



# TW 115

Wheel Aligner  
Computer-controlled axle alignment

twinbusch.de



## INSTALLATION, OPERATION AND MAINTENANCE MANUAL



Read this entire manual carefully and completely before installation or operation of the TW 115. Follow the instructions strictly.

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# 1. Important safety instructions

## 1.1 Important note

Read this manual before using the wheel aligner.

## 1.2 Professionals

1.2.1 Only trained personnel should operate the wheel alignment.

1.2.2 Electrical connections must be made by an electrician.

1.2.3 Uninvolved persons are not allowed in the vicinity of the wheel alignment.

## 1.3 Safety note

1.3.1 The operator must know the computer program and have basic knowledge of wheel alignment.

1.3.2 The vehicle lift used must be suitable for wheel alignment and regularly for flawless and secure function are checked.

Hold the area around the lift clean and free from some other parts.

1.3.3 The wheel alignment device works with image acquisition. Do not interrupt the light beam between the sensors. Avoid reflections from the ground or direct light on the sensor bars during testing.

1.3.4 Do not place the wheel aligner on vibrating or sloping surfaces.

Avoid direct sunlight and humidity.

1.3.5 The measuring heads are precision parts of the wheel aligner. Do not plug in or unplug the power cord while the units are turned on, otherwise the built-in sensor maybe goes damaged. Pay particular attention during the mounting of the probes to avoid damaging the casings and internal parts.

1.3.6 Avoid splashing water on the wheel aligner the system could be completely damaged.

1.3.7 Cables inside the housing and the measuring heads are firmly connected. Any modification can damage the sensor caused by improper separation is not covered by the warranty.

1.3.8 Check the wheel aligner regularly for accurate measurements.

## 2. Overview about the wheel aligner

### 2.1 General

The wheel aligner was designed to measure the axle geometry and compare it with the default values of the vehicle manufacturers. It also gives the user instructions on how to make appropriate adjustments for best steer ability and lowest tire wear.

### 2.2 Function and properties

- Complete test: The Wheel Aligner can be used to measure the most wheel alignment Parameters, such as front wheel toe-in, front wheel camber, caster, Kingpin inclination, Rear wheel toe-in, rear wheel camber, thrust angle, wheelbase difference, tread Difference, axle offset, front wheel setback and rear wheel setback, etc.
- Complete databank: wheel alignment data of over 20,000 vehicle models is stored in the system. User can also add new data to the databank.
- Adopts the charge coupled device (CCD) with high resolution, infrared 8-beam and full Loop measurement, accurate and stable, Bluetooth wireless communication mode, no Data transmission influence.
- Based on the thrust line to realize the real alignment measurement.
- Front alignment test function: user can select the alignment mode flexibly. Only two Probe rods are mounted can the emergency alignment measurement for the front wheels are performed.
- The sensor heads are individually interchangeable. After changing one of the sensor Heads, the other three needs not to recalibrate, which makes the after-sales service more convenient.
- Fully intelligence. The system can automatically recognize the vehicle with super-low Chassis to perform the alignment test for this kind of vehicle and the vehicle with enclosed housing. Aiming to the vehicle model, the system can automatically turn on the corresponding functions of height measurement and counterweight, etc.
- The demonstration version can run all test flow, which makes user's training more Convenient and quick.
- Perform the special alignment test for Mercedes-Benz, BMW, Audi and Passat vehicles, Etc.
- The units of the alignment parameters can be represented with Degree/Minute, percentage degree, mm and Inch.
- The voice prompt function is provided during measurement, very easy to understand.
- Automatic check function for incorrect calibration is provided, which can prompt the user to recalibrate in time.
- Client prompting function can make the client return visit in time.

## 2.3 Specification

description	accuracy	measuring range
Total toe	$\pm 1,2'$ ( $\pm 0.02^\circ$ )	$\pm 4^\circ$
Individual toe	$\pm 0,6'$ ( $\pm 0.01^\circ$ )	$\pm 2^\circ$
Camber	$\pm 1,8'$ ( $\pm 0.03^\circ$ )	$\pm 4^\circ$
Castor	$\pm 6'$ ( $\pm 0.1^\circ$ )	$\pm 18^\circ$
SAI / KPI	$\pm 6'$ ( $\pm 0.1^\circ$ )	$\pm 18^\circ$
Setback	$\pm 1,8'$ ( $\pm 0.03^\circ$ )	$\pm 2^\circ$
Thrust angle	$\pm 1,8'$ ( $\pm 0.03^\circ$ )	$\pm 2^\circ$

**NOTE:**

*The measuring accuracy refers to measured values within the measuring range.*

*Outside the measuring range, the values are larger.*

*The above accuracy can only be achieved if the user follows the listed versions.*

## 2.4 Environmental Requirements

Description	Specification
ambient temperature	-20~+50°C
humidity	≤90%

## 3. The components of the wheel alignment

### 3.1 Overview

The wheel aligner consists essentially of the control panel, the measuring heads, the wheel clamps, the steering wheel holder and the brake pedal pusher etc.

### 3.2 Operation panel

The control panel of the wheel aligner mainly consists of the housing (with recordings for the wheel clamps, main switch, power line, power supply and charging cable), computer and Bluetooth data transfer.

Computer parts are in compartments in the housing. For printing the measurement results a printer is needed preferably an inkjet printer (not included).

For a comfortable operation it is recommended to use the measuring heads # 1 and # 3 on the left side of the carrier and Place the measuring heads # 2 and # 4 on the right side of the carrier.

**Note: If the wheel aligner is not used, they should be placed correctly on both sides of the carrier and it should be ensured that they are charged.**

Do not place the control panel or probes in places with heavy spray or dust. Make sure the back of the control panel is well ventilated and that the back of the computer is not blocked or the fan is stopped.

### 3.3 Computer system

The computer system of the wheel aligner consists of computer, monitor, keyboard and mouse.

The Windows operating system and the program of the wheel alignment device are preinstalled on the computer.

To ensure the safety of the system and for the best performance of the device should be on the computer system never install other programs ore change some settings.

### 3.4 Printer (not included)

It is possible to set a printer. You can connect the printer directly to the computer ore connect it via wifi.

### 3.5 Bluetooth connector

The aligner is equipped with a Bluetooth communication device, as shown in the following figure.

Before use, insert the RS232 plug and USB port on the computer.



**Bluetooth communication unit**

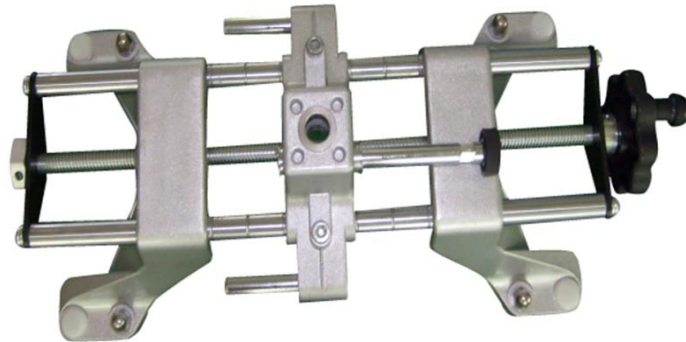


### 3.6 Wheel clamp

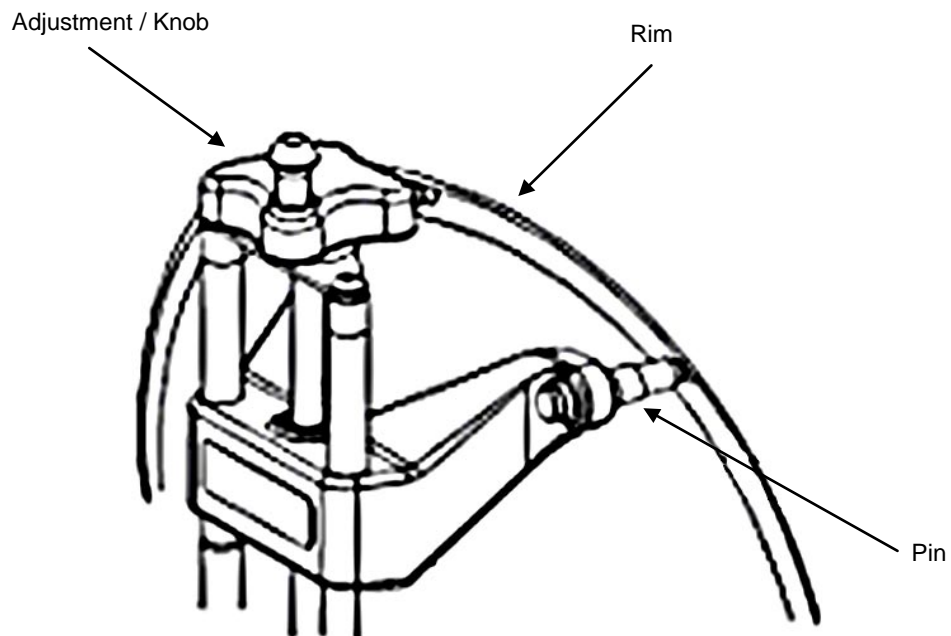
The wheel aligner has four wheel clamps. Turn the dial so that the distance is large enough to put the clamp on the rim if necessary, insert the pins in reverse and / or into other insertion holes. Then attach the pins first to the rim flange and then to the top of the rim flange. Turn the dial clockwise and tighten the wheel clamp. Make sure that the pins are even and clean. After attaching, check tightness by pulling on the wheel clamp.

**Note:** applicable wheel sizes 10"-22".

Wheel clamp



#### 3.6.1 Use the wheel clamp



### 3.7 Steering holder

The wheel aligner has a steering wheel holder as shown in the following picture.

The steering wheel holder is used to fix the steering wheel against rotation during measuring operations.



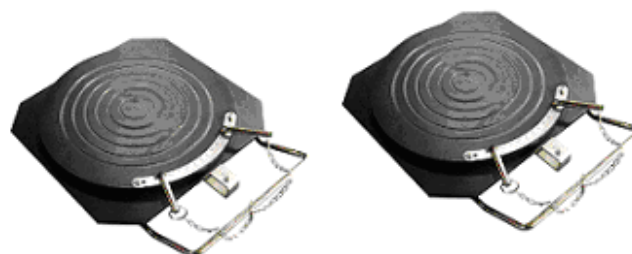
### 3.8 Brake holder

The wheel aligner has a brake pedal pusher as shown in the picture below.

It is used to depress the brake pedal to prevent the vehicle from moving of the measuring process rolls away.



### 3.9 Mechanical turntable (optional)

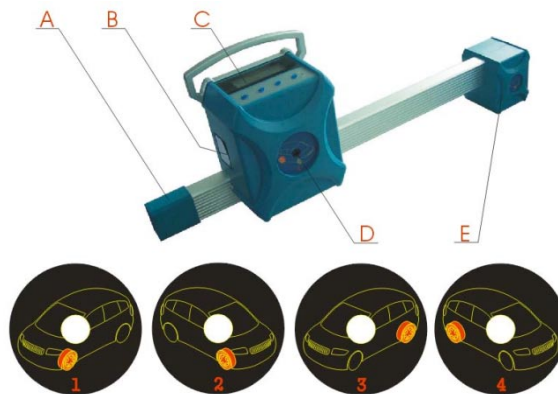


### 3.10 Measuring head

The wheel aligner is equipped with four measuring heads, which are mounted on the corresponding wheel clamps. Before attaching the measuring heads, first attach the wheel clamps to the wheels, then insert the axle pin of the corresponding measuring head into the hole of the central carrier.

After aligning the measuring head horizontally, tighten the adjustment knob on the wheel clamp.

