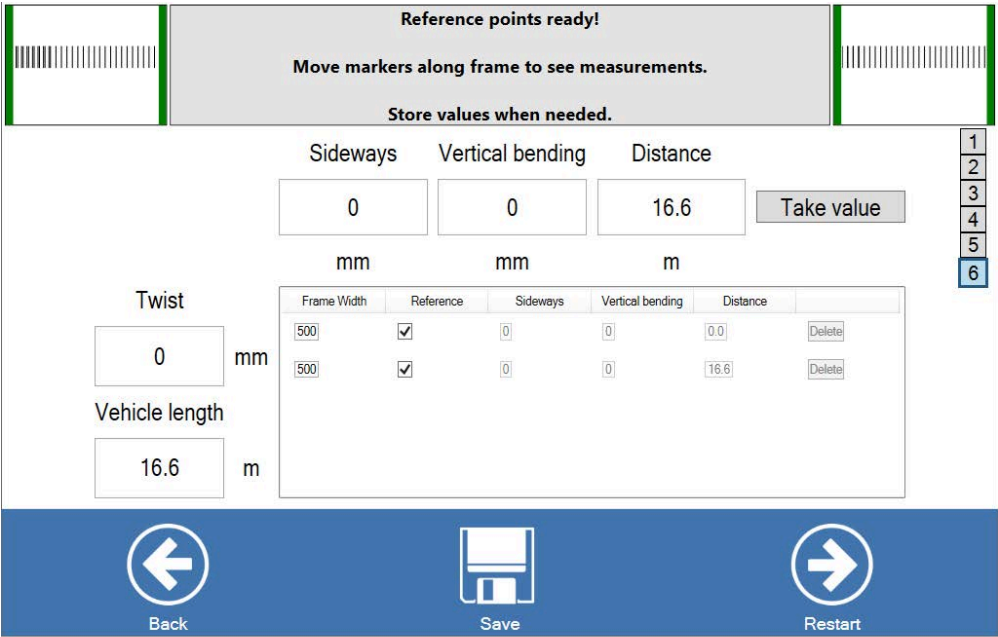
#### Method 2: Using more than two frame gauges


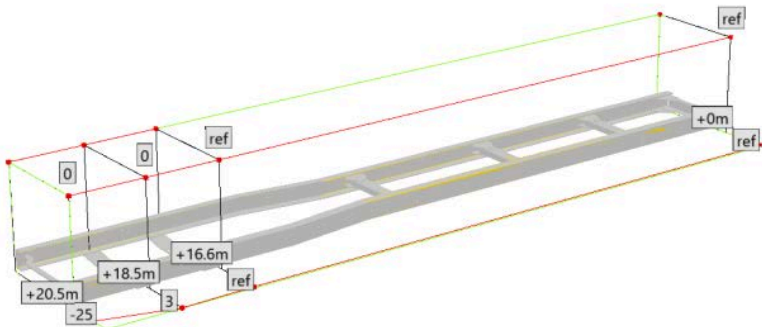
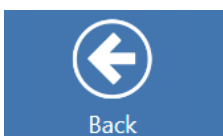
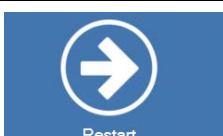


If you are using more than two frame gauges, and you have placed for instance three more gauges in between the front and the rear gauges, just move the camera markers which are placed on the gauges on the far side to the next frame gauge in order to take a 3rd, a 4th and a 5th measuring point. Store the values at each step, see "Storing values" below.

### Storing values

When the camera markers have been moved to a new position, live measurement values will appear in the larger text boxes.

