TECNICHE DI COLLAUDO

New Dimension

3D WHEEL ALIGNMENT SYSTEM

Operating Manual

Rev. 03
August 2013

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ATTENTION!

The following manual is integral part of the product and contains instructions on how to use the wheel alignment equipment. All operators must read the manual carefully before using the equipment. Keep the manual for the whole operating life of the equipment in an easily accessible and well-known place and consult it in case of doubts. The manufacturer is not responsible for damages caused by the non-compliance with the instructions contained in this following manual and an improper use of the equipment. Instructions for the system calibration (reserved to trained service engineers) are contained in the calibration manual.

IMPORTANT INSTRUCTIONS ON BASIC SAFETY AND PROPER USE

- The nameplate with voltage and frequency data is placed on the back of the equipment. Please, note the instructions contained on the nameplate. NEVER connect the equipment to a power supply of different voltage from the one indicated in the nameplate.
- This product is equipped with a three-pin plug with ground connection; mains (ac socket) must be provided with ground connection; if not so, please consult an electrician. Do not modify or use the power plug improperly.
- Never turn off the PC just by pulling the power plug; always follow the switch off procedure described in this manual.
An unordered turn off of the PC is turned off may cause a file corruption that may cause the equipment to become useless.
- Maintenance shall only be carried out by authorized and trained service engineers.

GENERAL INFORMATION FOR THE USERS

Equipment disposal

- This equipment must not be disposed of as household waste but as "Special Waste".

- The re-use or recycling, in compliance with the rules regarding the Electrical and Electronic Equipment (CEE), is useful to safeguard the environment and our health.

- In compliance with the WEEE European Directives 2002/96/EC, there are specific collection centres at citizens' disposal for the collection of unused electrical equipment.

- The public administration and producers of electrical and electronic equipment commit themselves to simplify the waste re-use and recycling processes such as electrical and electronic equipment through the separate waste collection and compliant measures.

- The law punishes with equivalent sanctions, those who do not respect the rules and do not dispose of the electrical and electronic equipment in compliance with what has been established by the law.

Battery disposal

- Recycle and dispose of the batteries in compliance with the rules. Do not throw them away in the household waste.

- Never throw batteries into the fire!

1 – GENERALITIES

The ND system includes the following parts:

ND-F (Floor or pit installation)

Q.ty	Description
2	CAMERA HEADS
4	TARGETS
4	KNOBS FOR TARGET
2	SUPPLY CABLES
4	SQ3 ANGLES
16	SOCKET HEAD SCREWS
16	ML SPRINGS
16	PM8 PLATES
2	PART NUMBER STICKERS
2	TRANSPARENT STICKERS
2	NEW DIMENSION STICKER
1	OPERATING MANUAL
1	DVD WITH SOFTWARE AND USER MANUAL

ND-C (Ceiling installation)

Q.ty	Description
2	CAMERA HEADS
4	TARGETS
4	KNOBS FOR TARGET
2	SUPPLY CABLES
4	SQ3 ANGLES
16	SOCKET HEAD SCREWS
24	ML SPRINGS
24	PM8 PLATES
2	PART NUMBER ADHESIVES
2	TRANSPARENT ADHESIVES
8	8X30 TPSCE SCREWS
2	EXTRUDED BEAMS
2	NEW DIMENSION STICKERS
1	OPERATING MANUAL
1	DVD WITH SOFTWARE AND USER MANUAL

The supply can be composed also of many other parts that are not described in the previous lists; they may be optional accessories like cabinet, clamps, WiFi interface, etc. that customer can choose. Please refer to the current catalogue/price list for details.

Further to what specified above, also the wheel alignment software and car data base are supplied along, as described further on in this manual.
A Windows-compatible PC with monitor, keyboard, mouse and printer is needed to run the wheel alignment software and data base; if not supplied, the customer must procure it according the specifications provided further on in this manual.

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1.1 HOW TO ASSEMBLE THE TARGET TO A CLAMP
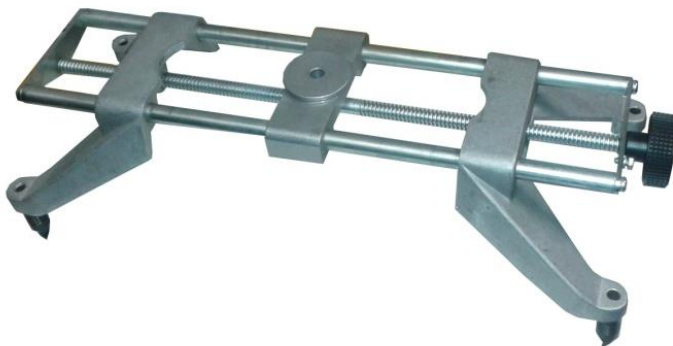
The targets may be assembled to a choice of different wheel or tyre clamps as listed in the VAMAG catalogue/price list.

Target knob with washer

Target

4-pin standard clamp (optional)

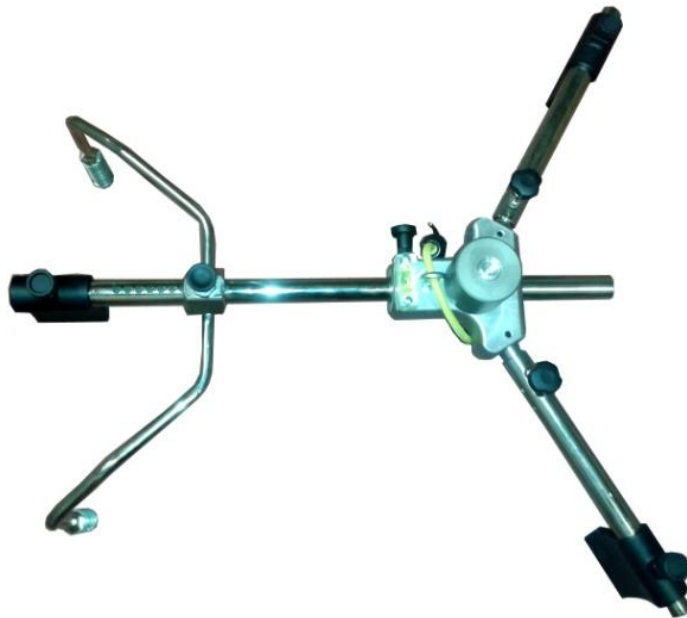Rev. 3 - August 2013

BEWARE: The Target has a specific position in the clamp; when tightening the bolt, turn the target around to have the reference dot facing up, as in the picture below:

Threaded adapter for AGS-RF clamp (optional) to assemble the Target

2 – USE

2.1 – INTRODUCTION

This Manual applies to whatever configuration (ND-F, ND-C) or installation (ceiling, floor, wall,…) has been choosen for the NewDimension wheel alignment system, with no difference in performance or behaviour if the equipment has been properly installed and calibrated as per manufacturer's instructions.

2.2 - DEFINITIONS

The VAMAG NewDimension wheel alignment system is a 3D-Scanning system developed and manufactured to check and adjust the wheel and chassis alignment of a passenger vehicle.
The NewDimension system is made of the following parts:
- Optical measurement units (camera heads) positioned on either side of the vehicle,
- Wheel-simulating targets to be put on every wheel by means of clamps
- A console with a PC to run the NewDimension alignment software.
Every camera head contains an industrial pc which receives the images from the 5Mpixel definition CCD cameras; the camera heads are connected to the PC through a wired Ethernet network or an optional WiFi link.

<u>Warning:</u> the New Dimension management pc must not run other software not supplied by VAMAG, as they may interfere with the wheel alignment software and change the system configuration thus impeding or damaging the equipment. Warranty condition may not apply if other software Is found in the pc.