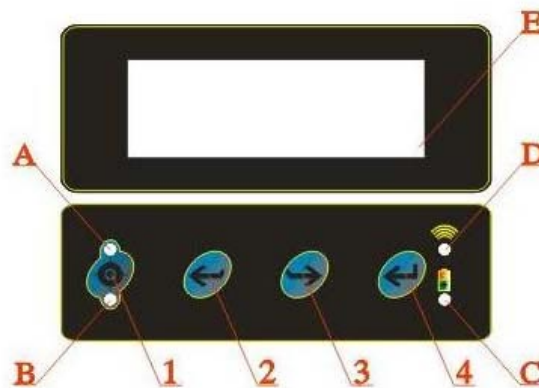
#### 3.10.1 Function of the measuring head



<b>A</b>	Battery
<b>B</b>	center-CCD
<b>C</b>	Operation panel
<b>D</b>	Charging socket
<b>E</b>	Front-CCD

<b>1</b>	Measuring head front left
<b>2</b>	Measuring head front right
<b>3</b>	Measuring head rear left
<b>4</b>	Measuring head rear right

#### 3.10.2 Explanation of the sensor head and the control panel



#### Control panel:

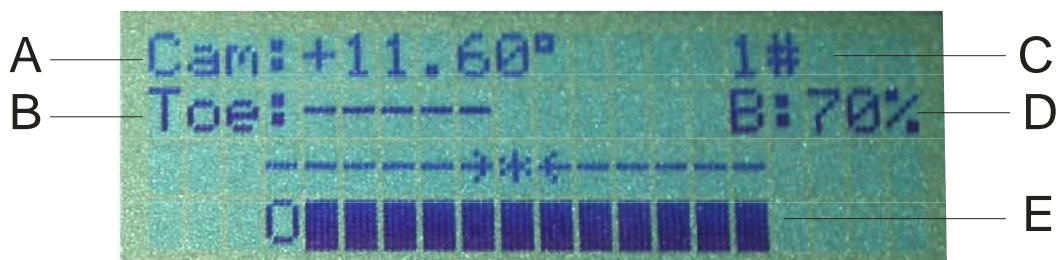
1. Run out compensation button
2. Reverse button
3. Forward button
4. Enter button

**Note:** To switch on the measuring head, press any button on the control panel.

**Display:**

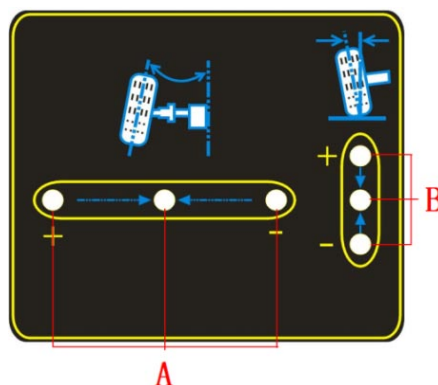
- A/B run out compensation display  
After calling the rim override function, the display A flashes after the first press of the button, display B flashes after the second press of the button, displays A and B go out, the third time the button is pressed.
- C Battery  
When the battery voltage is low, the indicator is red. If the battery voltage is normal, the indicator is green.
- D Connection status  
If the connection is normal, the indicator lights up. If the connection is not correct, the display goes off.
- E LCD Display

**Control panel LCD screen Explanation of the display (as shown in the picture)**



- A Camber, the currently measured value of the camber of the wheel to which the meter is attached.
- B Toe, the currently measured value of the single track of the wheel to which the meter is attached.
- C Number of the Measuring head 1#, 2#, 3# and 4#.
- D Battery capacity in percent indicates the remaining energy of the battery in the measuring head.
- E Alignment status indicator indicates the orientation of the measuring head. The measuring head is aligned when the position mark 0 matches the mark \*.

**3.10.3 Measuring display**



- A Toe indicator, the middle green indicator lights up when the toe is within normal limits, the outer red indicator lights up when the toe is larger than the standard values, the inner red indicator lights up, if the toe is smaller than the standard values.
- B Camber adjustment indicator, the middle green indicator lights when the camber is within normal limits, the upper red indicator lights when the fall is larger than the standard values, the lower red indicator lights up, if the fall is smaller than the standard values.

## 4. Set up and connect

### 4.1 Set up the device

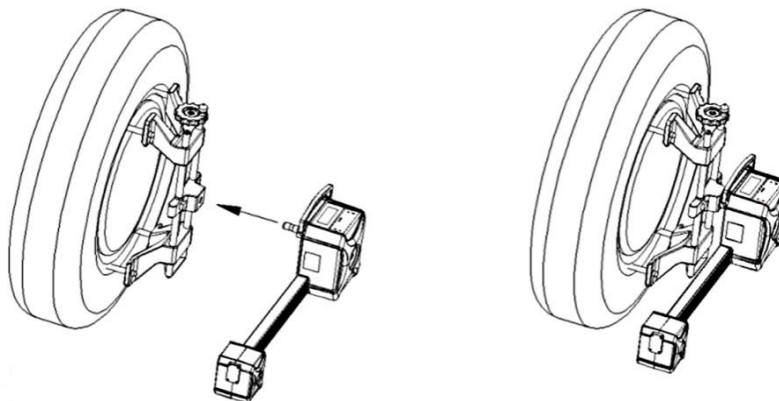
- Place the control panel in a suitable place, with sufficient space for the equipment. Manual, packing list, etc., keep these documents well.
- Unpack the monitor, place the supplied material, set it up and connect it.
- Plug the power cord through the hole on the back of the control panel and into the power strip in the bottom compartment. Also run the monitor cable through the hole and connect to the computer.
- Unpack the printer (not included), store, place, and connect the supplied material. Connect the USB printer cable to the computer plug the power cable into the extended-voltage socket in the lower compartment of the control panel. Insert ink cartridges.

### 4.2 Connect the device

- Connect the power cable.
- Push the ON button on the computer
- Push the ON button on the monitor
- Push the ON button on the printer
- The unit is correctly connect when all systems are working fine

### 4.3 Check the connection

- Drive a vehicle on the vehicle lift or over the pit so that the front wheels are centered on the turntables, apply the handbrake. To protect the turntables from twisting, remove the pins on the turntables only after starting the vehicle.
- Attach the wheel clamp to the wheels and tighten with the knob. The pins of the wheel clamps should sit on the outer or inner edge of the rim flange, depending on the rim type.  
Make sure the height of each clamp is the same and avoid mounting on deformed areas.
- Install the measuring head on the correct wheel brackets according to the defined positions.  
See the following picture:



- Adjust the measuring heads.
- Restart the computer and run the axis measurement program. On the main screen, press the [System] button (**F5**), then press the [Sensor Information] button (**F6**).

Check the connection between the computer and the measuring heads is normal and the indicator for the Measuring heads is normal.

The connection check succeeds if all the above steps are normal.

## 5. Basic work steps with the wheel alignment device

The basic steps with the wheel aligner are the following:

Vehicle information procure → road test → Carry out testing prior test (each chassis part and tire wear carefully check) → measuring and adjusting → test result print → back road test perform to confirm the results of the wheel alignment.

The order, the settings, the axle geometry for normal vehicles is:

Rear camber, track back, trailing forward, fall forward, front track.

The order of the axle geometry settings for multi-link axles (such as the VW Passat B5, Audi A4 / A6 / A8, etc.) is:

Rear camber → Rear track → Front camber → Front toe-in measurement → Front toe-in.

Ask the vehicle owner for drivability issues, as well as find out about past symptoms and wheel measurements, and brand, model and year information.

Check each chassis part carefully, including dust sleeves, guides, handlebars, suspension ball joints, shock absorbers, tie rod joint and steering mechanism in play and / or wear.

Then check the air pressure and compare if the tire wear is the same on both sides.

Do not perform the survey until the initial conditions are known.

If the measured values deviate from the given values, the wheel position must be corrected.

After completing the wheel alignment, check the vehicle to see if the deviating conditions have been eliminated.

If necessary, carry out the wheel measurement again.

### 5.1 Prepare for the measuring

1. driving a vehicle on the car lift or over the pit, so that the front wheels are on the center of the turntable, apply the hand brake. To protect the turntables from twisting, remove the pins on the turntables only after starting the vehicle.
2. Attach the wheel clamps to the wheels and tighten with the knob. The pins of the wheel clamps should sit on the outer or inner edge of the rim flange, depending on the rim type. Make sure the height of each clamp is the same and avoid mounting on deformed areas.
3. Install the measuring heads on the correct wheel clamp according to the defined positions.
4. Adjust the measuring heads.
5. Mount the steering holder on the steering and fix this.
6. Mount the brake holder between the brake and the driver seat.
7. Start the alignment system with the power button.

## 5.2 application interface

The display shows the application interface.



- F2 Info-button shows information about the wheel etc.
- F3 Quick measurement button provides a working surface for quick measurement in which toe-in and Camber the front and rear wheels are simultaneously measured and displayed.
- F4 Measurement button, for carrying out the measurement and adjustment of the survey geometry of the vehicle.
- F5 System button, to enter or set the status of the program, such as workshop info, own data, sensor information, etc.
- F6 Customer management button to create, modify or delete customer maintenance records and Print the test report form.
- Esc Exit button, to exit the system and goes back to windows.

### 5.3 (F5) System settings

If you click on the button (F5), System, the screen shows a user interface as shown in the following picture:

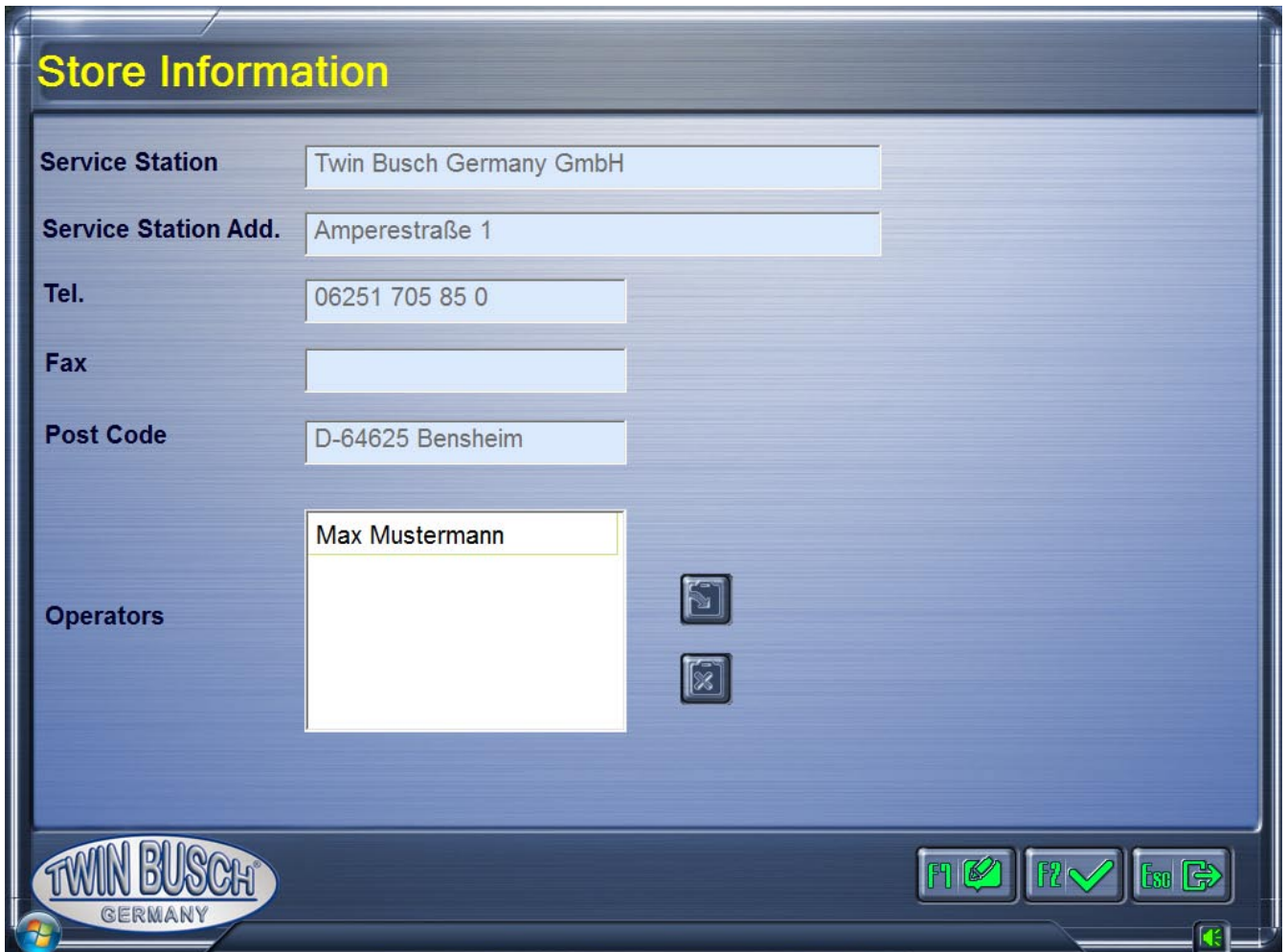


- F2 Workshop info, for the input of workshop data, such as name, address, telephone and fax etc.
- F3 Own files, for entering your own vehicle survey data and for importing Standard data by the operator.
- F4 Standard data, for access, to the vehicle measurement data of the manufacturer, by the operator.
- F5 Configuration system, to set the operating parameters (such as units of measurement and language versions) of the wheel alignment program.
- F6 Sensor information, for the display of the status, of the sensor in the measuring head.
- F7 Lifting platform calibration, to calibrate the platforms of the lift.
- F8 Calibrate the measuring heads.
- F9 Errors, show the error logs.



### 5.3.1 (F2) Workshop information

If you click the button (F2) Workshop Info, the screen shows a user interface, as shown in the following picture:



**Store Information**

**Service Station** Twin Busch Germany GmbH

**Service Station Add.** Amperestraße 1

**Tel.** 06251 705 85 0

**Fax**

**Post Code** D-64625 Bensheim

**Operators** Max Mustermann

TWIN BUSCH GERMANY

F1 F2 Esc




It is necessary to create your own workshop information before the first use.

The entered information appears in the printout of the survey report.

### 5.3.2 (F3) my documents

If you click the button (F3) My Documents, the screen shows a user interface, as shown in the following picture:

Manufacturer name	Model	Model year		Min	Specs	Max
AUDI(EUR)	A6 (Typ C7) allroad (PR	2012-2017	Total Toe	0.17	0.33	0.50
BMW(EUR)	check	2010	Left Toe	0.08	0.17	0.25
CADILLAC(EUR)	CTS AWD (FE2/FE3)	2008-2014	Right Toe	0.08	0.17	0.25
FORD(EUR)	Ranger Hi-Rider 4x2 4x4	2011-2014	Left Caster			
KIA(EUR)	Sportage	2010-2015	Right Caster			
VOLKSWAGEN(EUR)	Golf IV/Golf Plus BlueMc	2003-2009	Left Camber	-1.45	-1.07	-0.68
VOLVO(EUR)	XC60	2008-2015	Right Camber	-1.45	-1.07	-0.68
			Left SAI			
			Right SAI			
			Total Toe	0.17	0.33	0.50
			Left Toe	0.08	0.17	0.25
			Right Toe	0.08	0.17	0.25
			Left Camber	-1.75	-1.33	-0.92
			Right Camber	-1.75	-1.33	-0.92
			Wheelbase		0.00	
			Front tread		0.00	
			Rear tread		0.00	
			Tyre model			
			Diameter(mm)			
			Diameter(in)			

On this page, the user can create self-defined survey data (Button F6 ) , or import standard data, as well as modify and delete this data. Standard data can be accessed by F8  be selected and imported. With the button F2  the self-defined data for the measurement are taken over.

### 5.3.3 (F4) Standard data

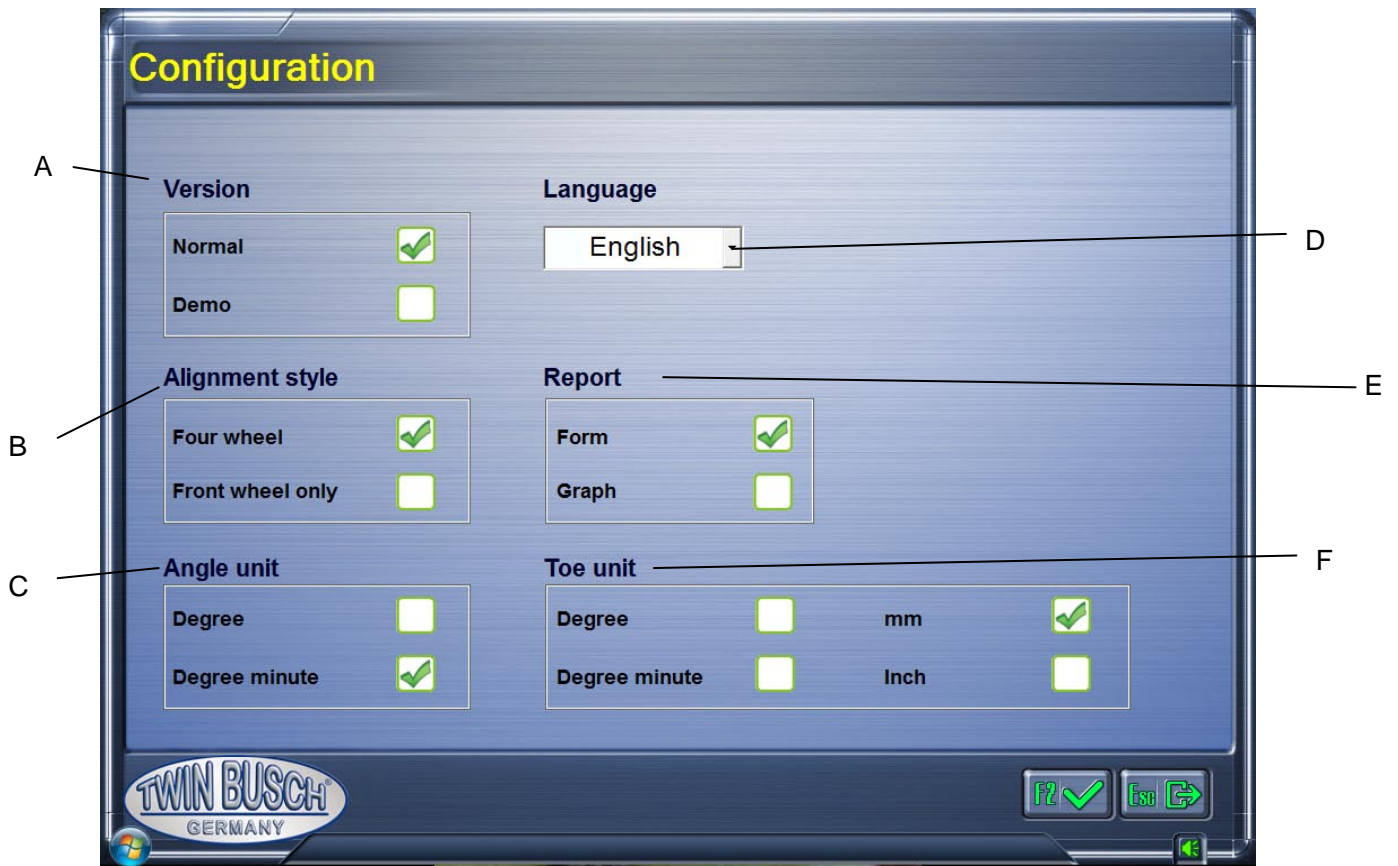
If you click the button (F4) Standard data, the screen shows a user interface, as in the following picture:



On the Default Data page, the user can query original vehicle survey data.

### 5.3.4 (F5) Configuration System

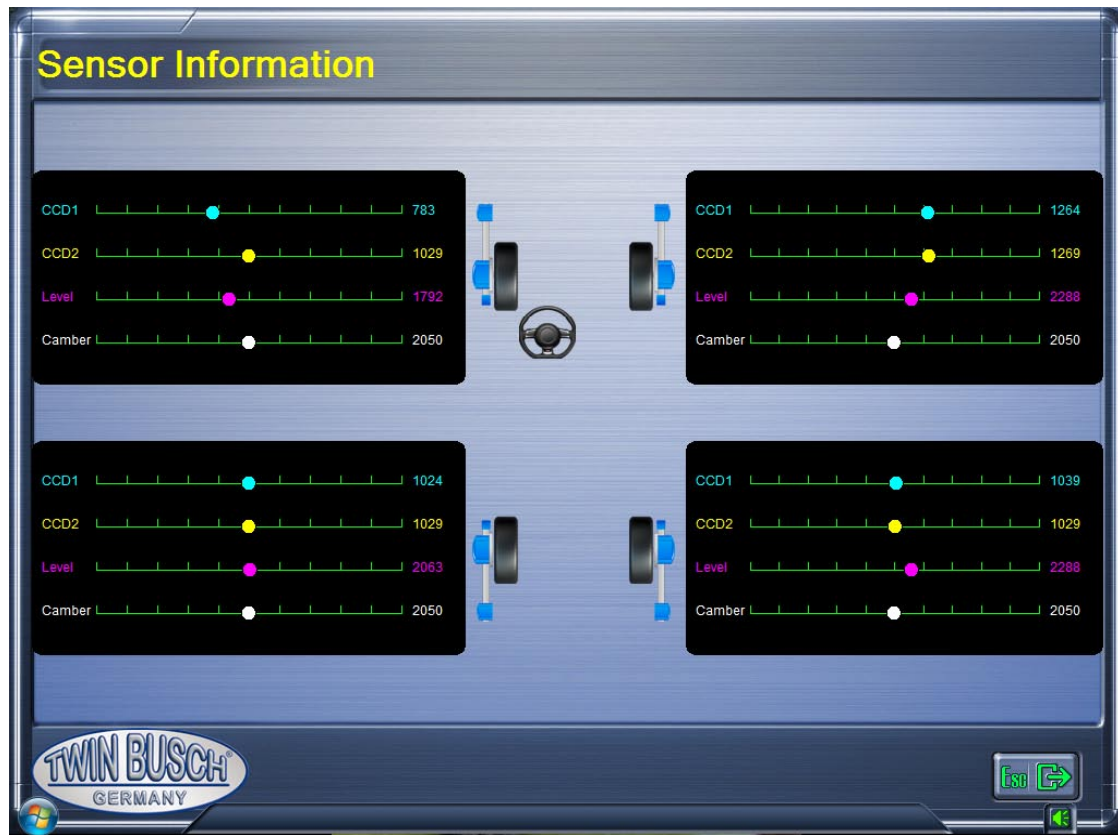
If you click the button (F5) configuration system, the screen shows a user interface, as in the following picture:



- A Select Version: here you can choose between the normal and the demo version.  
If you do a survey, you have to choose the normal version.  
The demo version is for demonstration purposes only and for practicing on the wheel measurement.
- B Select wheel alignment mode: here you can choose between the two wheel alignment modes, 4-wheel measurement (normal case) or front axle measurement.
- C Select of angel unit: here you can set the unit of the angles.
- D Set the language.
- E Select of the print form: here you can choose between two types of report form, formal or graphical.
- F Unit selection for the toe: degree, millimeters, degrees / minutes, and inches.