1.	Click <b>[Take value]</b> in the software to save the values. A new row of measurement data will then appear.	
2.	A new row of measurement data will then appear.	
3.	To remove a row of measurement data, click the <b>[Delete]</b> button next to it.	
4.	 <p>The software allows you to change the reference points by clicking on the checkbox in the "Reference" column. When changing the reference points, the software automatically calculates the values for side bending and vertical bend. In this case no new measurement is required.</p>	
5.	Repeat the steps described above for the desired number of measurement points.	
6.	When finished, click:	

	<div style="display: flex; justify-content: space-around; margin-bottom: 10px;"> <div style="text-align: center;">Tilt <div style="border: 1px solid black; padding: 2px 10px;">0 mm</div></div> <div style="text-align: center;">Twist <div style="border: 1px solid black; padding: 2px 10px;">0 mm</div></div> <div style="text-align: center;">Vehicle length <div style="border: 1px solid black; padding: 2px 10px;">20.5 m</div></div> </div>  <p><b>[Save]</b> to store all values and see the results.</p>
	<p><b>[Back]</b> to exit without saving.</p>
	<p><b>[Restart]</b> to restart frame measurement without saving.</p>

## 20 Equipment calibration

### 20.1 Calibrate the camera

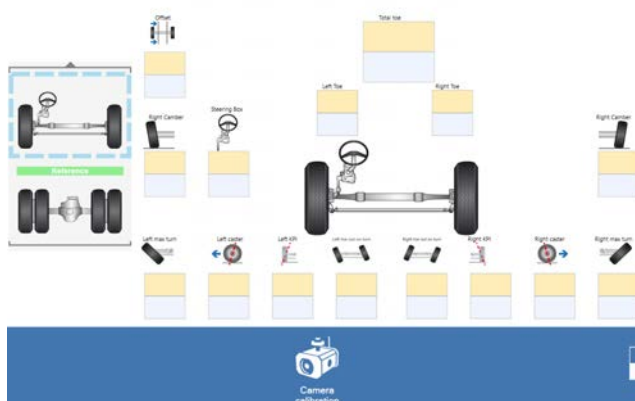


It is recommended to calibrate the camera at least once every quarter. Always calibrate the camera if it has suffered an impact, e.g. being dropped on the floor.

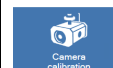


The software has a built-in function for checking and calibrating the cameras. This calibration is carried out on the vehicle to be measured, using the standard measurement equipment. If necessary, start up the unit itself by pressing the ON/OFF button on the back of the camera. Follow the steps presented by the help texts in the square on the computer screen:

1.



In the Cam-aligner main window, press **[Camera calibration]**



2.

Serial number 000000 ▼			
Date	Toe	Camber	Result
11/26/2024 3:05 PM	0.0	+0°00'	Success



Choose the **[Print]** button to access the print view. There you will see the latest calibration of the connected equipment.

3.

- ☐ Wheel Alignment (Combined)
- ☐ Wheel Alignment (Separate)
- ☐ Wheel Alignment (Text)
- ☐ Frame (Report)
- ☐ Tire Management (Report)
- ☐ Information
- ☒ Calibration

Work order no. 20241205131338-729 12/5/2024 1:13:40 PM

**KALLA KORSASTIG 42**

TURNER BET PNEU CHARLES 2

2018 MANITOU 12 Box 32

Model: Used specification

VIN: TRUCK371

Registration Number:

Owner:

Returned By: Administrator

All values are in mm, if not differently stated

**Calibration**

**Laser System**


Unit	Time	Type	Calibration difference
90000	----	----	----
90001	----	----	----
JT718-Sim	----	----	----

**Camera System**

Unit	Time	Result	Top	Camber
408947	----	----	----	----

Change Printer
Export as PDF
Microsoft Print to PDF

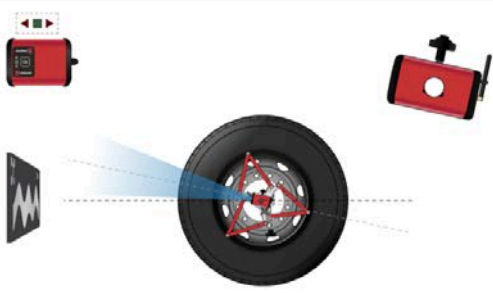
Choose the camera to calibrate and press **[Camera calibration]**



4.