3 – TECHNICAL DATA

3.1 OVERALL DIMENSIONS

PAS cabinet (optional)

Width (Targets included)	=	950mm
Depth	=	850mm
Height (monitor excluded)	=	1250mm

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3.2 POWER SUPPLY AND CONSUMPTION

Control unit (control box)
Max. absorbed power Computer   400 / 500 W
Max. absorbed power Monitor   it depends on the type

Camera heads (measurement units)

Power supply   110 - 240 Vac monophase 50/60 Hz
Max. absorbed power x Unit   50 W

3.3 STANDARDS AND ACCURACIES

Total toe:	accuracy:	± 4'	field: ± 50°
Camber:	accuracy:	± 3'	field: ± 15°
Set Back:	accuracy:	± 4'	field: ± 9°
Thrust angle:	accuracy:	± 2'	field: ± 9°
Caster:	accuracy:	± 6'	field: ± 22°
Kingpin angle (SAI):	accuracy:	± 6'	field: ± 22°
Track:	accuracy:	± 2mm	field: 1.2 – 2.1 m

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4 – PERSONNEL TRAINING

Only suitably trained and authorized personnel may use the equipment.
For an optimal management of the system and effective measures, the personnel must be suitably trained to understand the necessary information and operate in compliance with the indications supplied by the manufacturer. In case of any doubt regarding the use and maintenance of the system, consult the instruction manual; in case of doubt do not interpret, consult the authorised service centres or directly the technical assistance.

5 – COMPOSITION OF THE EQUIPMENT

5.1 CONSOLE

For all the operations use a console is required, equipped with electronic components to process and manage the measures deriving from the 3D measurement units.
Alternatively a Windows-compatible Tablet PC can be used; in this case the New Dimension System must be equipped with optional WiFi interface

Components (optional PAS cabinet shown in picture):
1 - Monitor Full HD.
2 - PC Keyboard with 105 keys.
3 - Mouse
3 - Target
4 – Upper space (drawer) for the printer housing
5 – Personal Computer Space (front door)

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5.2 MANAGEMENT PC

Minimum PC features
Intel Dual Core
Windows 7 Operating system
Ram 2GB
Hard Disk 100GB
CD-ROM
4 USB Ports
Video card 1920x1080 (Full Hd)

5.3 PC KEYBOARD

The system is equipped with a QWERTY keyboard. The PC keyboard serves as data input and management.

5.4 MONITOR

The visualisation of data is realized by a Full Hd display, necessary for the right visualisation of images and use software.
The optimal resolution setting is 1920x1080 (1080p).

5.5 PRINTER

A A4 printer in needed to prints the results.

5.6 HEADS (MEASUREMENT UNITS)

The camera heads require an external power supply 110 – 240Vac monophase 50/60 Hz.
Always provide for an easily accessible power switch.
With wired connection, Ethernet cables with RJ45 plug are required. Best practice is to provide for a commercially available router (i.e.: Edimax BR-6428nS) connected to the two camera heads on one side and the pc on the other side.
With optional WiFi link, no other cable is necessary. The WiFi network between the measuring heads and the PC must be "*ad Hoc*"-type to separate this network to whatever else network possibly on in the area.
The heads are provided with an on/off switch in the back panel.

5.6.1 Heads (measurement units) - Calibration

N.B. After being physically installed in the right position, the camera heads must be calibrated using the Calibration software and suitable tools. For the correct calibration, see the Service Manual.
Moreover, to ensure accurate measurement, the lift should have been properly installed and levelled.
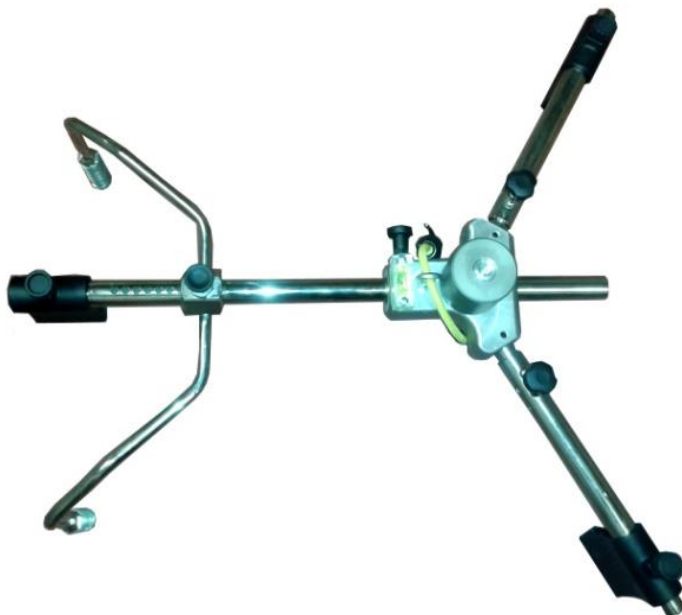
5.7 TARGETS

The New Dimension wheel-simulating targets are to be located parallel to the wheels using whatever clamp available in the VAMAG catalogue.

Example of target assembled on a AGS 4-point clamp (run-out compensation required)

Example of target assembled on AGS-RF hang-on-tyre clamp (run-out compensation not allowed)

Warning: targets must be assembled on the clamp with the reference dot facing up, as in picture below:

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5.8 TURNTABLES

The turntables (optional) are of 310 mm diameter and of 1000 kg. load capacity (each piece).

ROC Adapters (optional) can be used in conjunction with the PRN turntables; each ROC adapter kit is made of 2 C-moon style components.

This accessory is used to fill the gap between the turn plate and the lift to perform run-out compensation properly.

The run-out compensation is carried out by means of a software procedure that instructs the operator to pull the car 90° backwards and then forward back on the turn plates.

The run-out compensation recovers possible coupling errors between the clamp and the rim as well as possible damages, dents or imperfections of the rim.

When performing the caster swing or in general when steering, the ROC adapter can impede the turn plate to turn; the ROC adapters must always be remove after having performed the run-out compensation.
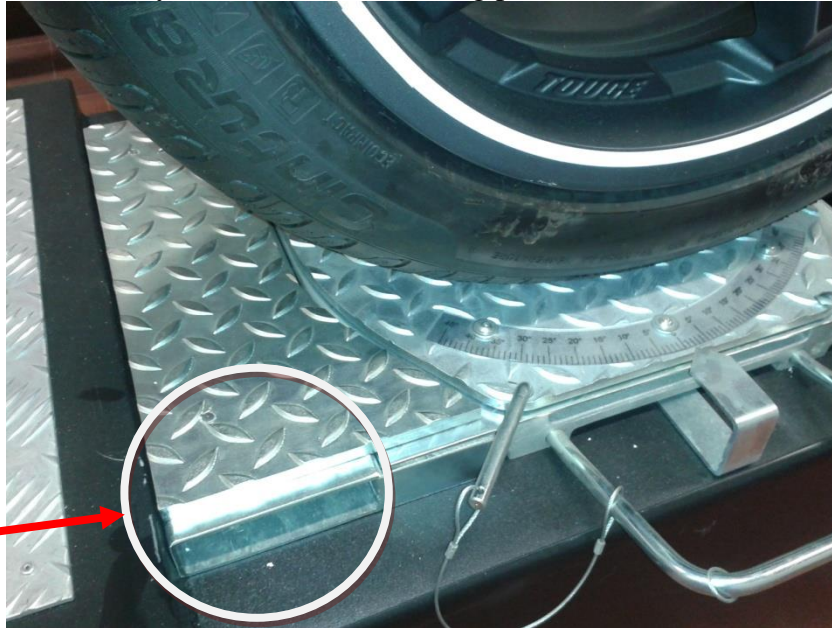