### 5.3.5 (F6) Sensor information

If you click the button (F6) sensor information, the screen shows a user interface, as shown in the following picture:



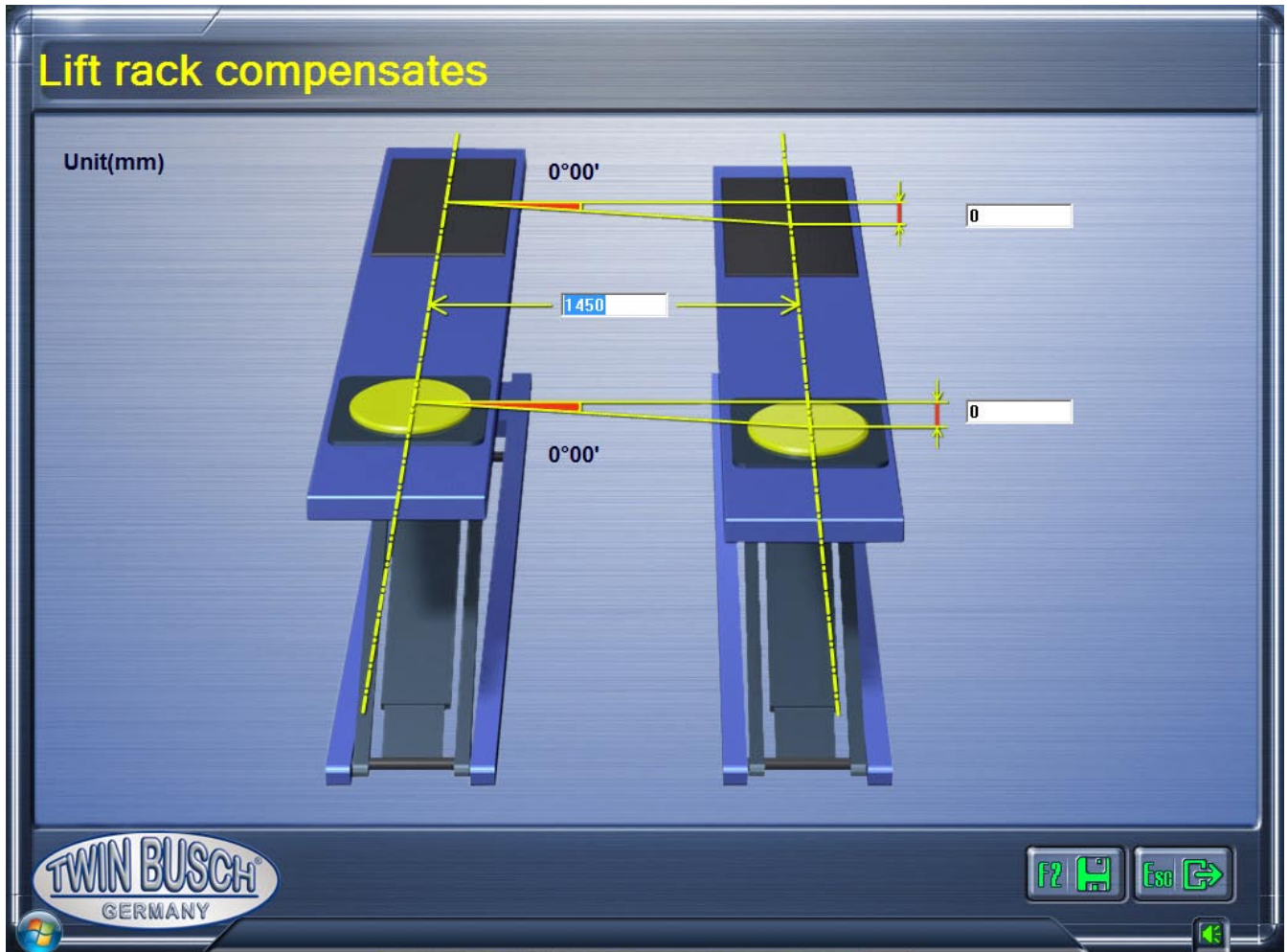
If the colored dot is on the far left, right, or jump, it indicates that the sensor inside the probe is faulty. This function performs a self-test on the faulty sensor. Result is displayed in red text on the bottom line:

Communication failed:

The communication with a measuring head is failed; check if the measuring head is turned on.

### 5.3.6 (F7) Lift settings

If you click the button (F7) lift calibration, the screen shows a user interface, as in the following picture:



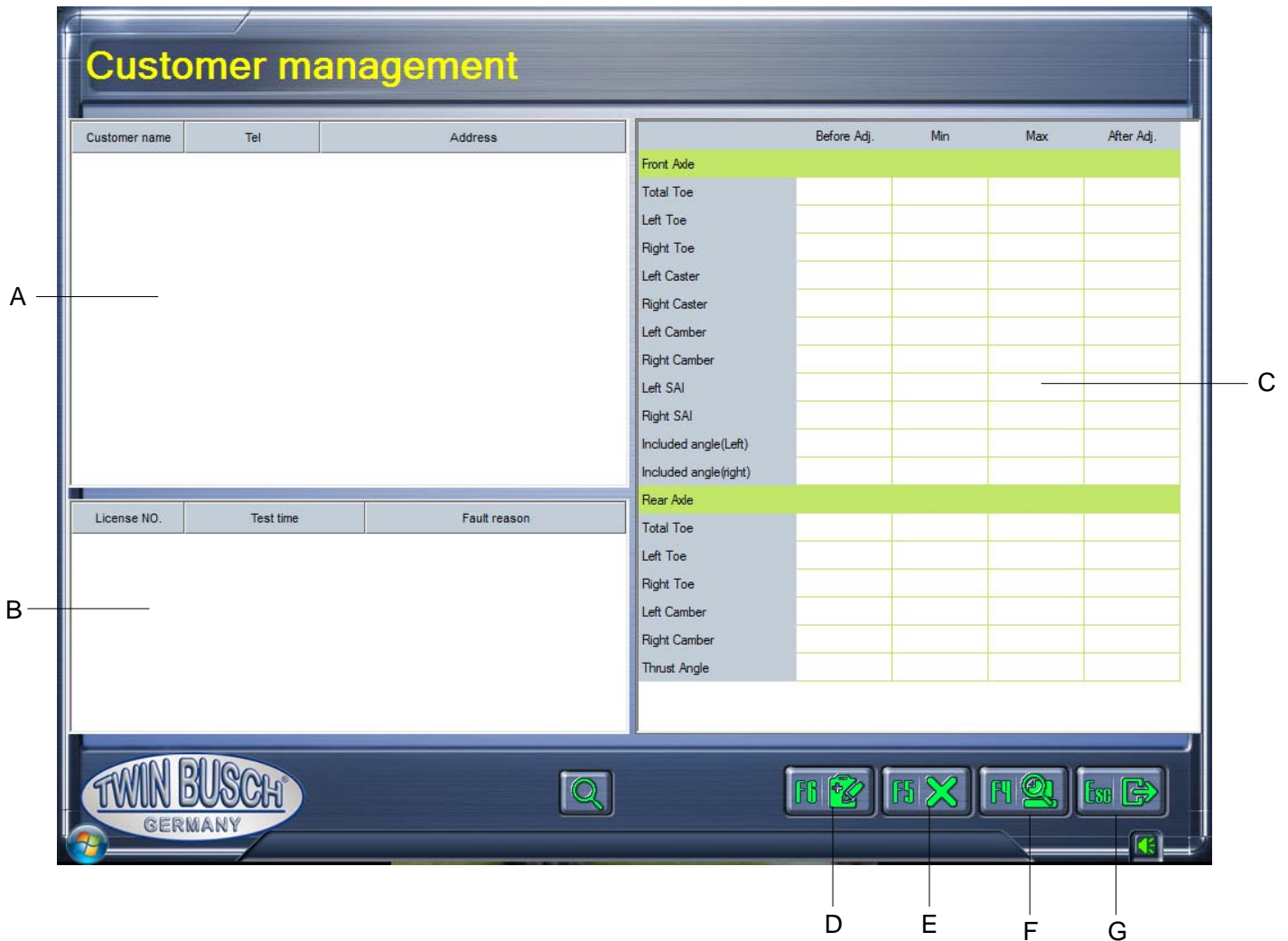
Sometimes the left and right sides of the platforms are not at the same height due to inaccurate mounting. As a result, the measurement of the fall is faulty.


If the surveying system is used for the first time, please check the gauge and height difference between the Enter left and right platform.

After pressing the Save button (F2), the system compensates automatically during wheel alignment the fault of the lift platforms.

### 5.4 (F6) Customer management

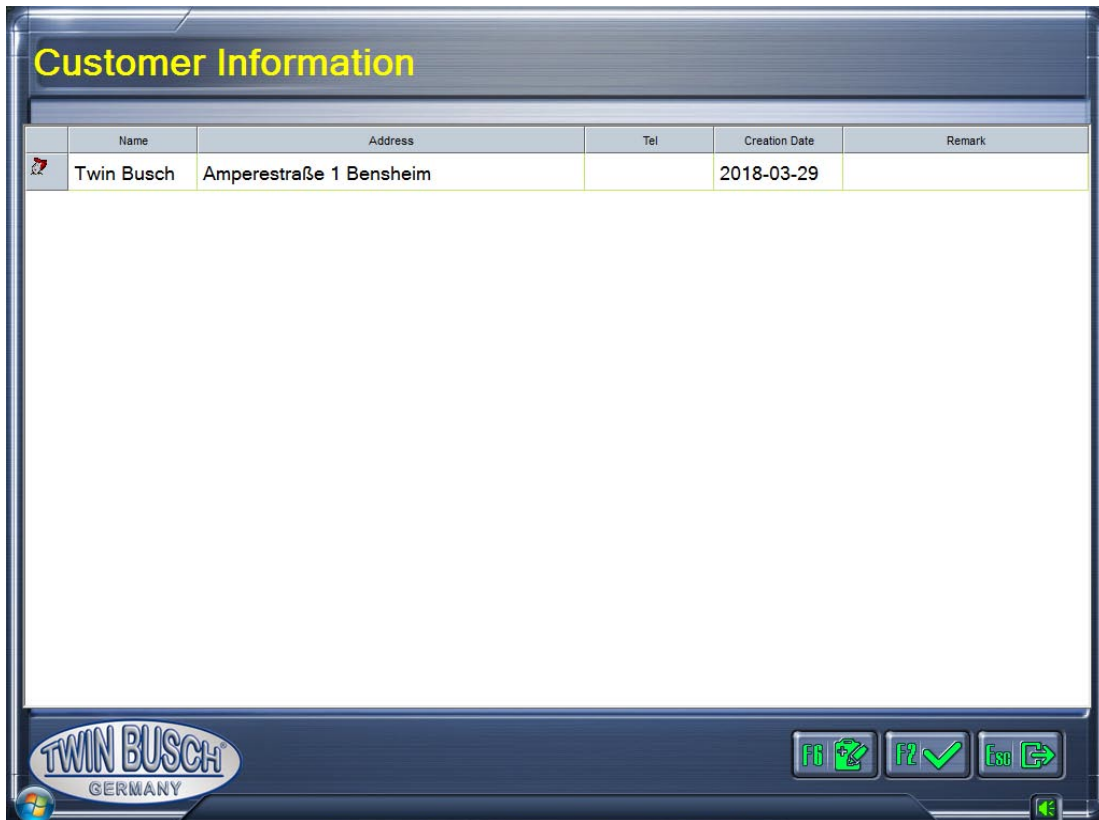
If you click on the button (F6) Customer Management, in the main screen the screen shows a user interface, as in the following picture:



- A Customer information, for customer name, telephone number, address.
- B Measurement log, for the display of number plate, check date and cause of error.
- C Test data corresponding to the vehicle selected in column B, the measured values before and after the test are displayed here.
- D  The Button **F6** Add customer opens the window Customer information, a user interface, as shown in the following picture.








The necessary customers data can be entered with button **F6**  , including name, address, telephone number and creation date etc.