**1. Aim slightly up.**

**2. Press OK**



←

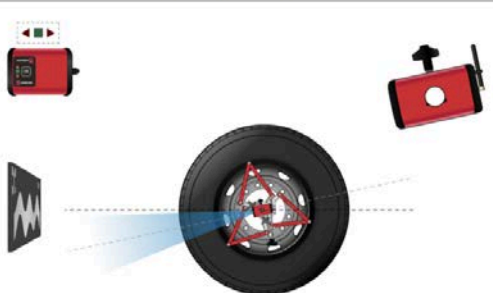
Back

Aim the camera slightly upwards and press the **[OK]** button.

5.

**1. Aim slightly down.**

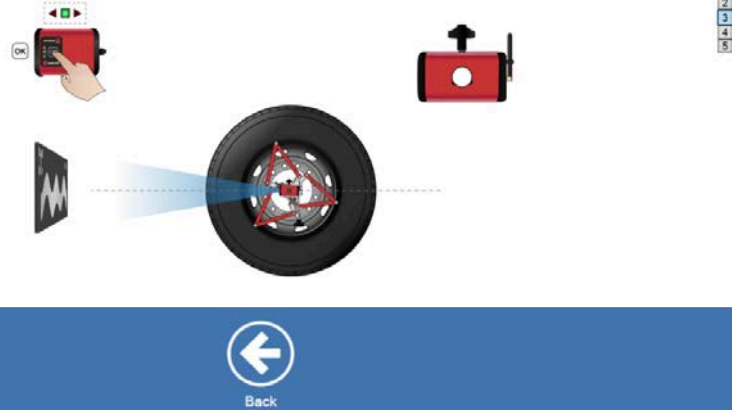
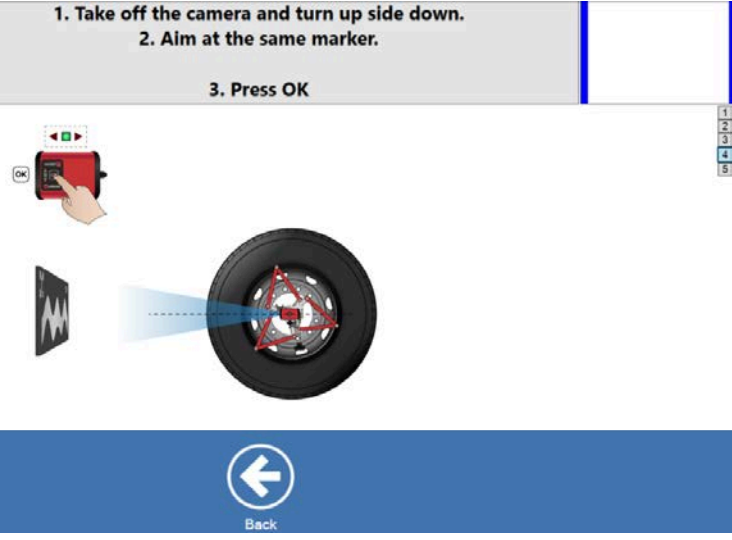

**2. Press OK**





←

Back

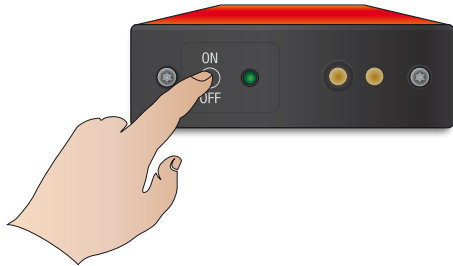
Aim the camera slightly downwards and press the **[OK]** button.