ROC ADAPTER
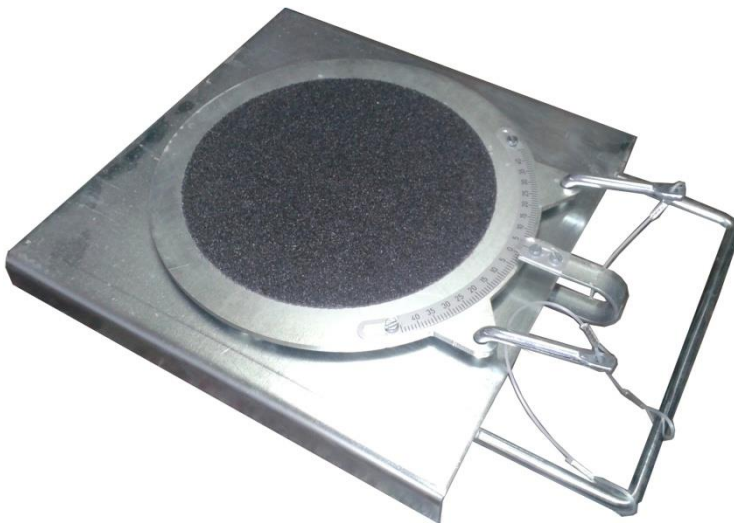
N.B. the ROC adapters are to be used in conjunction with the PRN turn plates. The PRN E.L.-type turn plates are not suitable for the ROC adapters

PRN E.L. turntables

5.9 BRAKE PEDAL PUSHER

The brake pedal pusher is a tool used to block the brake pedal fully kicked down during the alignment procedures. Use it as shown in the instructions displayed by the software during vehicle set-up.
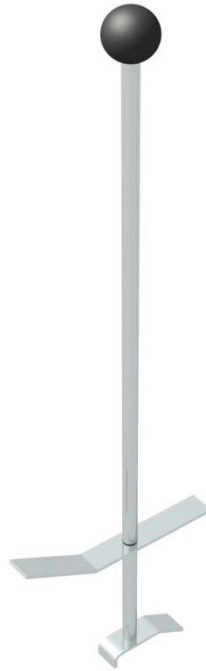
5.10 STEERING WHEEL HOLDER

The steering wheel holder is used to hold the steering wheel in a fixed position. To be installed at the very beginning of the wheel alignment adjustment procedure as specified in following paragraphs.

The steering wheel holder must not be used if the aligner is equipped with the optional ROBOSTERZ steering robot.
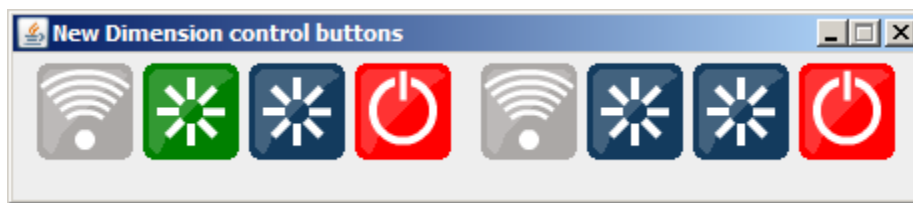
6- NewDimension SOFTWARE INSTALLATION

The NewDimension software is on the DVD supplied along.
The operating system on the PC must be WINDOWS 7

- Insert the DVD in your PC and wait for auto-start; if it doesn't automatically start, access the files inside the DVD and click on Setup.exe.
- Confirm each request and proceed all the way down till the completion of the installation.
  At the end of installation 4 icons will show on the desktop:
    o NewDimension   (ND wheel alignment software)
    o ND Calib   (calibration software)
    o Database   (vehicle Database)
    o ND buttons   (keypad to manage the measuring heads)
-

- Turn on the 2 measuring heads by means of the switch on/off button located in the back of each camera head.
- For wired communication the wake-on lan feature is available: the camera heads can be turned on by means of the NewDimension software buttons shown above. See paragraph 6.4 below.

6.1- COMMUNICATION METHODS

If the optional WiFi kit is included, a WiFi device is supplied to be connected to the main PC.
The network for the WiFi mode has to be a dedicated network.
If the PC is equipped with an built-in WiFi module, the dedicated network may be created through the internal pc WiFi module.
An Internet connection to the main PC is recommended to allow remote updating of the software installed on the PC, and on the camera heads and to perform remote technical support.
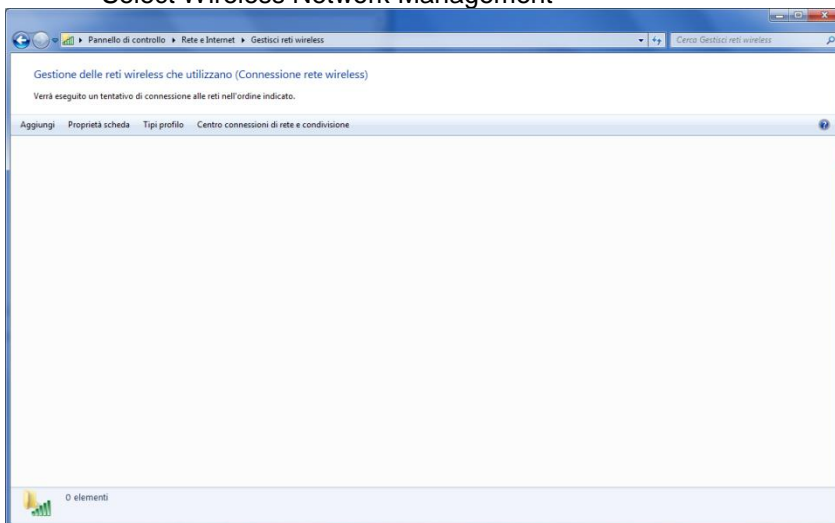
6.2- INSTALLATION PROCEDURE WIFI