E button **F5** (Clear) Customer data or the measurement record. If there are several measurement records under a customer name, all measurement records are automatically deleted when a customer is deleted.

F button **F4**  Preview and print customer test report.

G button **ESC** to exit the customer management.

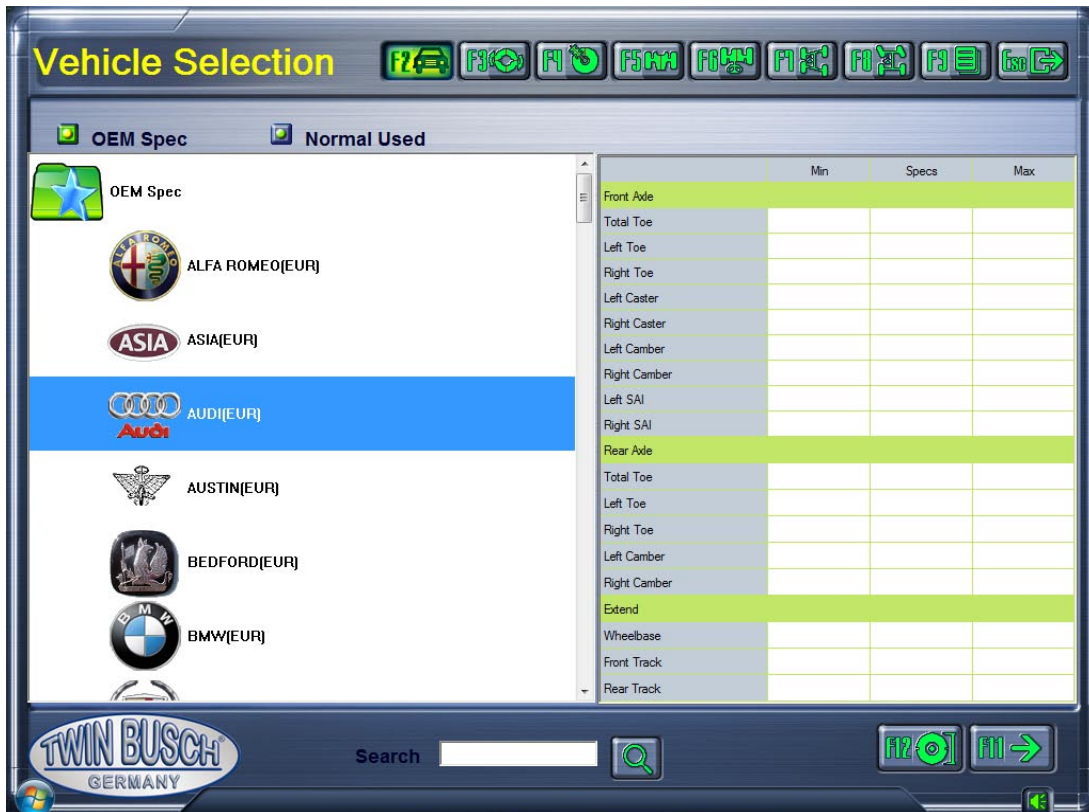
## 5.5 (F4) Measuring

Pressing (F4) Measurement opens the main screen of the wheel alignment. The corresponding

Press function key or shortcut key to call up the corresponding interface function.

### 5.5.1 Select a Vehicle

If you press the (F4) Measurement key, the vehicle selection automatically opens, as shown in the following figure.



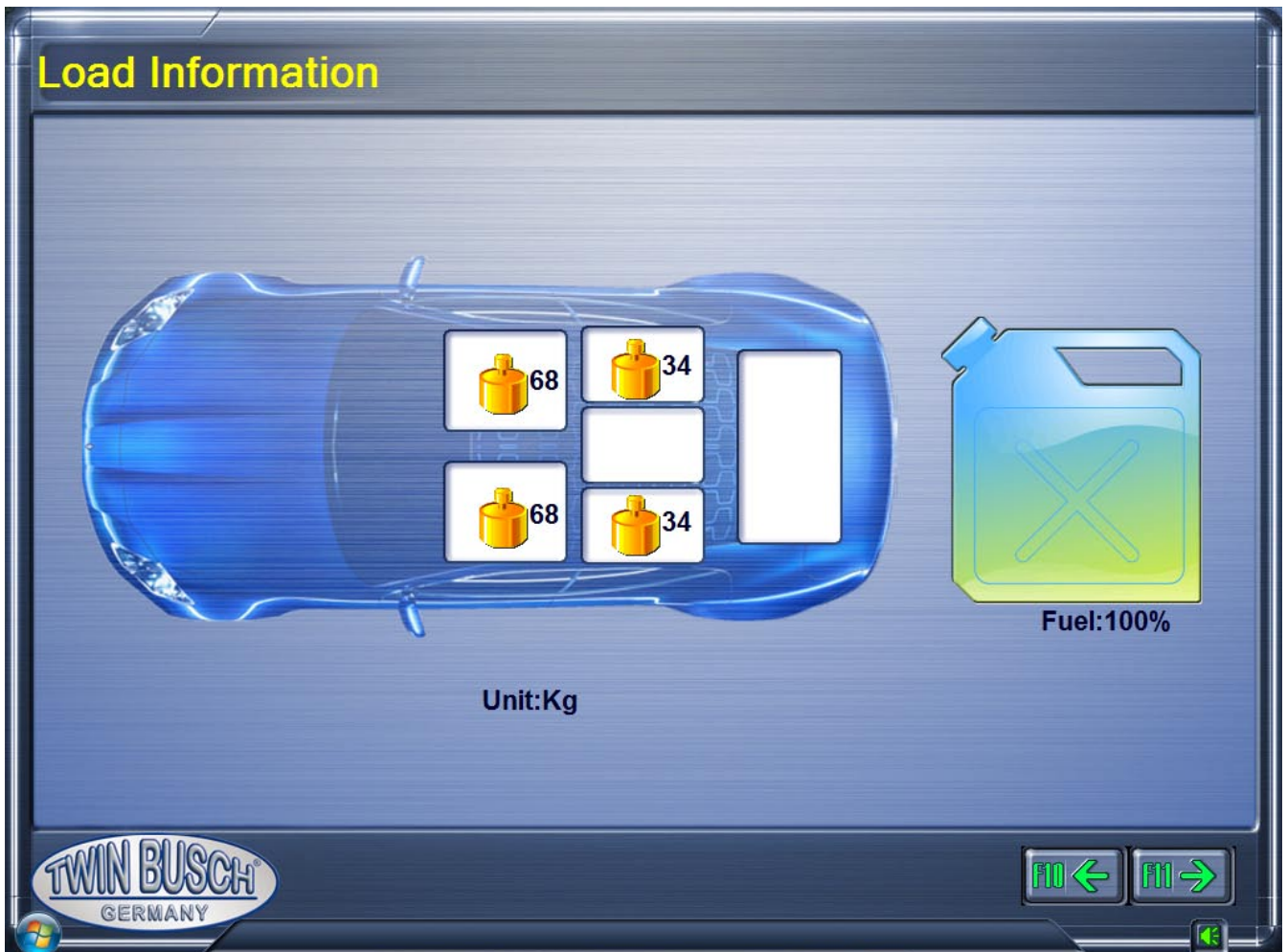
On the screen you can choose the right manufacturer, vehicle model and year, for example:

Audi A6 from 2012 till 2017

With the button **F12** you can optionally enter the tire diameter, optionally via the wheel size. Then call the next function step with **F11** , or with **F3** as the next step the rim impact compensation. If you do not want to carry out the rim stroke compensation, you can go straight to the next step, with **F4** for tracking measurement.


Depending on the vehicle selected, the system will proceed to two measurement methods:

- 1 Balancing weight method; for vehicles which must be loaded with predetermined weights for testing.



The weights must be placed as indicated.

This screen also comes when (as in the example, then without values) vehicles do not require any special measurement method.

- 2 Ground clearance method; for vehicles which have to be measured according to the chassis height, the corresponding screen automatically appears. Measure according to the requirements of the screen the height of the specified positions (with measuring tool such as tape measure, etc.) and select the data of the applicable fields.
- 3 Enter tire diameter, input in mm or inch. Press the tire diameter key or enter **F12**  to enter the outside diameter of the tire, as shown in the following image. (The default value is 728 mm).

The screenshot shows a software interface titled "Tyre Diameter". It contains three input fields: "Tyre model" (empty), "mm" (containing "728.0"), and "Inch" (containing "28.66"). At the bottom, there are two buttons: "F2" with a green checkmark and "Esc" with a red X.

Alternatively, the tire size can be entered. The tire diameter is then automatically calculated as shown in the following picture.


The screenshot shows the same "Tyre Diameter" interface. The "Tyre model" field now contains "205/55R16". The "mm" field contains "632" and the "Inch" field contains "24.9". The "F2" and "Esc" buttons are still present at the bottom.

### 5.5.2 Run out compensation

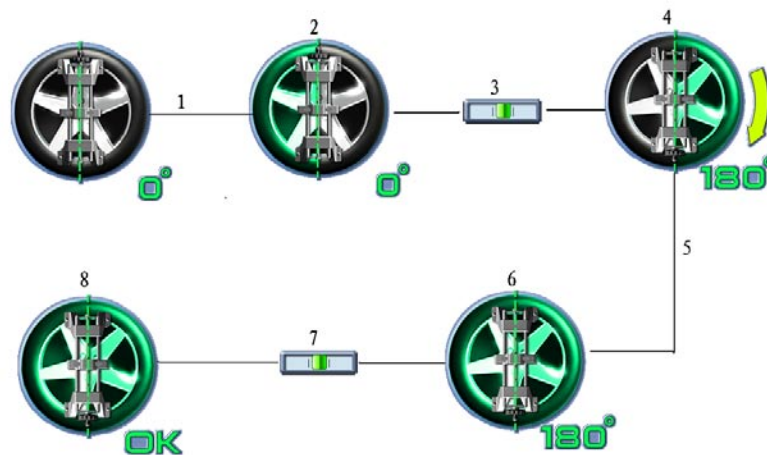
This function serves to reduce the error that can be caused by deformations of wheel and tire.

It is recommended to select the function to get a better accuracy of the measurements.

Before the rim stroke compensation, remove the brake pedal pusher, block the steering wheel with the steering wheel lock, and lift the vehicle with an axle lift. Adjust and block each measuring head individually.

- 1 make the measuring head movable Turn the wheel with the wheel clamp until the clincher is vertical. Press the rim run-out compensation button  on the control panel of the measuring head, an A (upper LED) blinks, shows screen means that the wheel is in 0° position 0th an indicator to align the probe appears. After alignment, the indicator a lights continuously and on the screen is required to turn the wheel by 180°.
- 2 rotating the wheel with the wheel clamp by 180° in the direction of travel press the rim run-out compensation button again, ad B (lower LED) blinks, shows screen means that the wheel is in position 180°. An indicator to align the probe appears. After alignment, the B indicator lights continuously and an indication appears that the rim stroke compensation has ended.
- 3 Press the rim run out compensation button on the control panel of the measuring head again and delete the displays A and B.

Do the step 1 till 3 also on the other 3 wheels.



**Note: During the run out compensation block the wheels which are not adjusted to prevent twisting.**

### 5.5.3 Caster measurement and adjustment

Press the caster measurement button or **F4** to call the caster measurement.

Then do the work according to the animation and the displayed text.

If you do not want to perform a follow-up measurement, you can directly press the function keys after the follow-up measurement to perform the other function.

Following the detailed work steps for the follow-up measurement:

- 1 Follow the information of the screen, release the brake pedal, remove the steering wheel holder and align and fix the measuring heads.
- 2 Set the steering wheel to the center point to the prompts of the screen by placing the red indicator on the green middle area, as shown in the picture below.