6.	<div data-bbox="231 197 1181 734"> <div> <div>1. Aim horizontally.</div> <div>2. Press OK</div> </div>  </div> <p>Aim the camera horizontally and press the <b>[OK]</b> button.</p>
7.	<div data-bbox="231 792 1181 1330"> <div> <div>1. Take off the camera and turn up side down.</div> <div>2. Aim at the same marker.</div> <div>3. Press OK</div> </div>  </div> <p>End turn the camera by taking it off of the wheel adapter spindle, turning it upside down and putting it back on the wheel adapter spindle again. Aim the camera at the same marker and press the <b>[OK]</b> button.</p>
8.	<div data-bbox="231 1442 1181 1980"> <div> <div>Calibration successful!</div> <div>Press "Back" to return to the start menu.</div> </div> <div> <div>Camber change from previous calibration</div> <div><b>+0°00'</b> Degrees &amp; minutes</div> </div> <div> <div>Toe change from previous calibration</div> <div><b>+0.0</b> mm/m</div> </div>  </div> <p>The screen will display the calibrated values.</p>



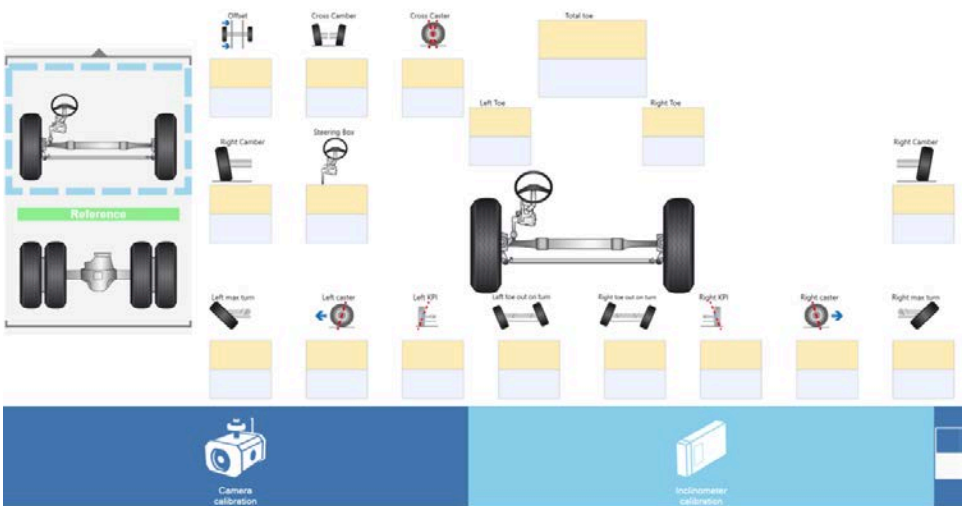
9.	Click either [ <b>Save calibration</b> ] to store the calibration values.	
	Or [ <b>Back</b> ] to exit.	

## 20.2 Calibrate the inclinometer




The software has a built-in function for calibrating the inclinometer. This calibration is carried out on a steady stand, using the standard measurement equipment. If necessary, start up the unit itself by pressing the ON/OFF button on the back of the inclinometer.

1.




From the Cam-aligner main window, click **[Inclinometer calibration]**




2.

Serial number 6084D1

Date	Camber	Result
2021-02-12 08:18	+0°00'	Success
2021-02-10 14:02	-0°00'	Success
2021-02-10 14:01	-0°00'	Success
2021-02-10 14:00	+0°00'	Success
2021-02-10 13:59	-0°00'	Success
2021-02-10 13:58	-0°00'	Success
2021-02-10 13:57	+0°01'	Success
2021-02-10 13:56	+0°00'	Success
2021-02-10 13:55	-0°00'	Success
2021-02-10 13:53	-0°00'	Success
2021-02-10 13:11	+0°00'	Success
2021-02-10 13:08	-0°00'	Success
2021-02-10 12:44	+0°00'	Success
2021-02-10 11:50	-0°02'	Success