- Insert the WiFi module into the PC.
  With Windows 7 the Wifi drivers are automatically installed; at the end of the installation procedure the WiFi connection icon will show in the right bottom corner (in the Tray Bar); click the RIGHT mouse button and select Open Network Connections.
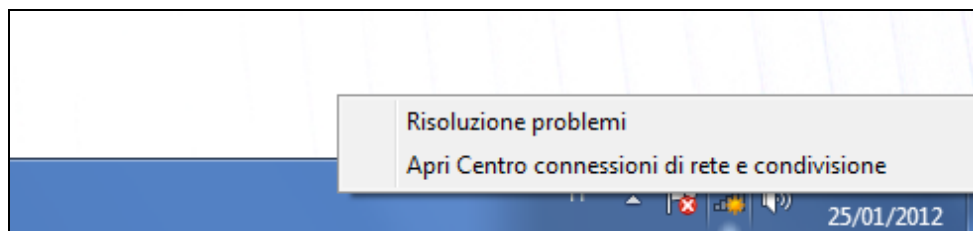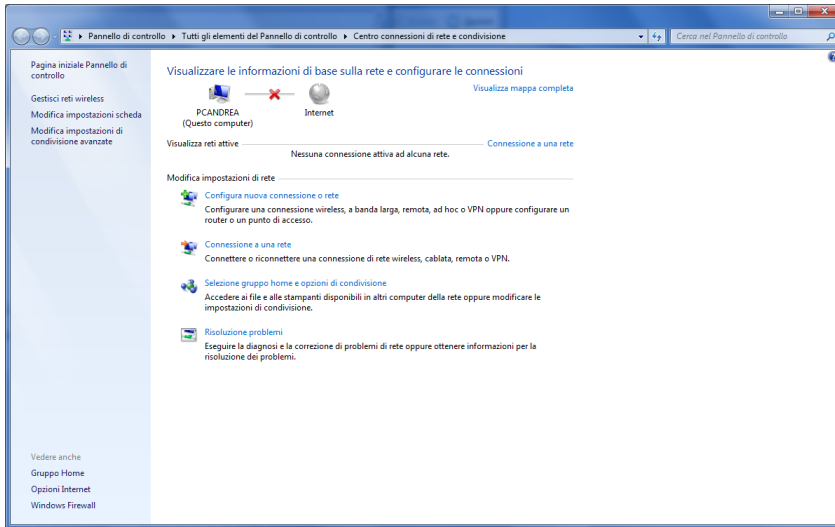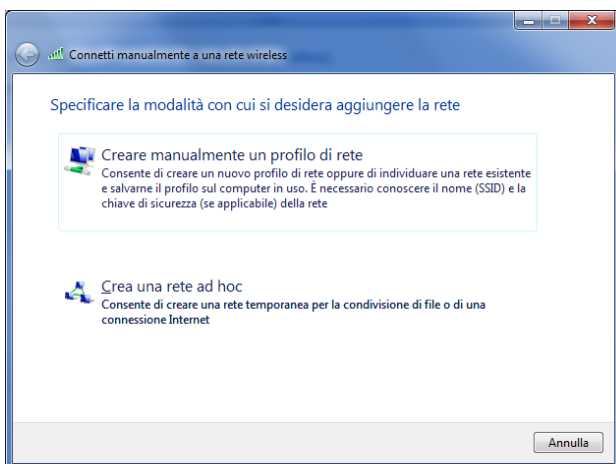
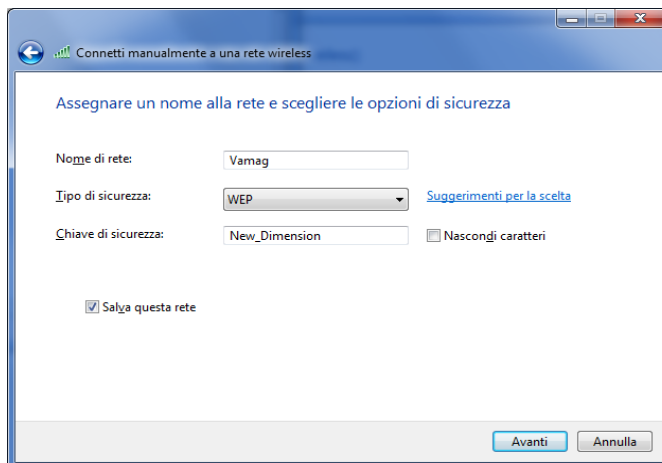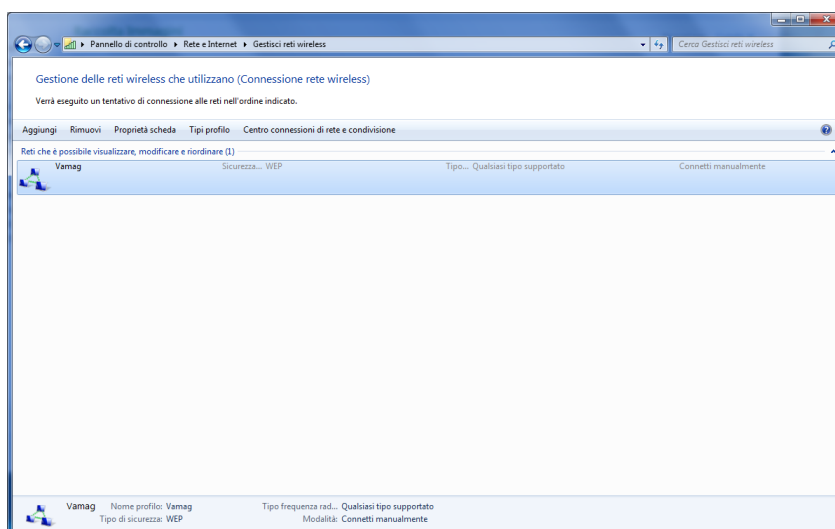Select Wireless Network Management

Select Add

Select Create Ad Hoc Network

NEXT

Set as indicated in the photo, then NEXT

The WiFi Network with the measuring heads is ready.

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6.3- INSTALLATION PROCEDURE WIRED VERSION.

Connect both camera heads to an access point-router by means of Ethernet cables with RJ45 plugs; connect the access point-router to the pc inside the console.

6.4 – TURN ON AND OFF THE EQUIPMENT

Turn on the PC. Once the PC is fully initialised click on "ND_Buttons": the keypad will show.
Click on Vamag DB and on "NewDimension" on the desktop.
The screen displays the alignment program presentation page.
If the camera heads are hardwired the system manages to automatically start the measuring heads through the Wake_On_LAN function, so the camera heads are turned on automatically.
See below the soft button software.

Left Head   Right Head
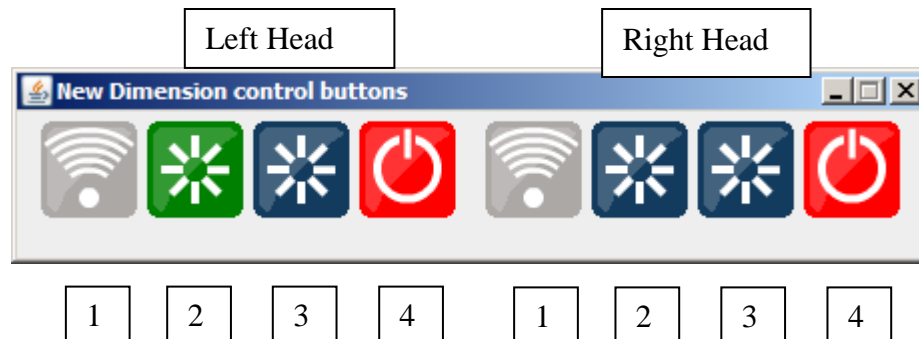
1= Connect (automatic WAKE ON LAN with hardwired camera heads)
2= Software reboot
3= Hardware reboot
4= Turn off

The Left and Right camera heads can be turned on and start working..

If the system is wireless Wifi the camera heads must be turned on/off by means of the on/off button located in the back of each camera head.

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To turn off the system after use, close the NewDimension software, click 4=Turn off and then close the windows.
With Wifi mode better to start always the camera heads using the button on the back before to turn the PC on; this way the system will start up faster.

7 Software configuration

The NewDimension software package is made of four separate modules for management convenience: the wheel alignment module [NewDim.exe], the Database module [VamagDatabase.jar], the Calibration software [NewDimensionSystemCalibrator.jar] and the camera head keypad [NewDimensionButtons.jar].

Language selection: To configure the software enter the NewDimension software folder, edit the file "Config.ini" and search for the following paragraph:

[Skin]
Grafica=default
Testi=English
Unicode=0
FontName=
FontSize=100
FontOffsetY=0
FontCharset=

Different languages can be selected by changing right SIDE of the "=" character in the "Testi" line. Available languages are indicated in the …..\Skin\Text\ folder; select your favourite and copy it in the right SIDE of the "=" character in the "Testi" line shown above.

Other options are available but they can be operated by trained service engineers only.