Turn the steering wheel to the left according to the on-screen display as soon as the display is in the left green area. Hold the steering wheel until the screen prompts the steering wheel to turn to the right as shown in the following figure:



Turn the steering wheel to the right according to the on-screen display as soon as the display is in the right green area. Hold the steering wheel until the screen prompting the steering wheel to turn to the left, as shown in the following image:

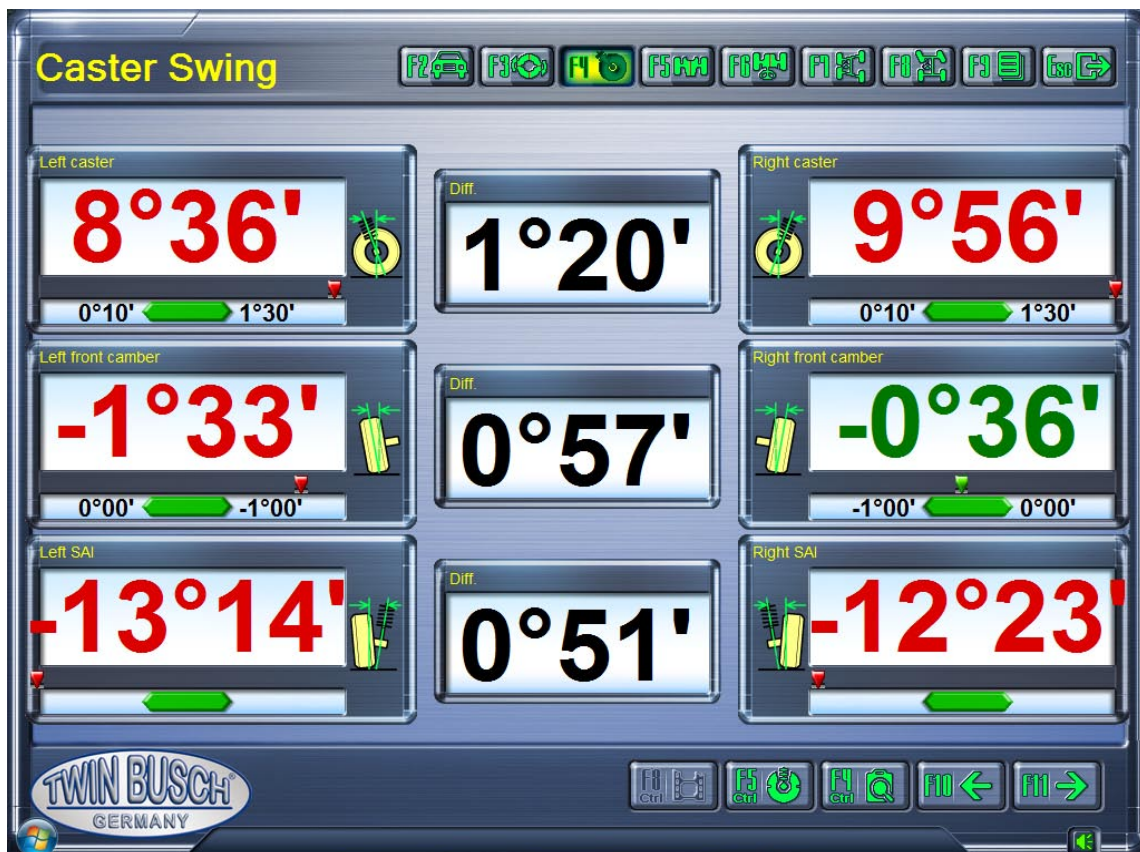




Turn the steering wheel to the left according to the on-screen display as soon as the display is in the middle green range.

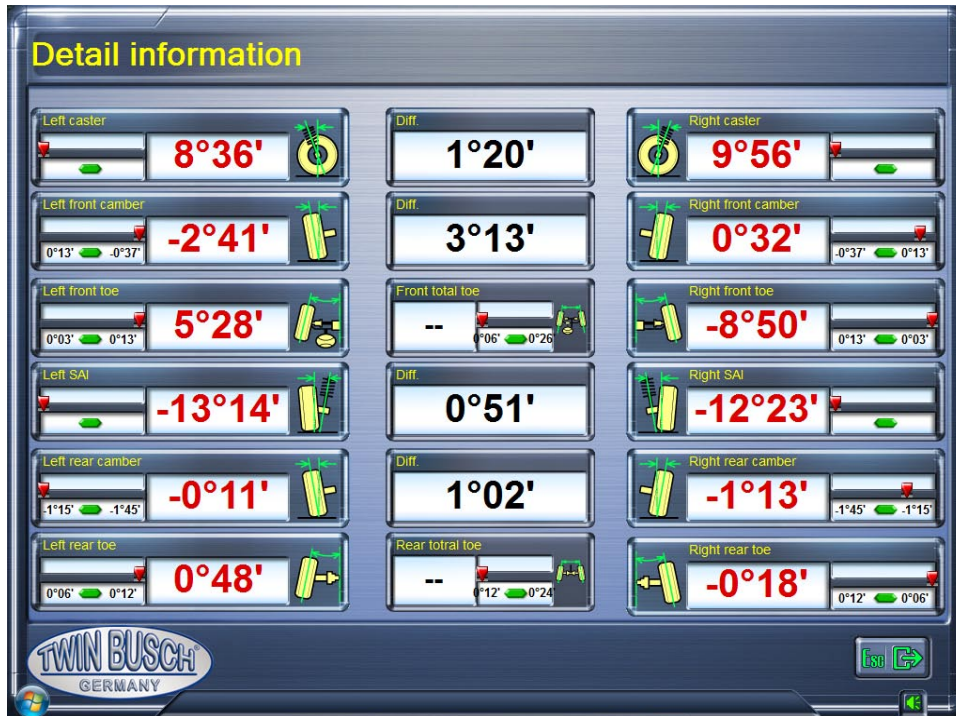


Hold the steering on the middle point till the measuring is done:

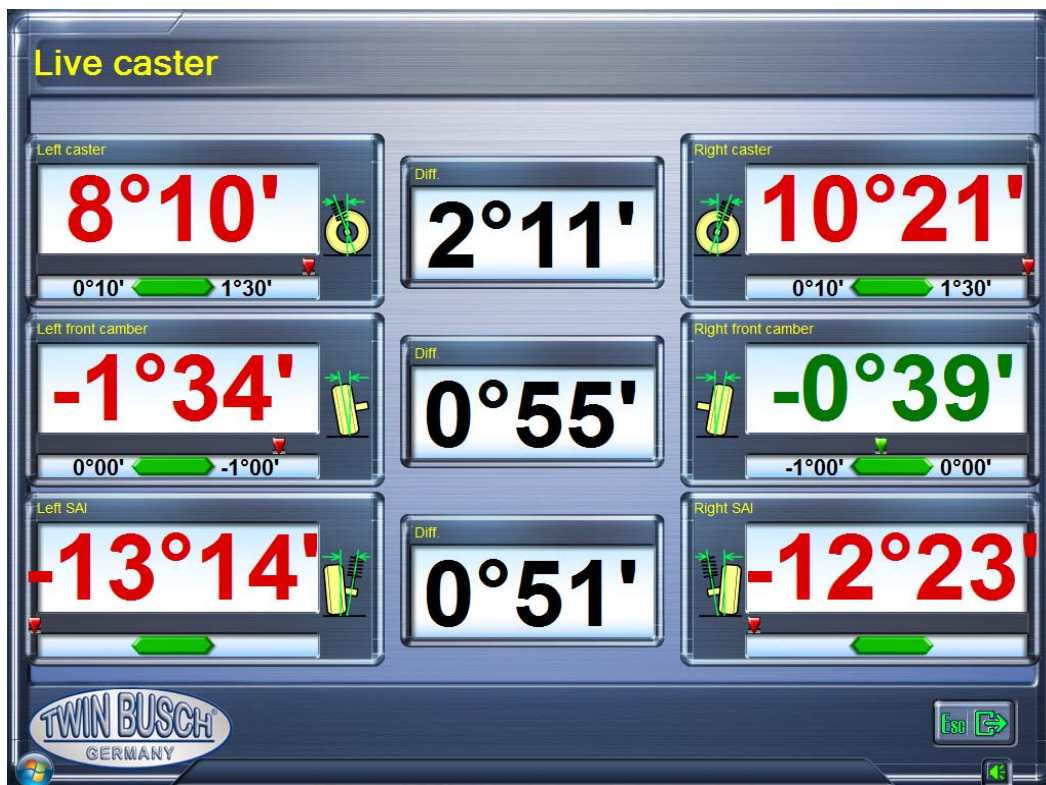


## 6. Detailed data display


On the Tracking Results screen, press the Detail Data button or Ctrl + F4, the Detailed Information screen displays the Caster, Front and Rear Wheel Survey parameters, as shown in the image below:



- 7 On the Tracking Results screen, press Live Caster or Ctrl + F5, the real time caster tracking and caster tracking screen appears, as shown in the following image:



### 5.5.4 Rear axle measurement and adjustment

Press the rear axle measurement button  or F5 to call up the rear axle measurement program. Then perform the work according to the animation and the displayed text. The rear axle measurement and adjustment screen will look like the following picture. After the screen prompts, the operator can view the currently measured values set the appropriate survey parameter in the range of default values.



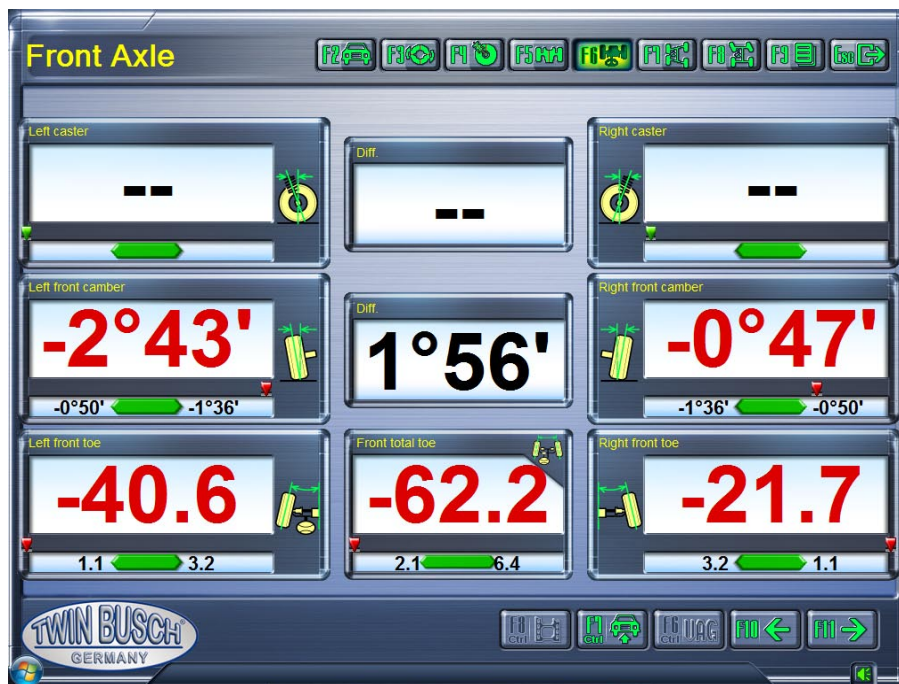
## 5.5.5 Front axle measurement and adjustment

Press the front axle measurement or **F6** button to call up the front axle measurement and adjustment program. Then do the work according to the animation and the displayed text.

The front wheel alignment and adjustment screen looks like the following image.

Following the prompts on the screen, the operator can set the currently measured values of the corresponding survey parameters within the range of the default values.

**Note:** To ensure correct measurement and adjustment of the front axle, it is necessary that the operator turns the steering wheel a few times from left to right and then places it in the middle, after which the steering wheel must be fixed with the steering wheel holder.