Back



Inclinometer calibration

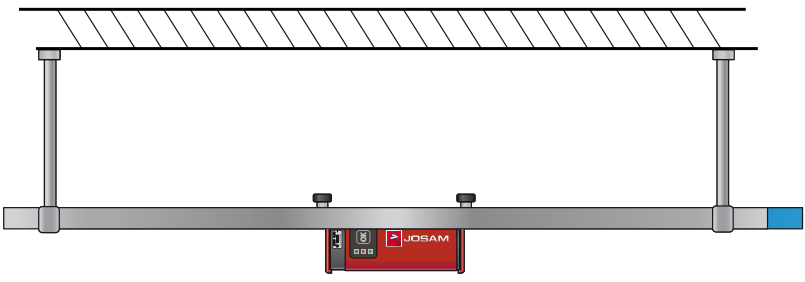
Previous calibrations are displayed. Click **[Inclinometer calibration]**



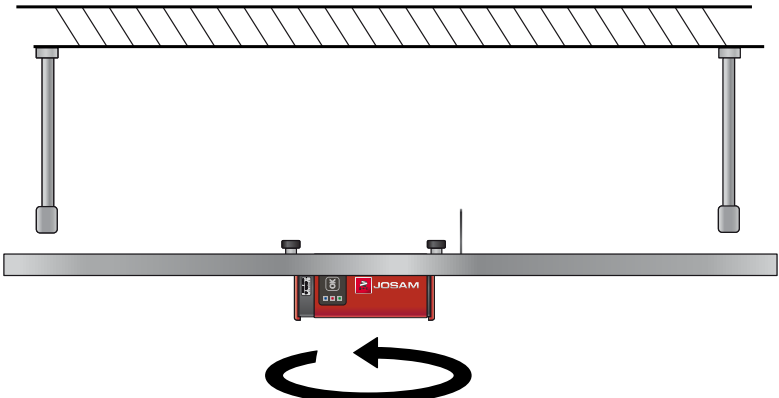
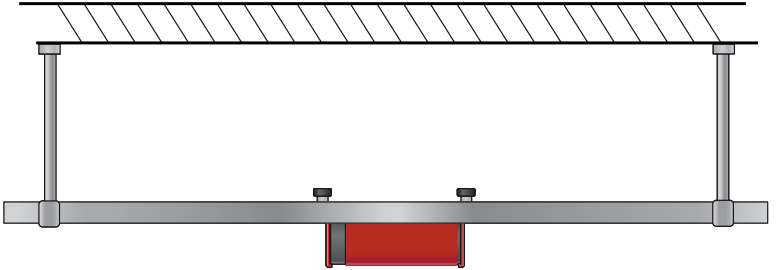
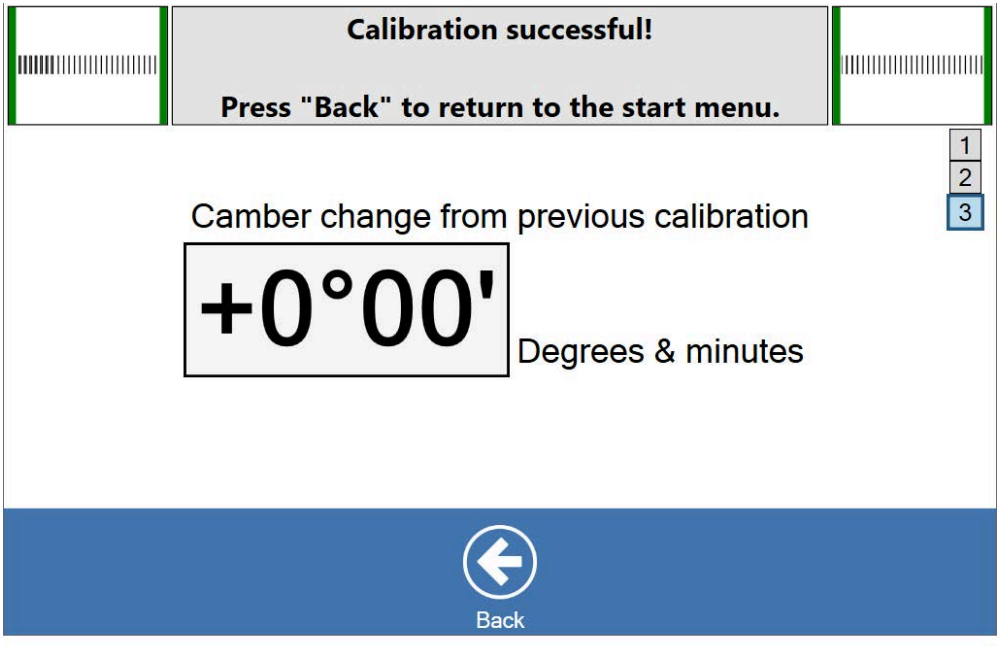

3.