8   Vehicle Database
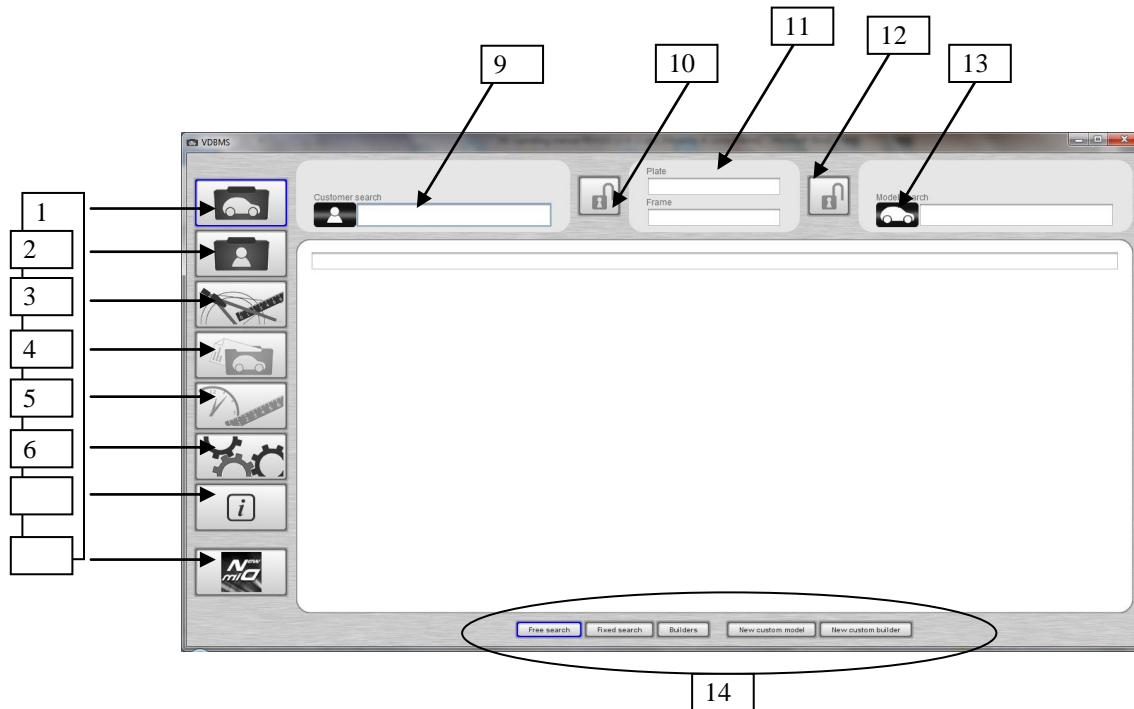
The icons in the left area of the display refer to the different data sets available:

1   – Vehicle data base
2   – Customer data base
3   – Report display, print and storage
4   – Wheel alignment data of the selected vehicle
5   – Archive of reports
6   – Option setup (data base package only)
7   - About.
8   – ND alignment software

1 - Vehicle Database: wheel geometry data of majority of the registered vehicles are included in this module; three different search modes are available: Free Search; Fixed Search; Manufacturer.
Free Search (default): the operator may type into any of the fields 9, 11 and 13 to access existing vehicles by the name or by the number plate or by the customer name. Existing vehicles are listed making the operator able to select it by clicking on it.
Fixed Search: the vehicle can be searched for as per free search, plus the selection shows all details of the chosen vehicle. Moreover the accaees can be made using the list of makers and then models and variant.
**Manufacturer:** the process starts with the manufacturer list where the manufacturer can be chosen, then vehicle and variant can be chosen in the related lists. The search by typing in 9, 11 and 13 fields is still possible as in Free search hand Fixed search.

2- Customer database, it contains the customer database and the alignment jobs done. When selecting a customer, all already existing customers are shown in alphabetical order by just typing in [field 9] the customer's name or surname as Free Search [Field 14] or Fixed Search [Field 14]. A new customer can also be entered by clicking on New Customer [field 14]; a window will show in which all customer data can be entered as in figure below:

Click "Add" to input the new customer in the DB.

After entering a new customer, a vehicle can be associated to him/her.

Every customer can be linked to multiple vehicles; when selecting a customer all vehicles associated to him/her will be displayed.


It is possible to remove the association of a plate or vehicle for a customer, clicking on the key identified by a [x] near the plate / frame:
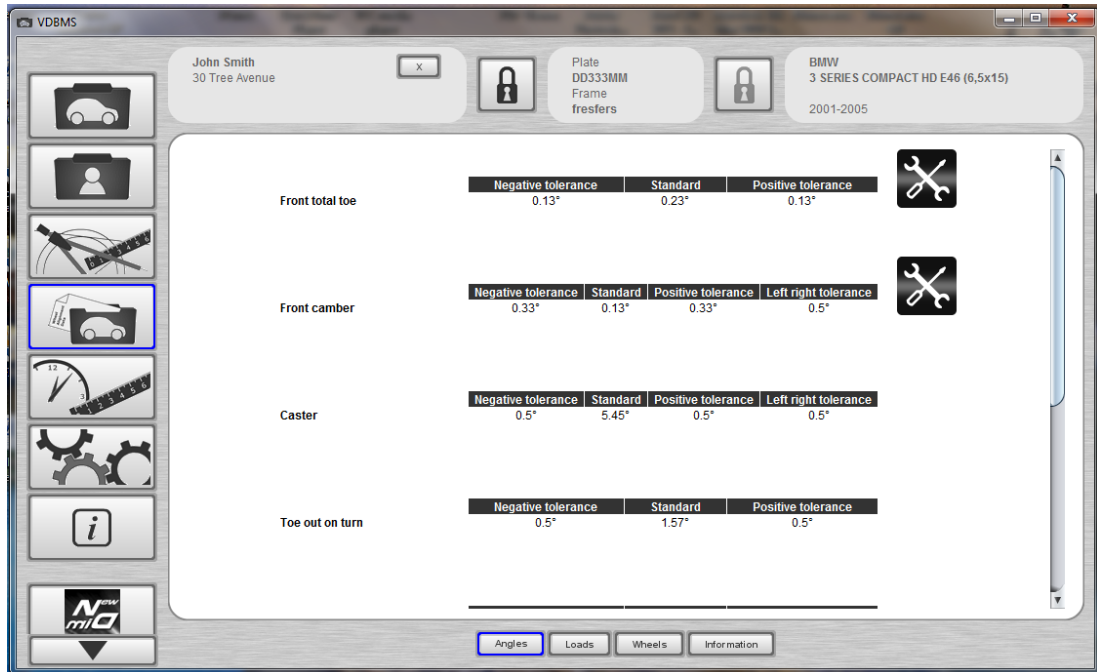
Clicking on [x] near the plate the association of the plate with the vehicle is cancelled; this is useful for example in case of wrong selection of the vehicle in the data base. In this case the measures and results will be kept valid and it will be possible to select the right vehicle in the database.

To end the job or to check/search for a previous job, click on [x] beside the Customer Name field.