### 5.5.5.1 Adjust with vehicle lift

If it is difficult for the operator to set camber or track, press the Raise-Set or Ctrl-F7 key to access the Raise-Set function. Then do the work according to the animation and the displayed text.

### 5.5.5.2 Toe-in curve measurement and adjustment

The toe-in curves button or Ctrl + F6 calls this function on various VW and Audi vehicles with four-link suspension on the front axle. The specific operations for the toe-in curves measurement and adjustment are as follows:

1. According to the on-screen prompts, deflect the front of the vehicle a few times and then align and lock the probes.
2. Place the positioning measuring frame V.A.G.1925 together with the height measuring pins V.A.G.1925 / 4 at the intended position under the front axle. Adjust the position of the height measuring pins and place the left and right bolts on the gusset plate of the vehicle. The vehicle is now in position B1.
3. According to the on-screen prompts, check the current toe-in changes in position B1 to see if they are within the specified tolerance. If not change the value accordingly (see Vehicle Maintenance Manual for specific adjustments).
4. Lift up the vehicle with the axle jack, remove the height measuring pin 1925/4, insert the pin with the shorter end into the hole and lower the vehicle on it. The vehicle is then in position B2.

**Note: While lifting the vehicle with the axle jack, the wheels must always touch the turntables and the turntables must not move on the lift. Otherwise the measurement will be falsified.**

5. Check the current values of the toe-in change in position B2 according to the on-screen prompts. Whether they are within the specified tolerance range. If not, change the value accordingly (see Vehicle Maintenance Manual for specific adjustments).
6. Raise the vehicle and remove the measuring device.
7. Lower the vehicle and deflect the front axle a few times.
8. Check if the current values for toe are within Tolerance. When the result is correct, the measurement and adjustment of toe-in and toe-in are completed.

**Note: the toe-in curve change must be checked in the following cases:**

- **After an accident and / or the chassis and parts of the wheel suspensions were replaced.**
- **If the vehicle drives over bad road surfaces, and the steering is unstable.**
- **During the braking process, the vehicle is unstable, although the brake system is ok.**

### 5.5.6 Wheelbase / offset measurement

Press the wheelbase / offset measurement or **F6** button to call up the corresponding program.

The results are displayed as shown on the following screen.

This feature is mainly used to display the angles of wheel offset front and rear, left and right offset, track width difference, wheelbase difference and misalignment.



**Note:**

**These results are not included in the printout of the report. If this data is needed, you need to copy it to the clipboard using the keyboard "Print" key, paste it into a program (such as Word) and print it out.**

### 5.5.7 Steering angle measurement

Press the Steering angle measurement button or **F8** to call the Steering angle measurement as shown in the following figure. There are two options on this screen: cornering or maximum steering angle. After selecting the desired function, perform the operations as shown on the screen.



**Note: Before measuring the steering angle, REMOVE THE MEASURING HEADS!**


*If there are no electric turntables, the operator must adjust the angles manually with the steering wheel as required on the screen.*

### 5.5.8 Print a Report

After completing the measurements and adjustments, press the Report or **F9** key to access the Report screen, as shown in the following image.


Before printing, enter all vehicle owners, license plate, customer name, telephone, address, etc. information.



If a new customer has to be created, press the  button. The screen for entering and changing new customers appears.

If the field Customer information is selected,

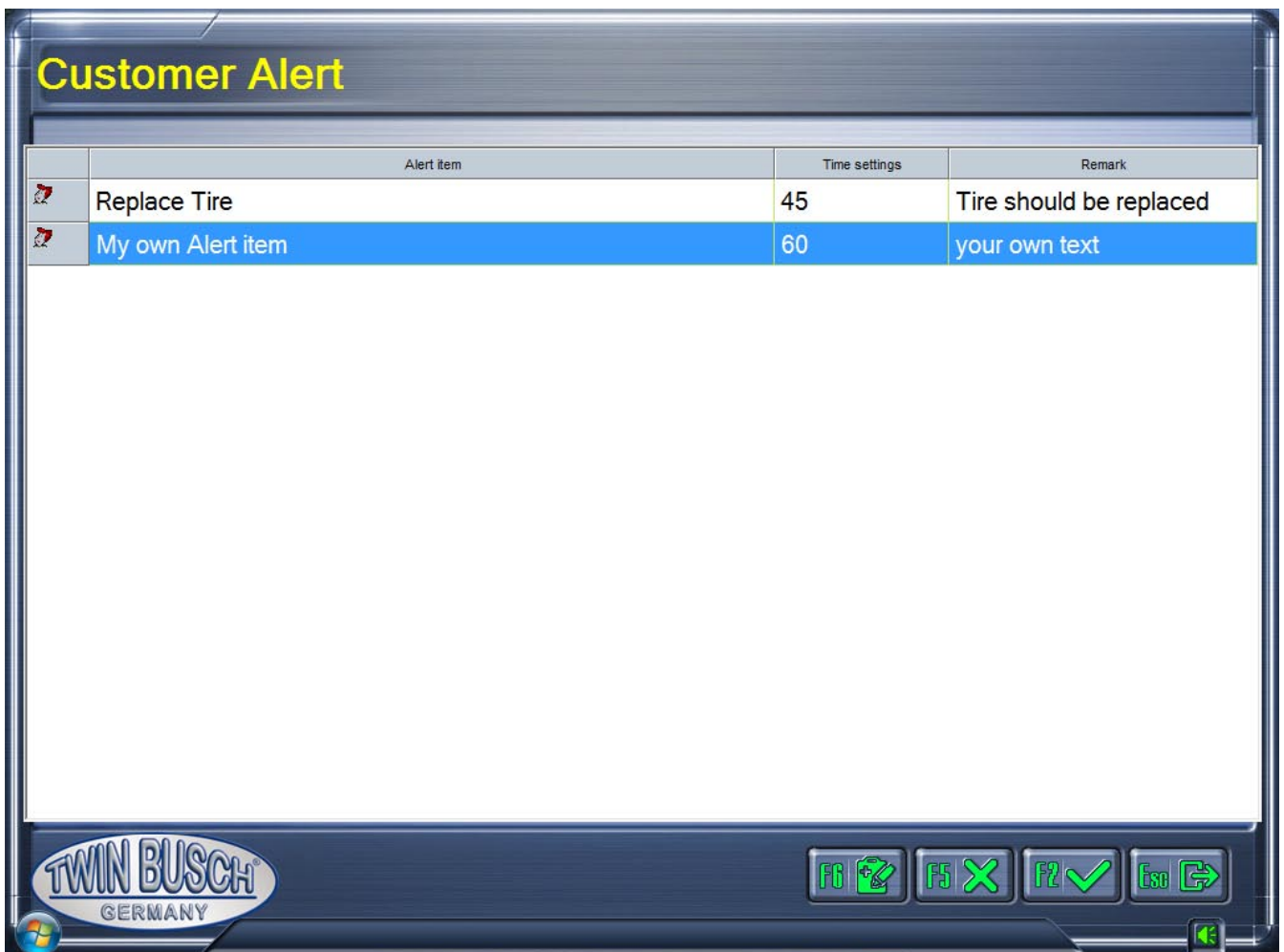


You can use the button  to create, change or delete further customer information.

You can also enter a time after which the footer of the screens displays the customer information when the report has been saved, as shown in the following image:



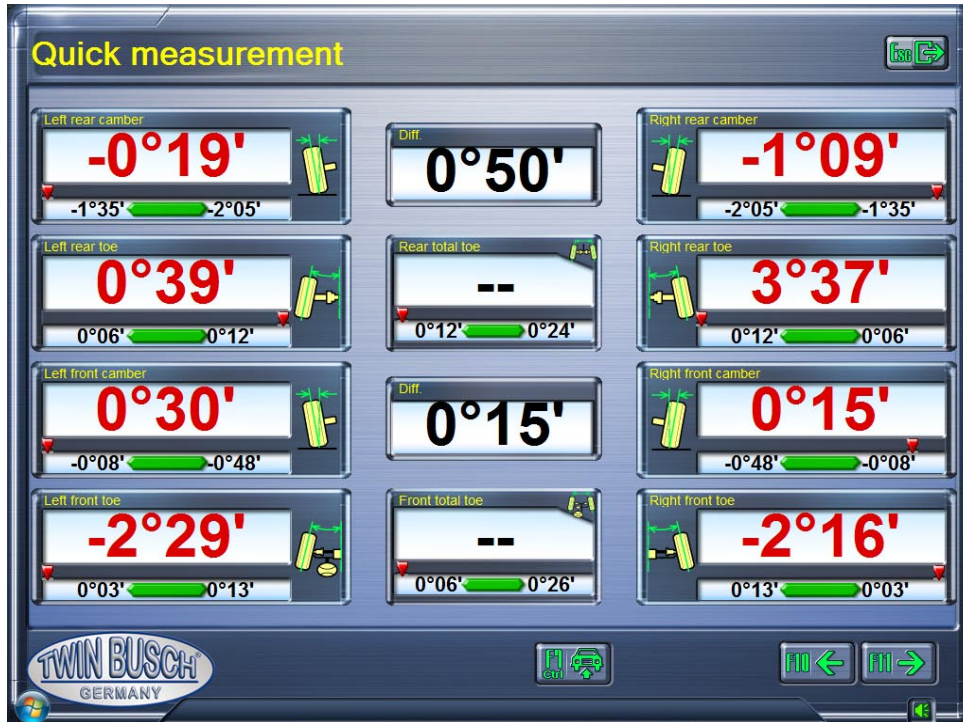
The screen for creating customer notes looks like the following picture:



### 5.6 Quick measuring

In the main menu you can use the **F3** key to select the program for the quick measurement. This is a quick-action work surface that allows you to simultaneously check and see the camber and lane of front and rear wheels after the vehicle has been selected.

The screen is shown in the following picture:



This user interface provides only the functions for measurement and adjustment of front and rear wheel track and camber.

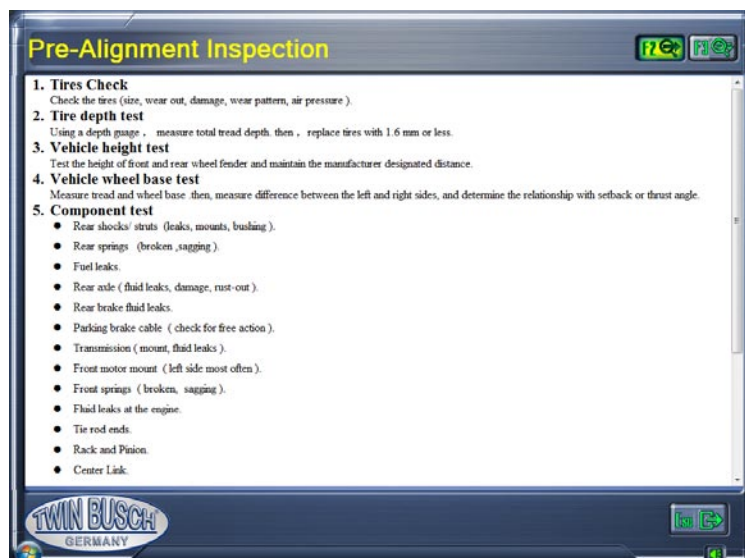
For other functions, please select the "Measure" program in the main menu.

### 5.7 Preliminary investigations

Use the Info or **F2** key in the main menu to get information about examinations prior to the survey.

The most important points are shown, which should be checked before the measurement.