Follow the steps presented by the help texts on the computer screen.

4.



Mount the inclinometer unit in the inclinometer bar, as described in [8.5 "Mount inclinometer unit", page 27](#). Place or hang the inclinometer and its bar in a steady position. Click **[Take value]** to take a first measurement.




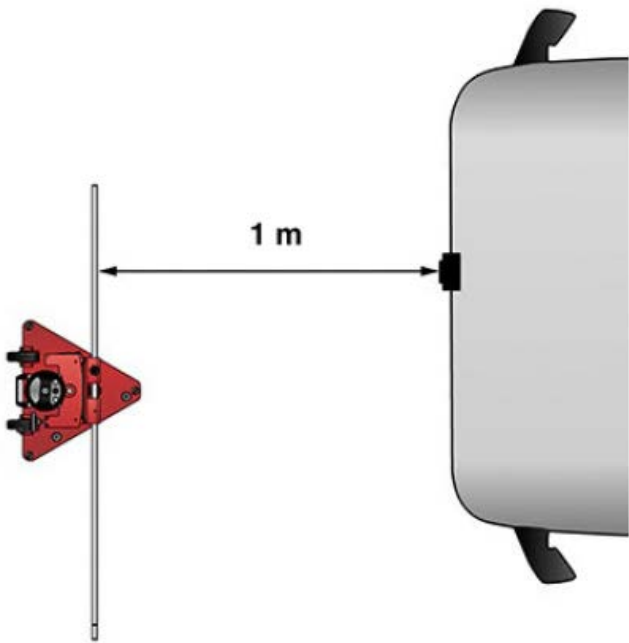
5.	 <p>Remove the inclinometer and its bar and turn it around.</p>
6.	 <p>Put it back in the same steady position as in step 4 and click <b>[Take value]</b> to take a second measurement.</p>
7.	 <p>The software has now saved the measurement values and calculated the calibration factor. The inclinometer is calibrated and ready to use.</p> <p><b>i</b> After mounting or dismounting the inclinometer unit to the bar, a calibration is always necessary to ensure high measurement accuracy.</p>
8.	<p>Click <b>[Back]</b> to return to the calibration menu.</p> 

## 20.3 Calibrate Wabco radar adapter

The software has a built-in functionality for checking and calibrating the Wabco radar adapter. This calibration is carried out on the vehicle to be measured, using the standard measurement equipment.



The Wabco radar adapter should be calibrated before using it for the first time. It is also recommended to calibrate the adapter if it has suffered an impact, e.g. being dropped on the floor.

1.	From the Cam-aligner main window, click <b>[Adas]</b>	
2.		
	Select the ACC/AICC radar stand and click on <b>[Hardware calibration]</b>	
3.	 <p>Place the radar stand 1 m in front of the radar unit.</p>	

4.