It is possible to cancel a previous job; to do so enter the customer name or surname in the [field 9] Customer Search; all associated saved jobs will show; by right clicking on it a menu will appear: Show, Modify, Clear.
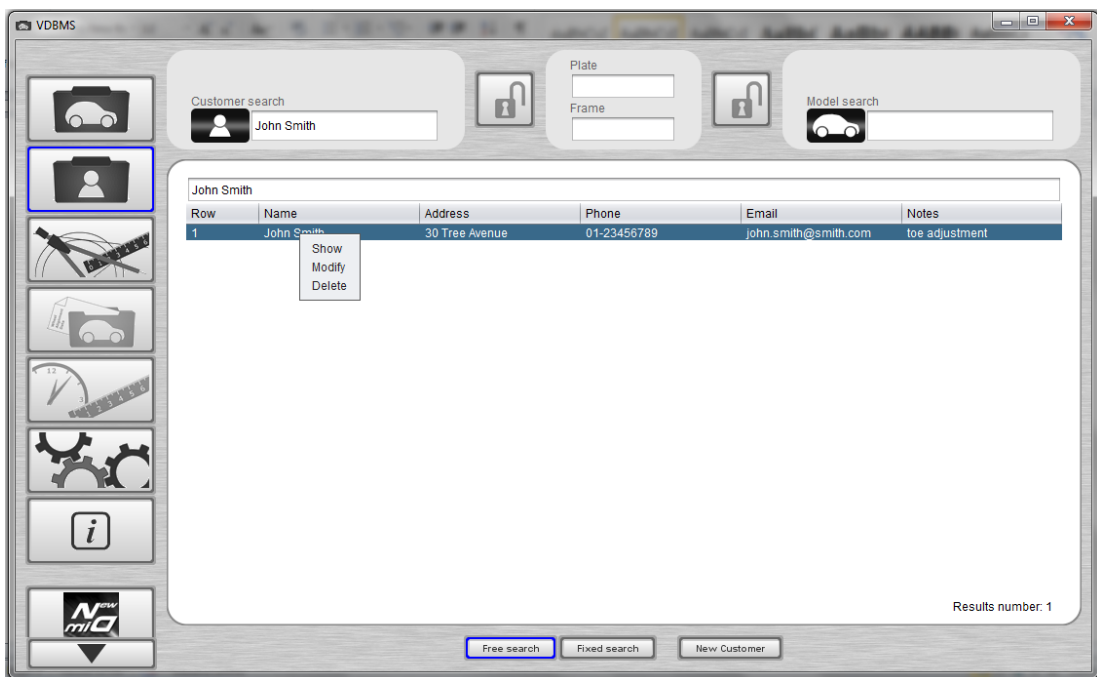
Choose Display, Modify or Clear to respectively show, change or erase the job.

3   **Display Print and Save the job** the complete job data and results form will display by clicking on the [key 3]

reporting the manufacturer data of the selected vehicle from the data base and the measured data before and after the adjustment, as well as customer reference and workshop data.
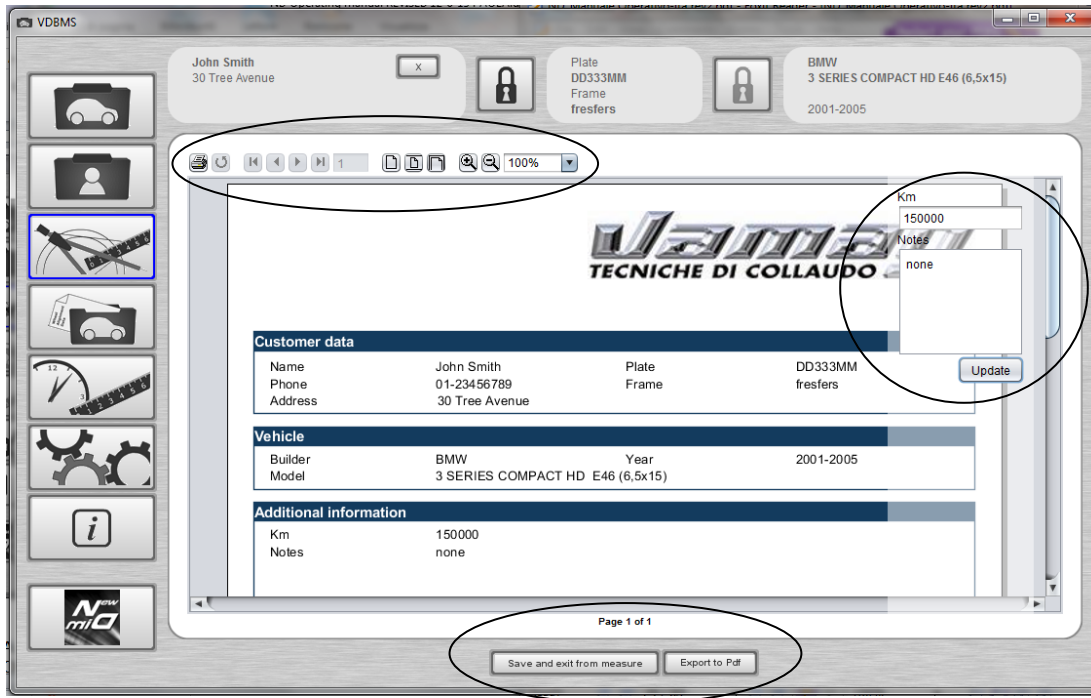

A number of options like print, change visualization, zoom-in/out is now available:.
Other data like mileage, notes, etc. can be entered in the upper side of the form clicking on update; all entered/amended data will be then displayed in the form and can be printed..
Moreover, the form can be saved and managed in the Customer Database as well as exported as .pdf-type file.

4- **Display Manufacturer Data,** Manufacturer's Data regarding the selected vehicle are displayed by clicking on the [Key 4], as shown in the figure below:
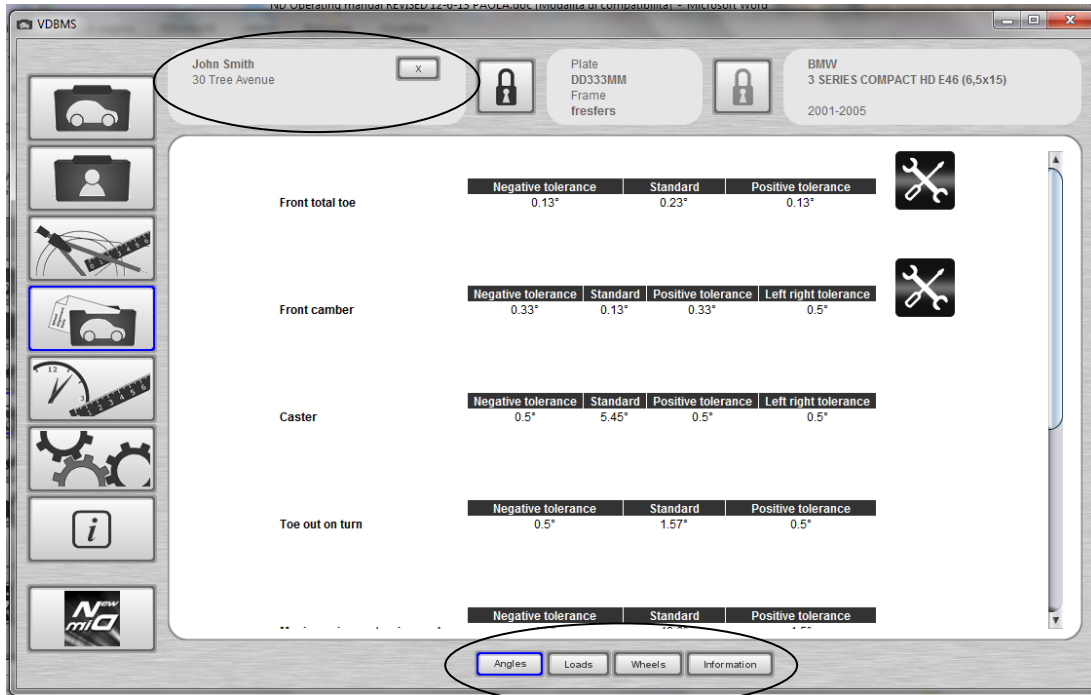
In the page indicated above, it is possible to display:
Angles, wheel dimensions, eventually loads required, and other information.