The screen looks like the following picture:





## 6. Maintenance

### 6.1 Computer

- The user should have basic knowledge of computer hardware and software for normal operation of the computer.
- Computer and monitor should be mounted stably on the control panel. Do not use in a frosty, wet, extremely hot environment, do not expose to direct sunlight, radiation and heat sources.
- Do not move the computer during operation.
- The computer is completely needed for wheel alignment. Do not install any other software to avoid computer viruses. The computer is checked for freedom from viruses before leaving the factory. If you install some anti-virus software it is possible that the software delete some important system parameter from the alignment software.
- After prolonged use, dust and oil spills accumulate in the computer case and monitor. Please clean with a neutral detergent. Avoid oily and corrosive agents.
- Do not delete unknown files from the hard disk, this may cause abnormal functions or the computer may stop booting.
- Never disassemble the computer or lay cables and plug-in cards from the inside to avoid damage.

### 6.2 Wheel clamp and measuring head

- The wheel clamps should be cleaned and oiled regularly to be sure that the brackets' clips are easy to adjust and the probes can be easily attached.
- The housing of the measuring heads is made of aluminum and plastic, after some time of use, dust and oil dirt will accumulate on the surfaces. Please clean with a neutral detergent. Avoid oily and corrosive agents.
- The measuring heads are precision parts, please handle with care. Manipulation may damage the internal components and interfere with normal operation.
- Do not disassemble the measuring heads to avoid damage to the component. Twin Busch does not warrant for such errors.

### 6.3 Printer (not included)

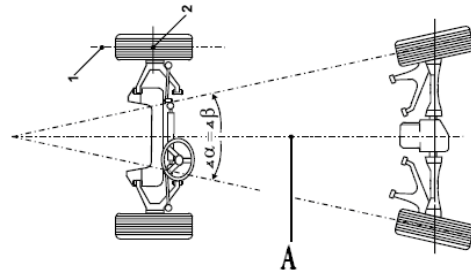
- Read the operating instructions of the printer carefully.
- Install the necessary printer driver and select the correct printer settings.
- If the printout is not easy to read, the printer cartridges may be empty.  
Please replace the printer cartridges in good time.

## 7. Annex

### 7.1 fundamental terms

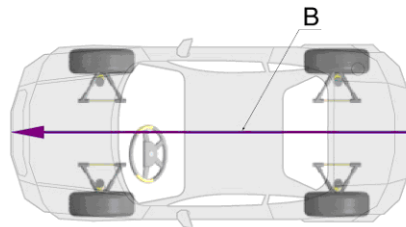
**Center line of the wheels:** The contact between the tire and the ground forms a line to which the middle line of the wheels is vertical.

A- Centerline of the wheels

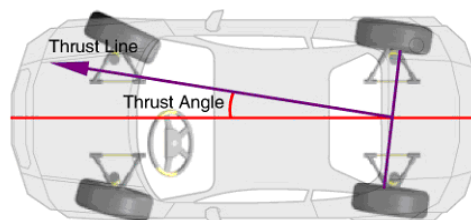


**Vehicle Centerline:** The line passing through the center of the front axle and the center of the rear axle.

B- Centerline of the vehicle (or geometric centerline)



**Axle thrust line:**



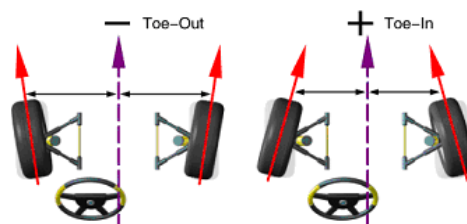
### 7.2 General geometry

#### 7.2.1 Toe

The toe is the value around which a front or rear wheel is facing inboard or outboard at the front, in relation to each other.

If the wheels point inwards, they are called toe-in, the wheels point outwards, and so on.

Toe-in has positive values; after-trace has negative values, see the following picture.



### 7.2.1.1 Function

Reduction of tire wear and rolling resistance.

### 7.2.1.2 Assessment of the symptoms

#### 7.2.1.2.1 Toe too big.

##### a. big wear on the outside of the tire.

- For radial tires, the wear pattern is similar to excessive positive camber.
- Heels or tread block wear.

##### b. Unstable steering

- Poor directional stability.
- Wheels tremble.

#### 7.2.1.2.2 Toe too big

##### a. Big wear on the inside of the tire.

##### b. Unstable steering.

### 7.2.1.3 Track adjustment in front

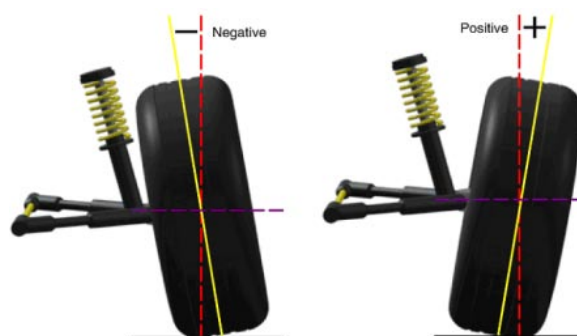
- Adjust track rod.

### 7.2.1.4 Tracking inside

Setting OEM controller, eccentric cam, eccentric pin, the eccentric bushing, the elongated holes and seals.

### 7.2.2 Camper

Camber is the inclination of the wheels inward or outward. Outward inclination is called positive fall, inward negative fall. Correct lintel can balance the load on the axles, extending the life of the components and minimizing tire wear. A wrong camper will increase the tire wear and the vehicle can pull to the side.



### 7.2.2.1 Function

Adjust vehicle load to center of wheels, remove drag and reduce tire wear.

### 7.2.2.2 Assessment of the symptoms

#### 7.2.2.2.1 Effects of too much positive camber

- a. Tires wear out only on the outside.
- b. stronger suspension wear.
- c. Vehicle pulls to the side.

#### 7.2.2.2.1 Effects of too much negative camber

- a. Tire wear only on the inside.
- b. stronger suspension wear.
- c. Vehicle pulls to the side.

### 7.2.2.3 Example

Put the camber on the front left side to  $+1.0^\circ$ , and on the left rear side to  $+0.5^\circ$ , the vehicle will pull during driving to the left side.

### 7.2.2.4 Caster-setting

Adjustment of seals, tapered seals, eccentric cams, slots, bearing mounts eccentric pins, eccentric bushings, eccentric ball and struts.

## 7.2.3 Wheelbase difference

Wheelbase difference is the angle between the lines going through the two front and rear wheels and the vertical line of the Axle thrust line.

If the right wheel is in front of the left wheel, the wheelbase difference is positive, if not negative.

When the track width is known one can indicate the wheelbase difference in mm.

### 7.2.3.1 Reason for a wheelbase difference

- Accident.

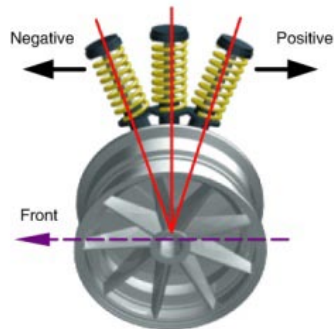
### 7.2.3.2 Assessment of the symptoms

For larger values of the wheel base difference, the vehicle will move to one side, generally on the side with the shorter wheelbase.

## 7.2.4 Caster

Caster is the inclination of the kingpin to the front or rear from the vertical.

If the slope is to the rear, the caster is positive, he is forward, and the caster is negative.



### 7.2.4.1 Function

The caster angle influences the steering stability and the self-return of the steering.

### 7.2.4.2 Assessment of the symptoms

Too small caster leads to unstable steering: the self-resetting is too low, at high speed you feel the direction deviate (the driver needs a lot of attention at higher speeds).

### 7.2.4.3 Example

Set the left front caster to  $+ 0.5^\circ$ , and the right front caster to  $+ 1.5^\circ$ , then the vehicle will pull to the left side.

### 7.2.4.4 Caster adjustment

Adjust gaskets, eccentric cams, slots, and eccentric ball heads, turn struts, and move the engine mounts.

## 7.2.5 Inclination

Spread is the angle of inclination from the vertical of the kingpin to the centerline of the vehicle.

Proper spreading balances the load on the bearings, increasing bearing life and improving maneuverability.

Without spreading the control of the steering is affected, further because vehicle weight and force inputs of the road surface substantial load on the axles and can damage the axles. Correct spreading also helps the self-provision of the steering.

The spreading is defined during design of the wheel suspension. It is not adjustable.



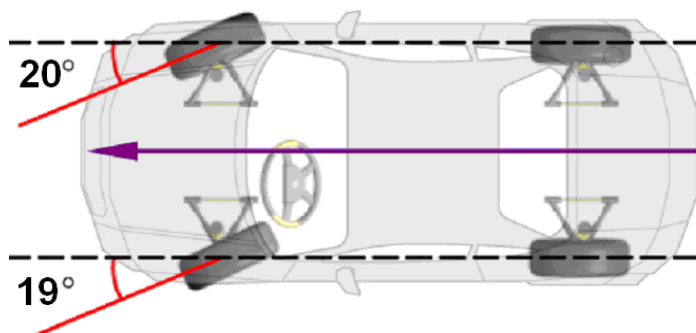
### 7.2.6 Thrust angle

The included angle is the angle between the center line of the wheel and the axes of the fall, usually the geometric sum of camber and SAI.



### 7.2.7 Toe-out when cornering

Turning on cornering is defined as the difference of the steering angle (track difference angle) between the two front wheels turned by 20 ° to the left or right.



### 7.2.8 Thrust angle

Definition: The angle between the vehicle centerline and the vehicle's axial thrust line.

While driving, the front and rear wheels should pull to the same side if the driving angle is not zero.

If the axle feed line is to the left of the vehicle center line, the driving angle is positive, otherwise negative.

The driving angle causes the rear of the vehicle to pull to one side.

For the vehicle to go straight ahead, the front wheels must be turned in the direction of the axial thrust line.

If the driving angle is not compensated for the front lane, the steering wheel must be turned to one side when driving straight ahead.

If you can adjust the rear track, the driving angle can be reduced to almost zero.

The direction of the axial thrust line is the current direction of travel of the vehicle, which is determined by the rear lane. If the direction of the axle thrust line does not coincide with the geometric center line of the vehicle, the steering wheel must be turned degrees to go straight ahead, causing a tilt of the steering wheel is caused. This is called lateral rear wheel deviation. Ignoring the axial thrust line the correctness of the survey cannot be ensured.

This is the main reason for steering wheel deviations.

### 7.2.8.1 Reasons which cause thrust angle

- Driving angle is created when an axis offset is generated.
- Rear track is asymmetric.

### 7.2.8.2 Effects of the driving angle

- Tire wear.
- Steering wheel misalignment.
- Pull.
- Vehicle is currently driving at an angle.
- Steering wheel offset.

### 7.2.8.3 Changes in the driving angle

- OEM controller.
- Add conical seals between axle and tire.
- Cam or other adjuster mounted after the vehicle has left the factory.

**My notes:**



**My notes:**

**My notes:**



The company

**Twin Busch GmbH | Amperestr. 1 | D-64625 Bensheim**

declares hereby, that the **wheel aligner**

**TW 115**

serial no.

in the configuration placed on the market by us, meets the relevant safety and health requirements, as required by the following EC directive(s) in it's/their current version(s).

EG-directive(s)

**1999/5/EC**

Applied harmonized standards and regulations

**ETSI EN 300 328 V1.8.1:2012, EN 60950-1:2006+A11:2009+A1:2010+A12:2011+A2:2013, EN 301 489-1 V1.9.1:2011, EN 301 489-17 V2.2.1:2012, EN 62479:2010**

CE Certificate

**EC.1282.0S141022.S3TQ032**

date of issue: 22.10.2014  
place of issue: Valsamaggio  
technical file no.: 646821 400901

Certification body

Ente Certificazione Macchine Srl,  
Via Ca' Bella, 243, Loc.Castello di Serravalle  
40053 Valsamoggia (BO) - ITALY  
Notified Body Appointment No. 1282

**Any alteration to the equipment, improper use or installation void this declaration.**

Authorized person to compile technical documentation is: Michael Glade (adress as below)



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Authorized signatory: Michael Glade  
Bensheim, 20.11.14 Qualitätsmanagement

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