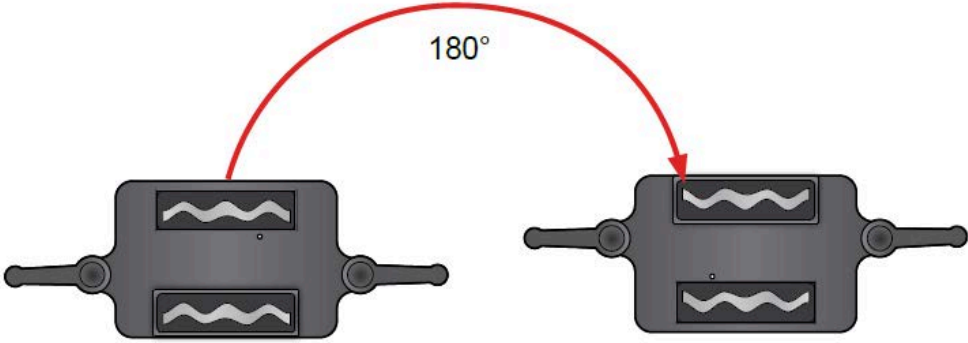
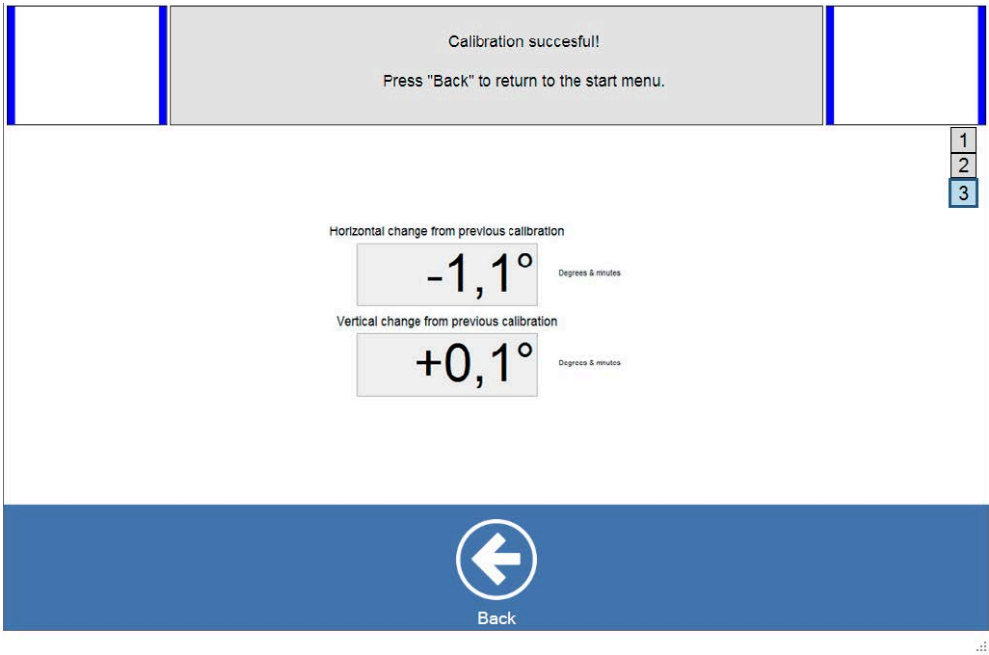


Mount the Wabco adapter on the ACC/AICC radar unit on the vehicle.

5.



Mount a camera on the radar bar stand. If necessary, start up the camera by pressing the ON/OFF button on its back side. Aim the camera at the Wabco adapter and press **OK** on the camera.

6.	 <p>End turn the Wabco adapter by 180 degrees. Press <b>OK</b> on the camera.</p>
7.	 <p>The calibrated values will be displayed on the computer screen.</p>

This page is intentionally left empty



**JOSAM®**

**Car-O-Liner Group / JOSAM**

Maskingatan 5

SE-702 86 Örebro, Sweden

Telefon: +46 19 30 40 00

[info@josam.se](mailto:info@josam.se)

[www.josam.se](http://www.josam.se)

This document is for general guidance only. Although every precaution has been taken in preparation of this document, the publisher assumes no responsibility for errors or omissions. Neither is any liability assumed for damages resulting from the use of the information contained herein. This document is not part of a contract or licence save insofar as may be expressly agreed. All items of technical information, advice, know-how, drawings, specifications and other similar items communicated in this document are confidential, and shall not be disclosed to a third party without prior written consent of the publisher

Josam is a trademark of Snap-on Incorporated. © 2025 Snap-on Incorporated.