5- **Archive of reports** a measure previously saved can be select and associated it with a customer.
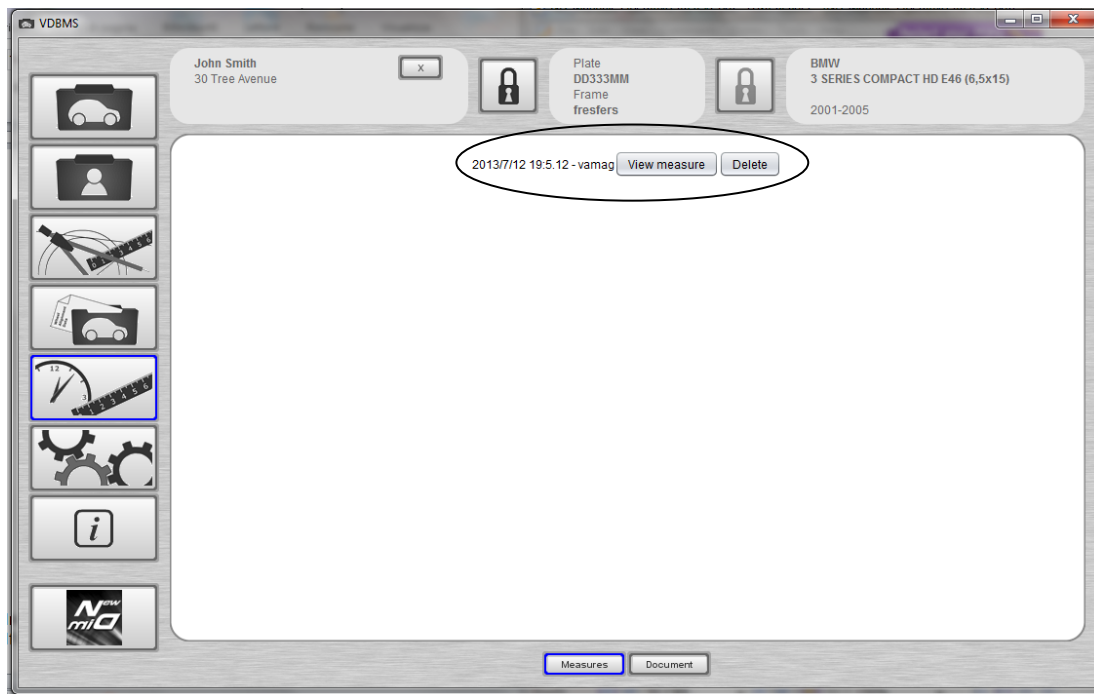
In the upper part, Display Measure or Clear, can be choosen for the job.
If different measures have been carried out for a customer, this page will display all measures and anyone can

be selected as desired.

6- Option setup
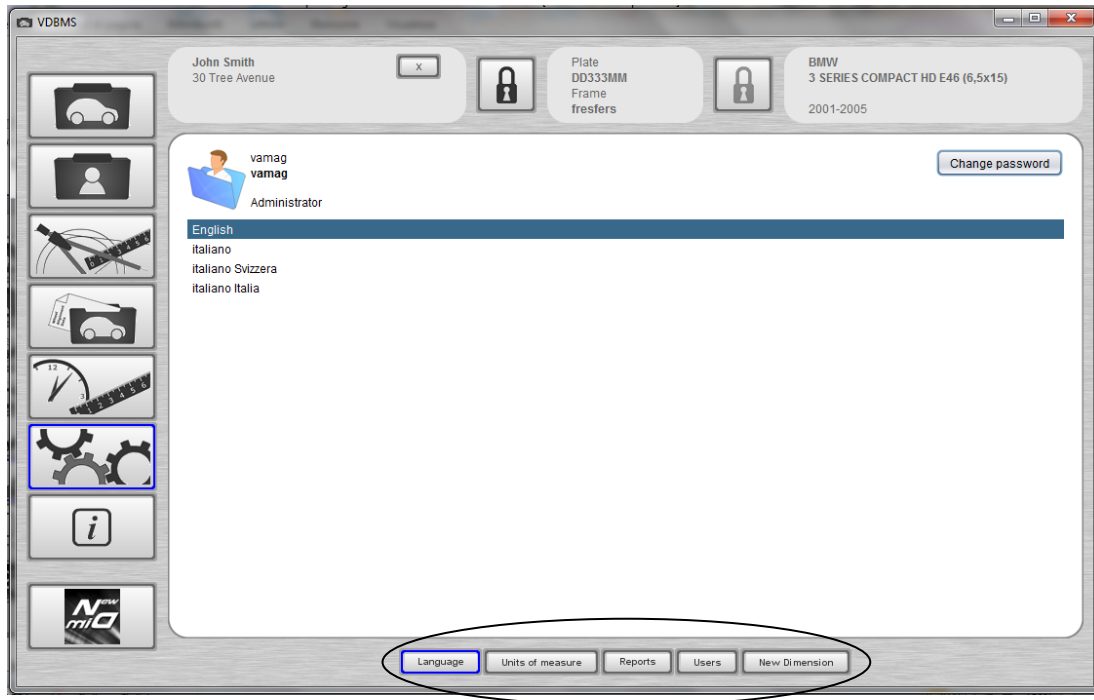

In this page the administrator Password can be selected and the language can e chosen.
Moreover, as indicated hereunder, measurement units, report format, workshop data and logo can be changed,.
It is also possible to manage more users.
In this page also set the path to start the New Dimension file can be changed.

IMPORTANT: for communication between the Database software and NewDimension software, set the path of the "NewDim.exe" file as indicated hereunder:
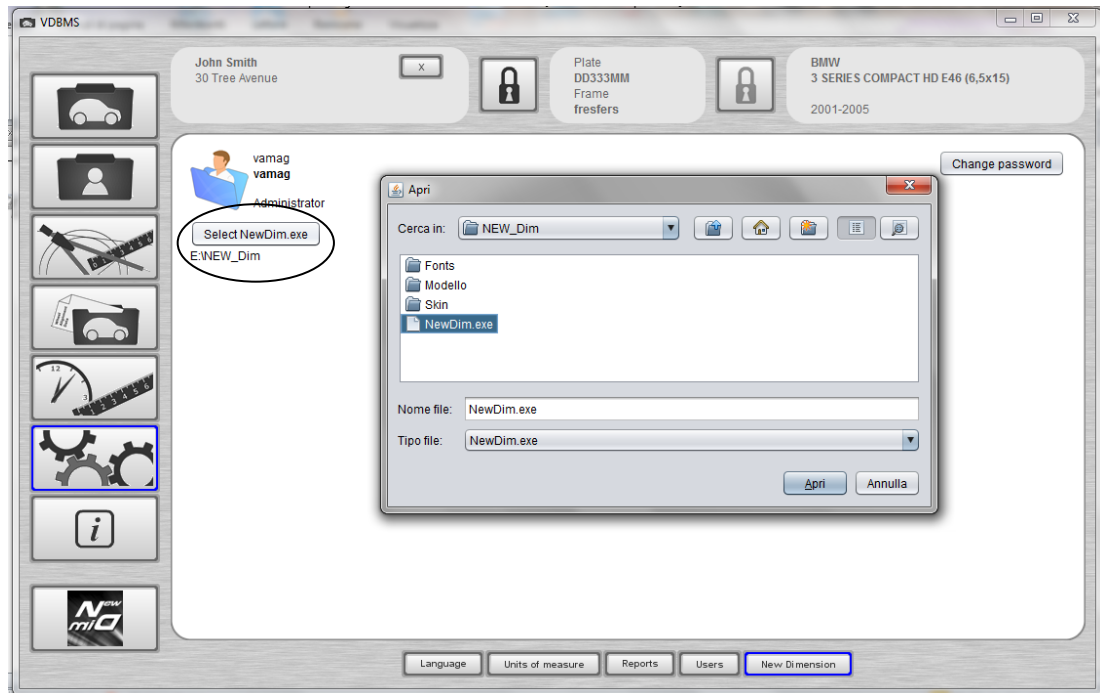
This step is important because (as explained successively) at the end of the test, the NewDim software sends a file containing the results to the Database software; if the path has not been set, this does not occur and the test report will not be filled in.

7- About
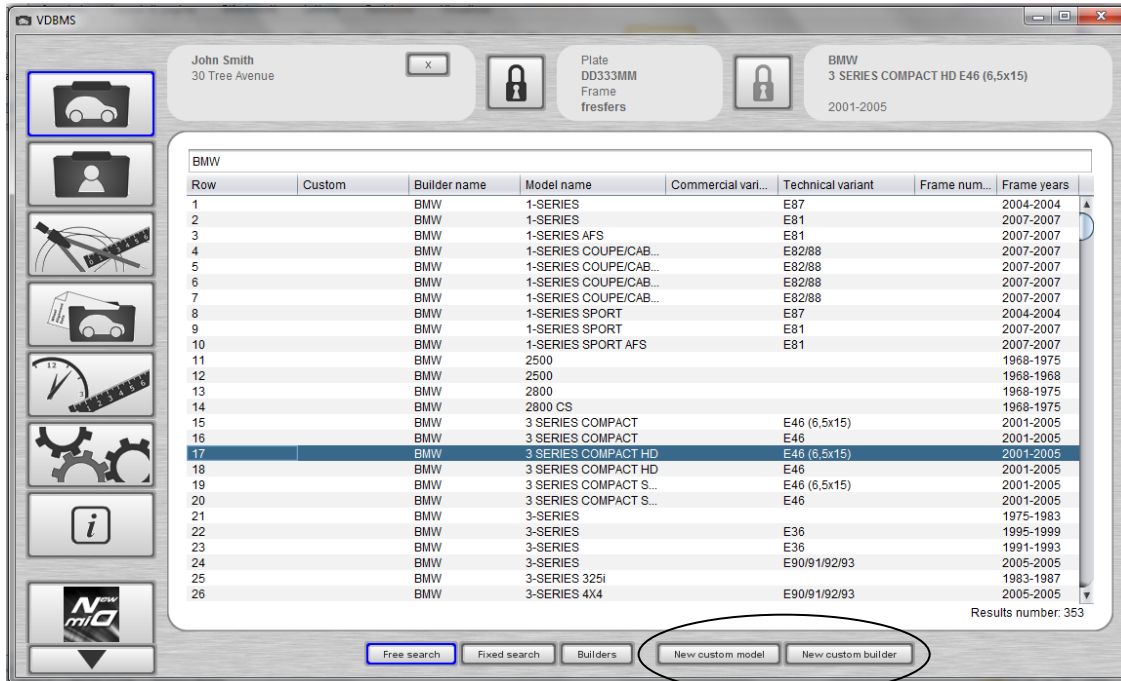This page show the software version and the Database version.
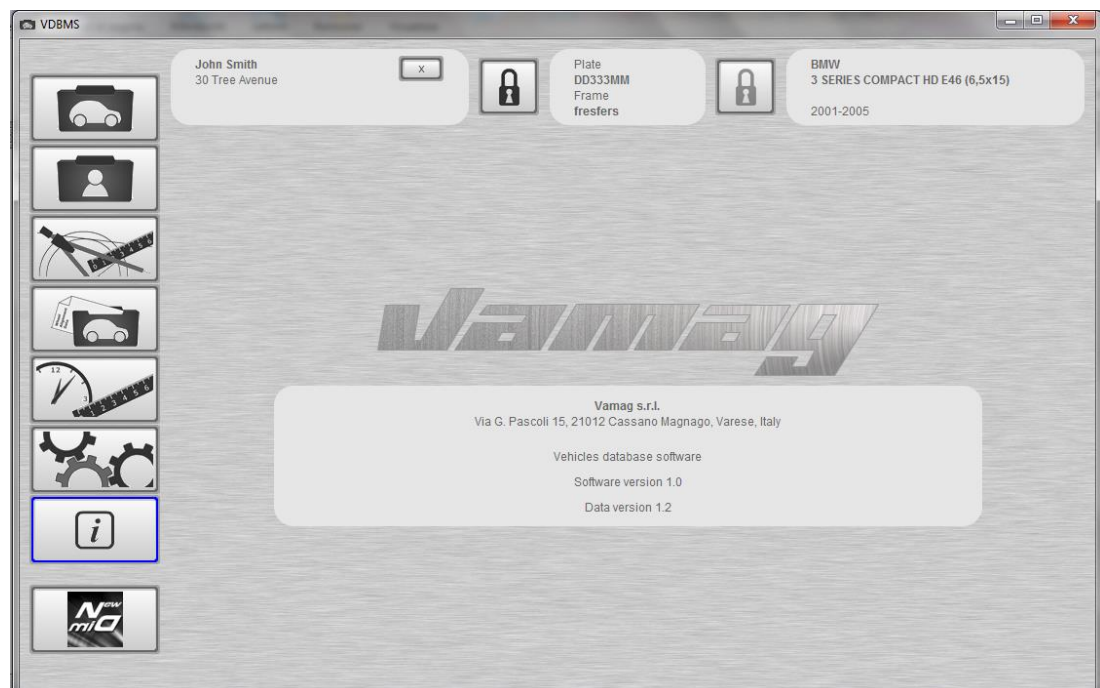

8- ND alignment software
This key starts the alignment software directly from the database page.

## 8.1 ENTER CUSTOMIZED VEHICLES INTO THE DATABASE

With the ND database it is possible to enter new vehicles made by existing manufacturers and enter new manufacturers.

select the desired option: "New model" or "New manufacturer" In the page above,.
Selecting the first option we will display a page as indicated below:
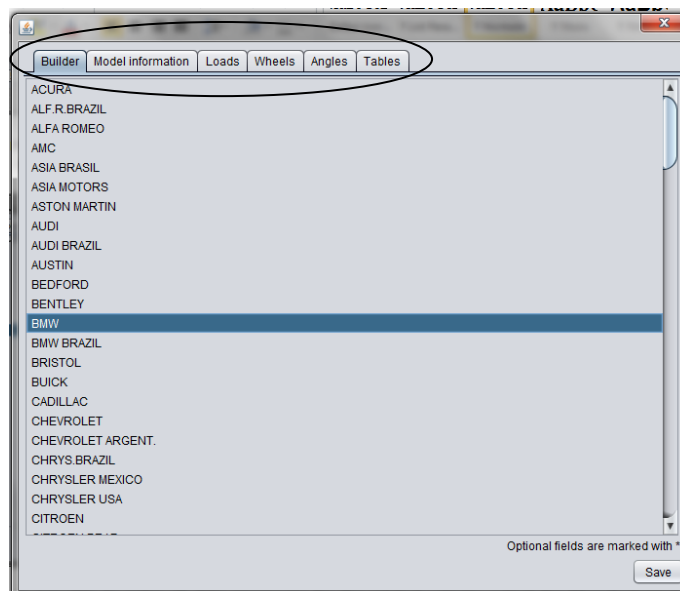
In the page indicated above, it is possible to enter all data necessary for the related vehicle: select the Manufacturer and enter all data requested by the indicated technical sheets in the upper part.
After entering all data and saving the entry, the model introduced by the customer will be displayed as follows:
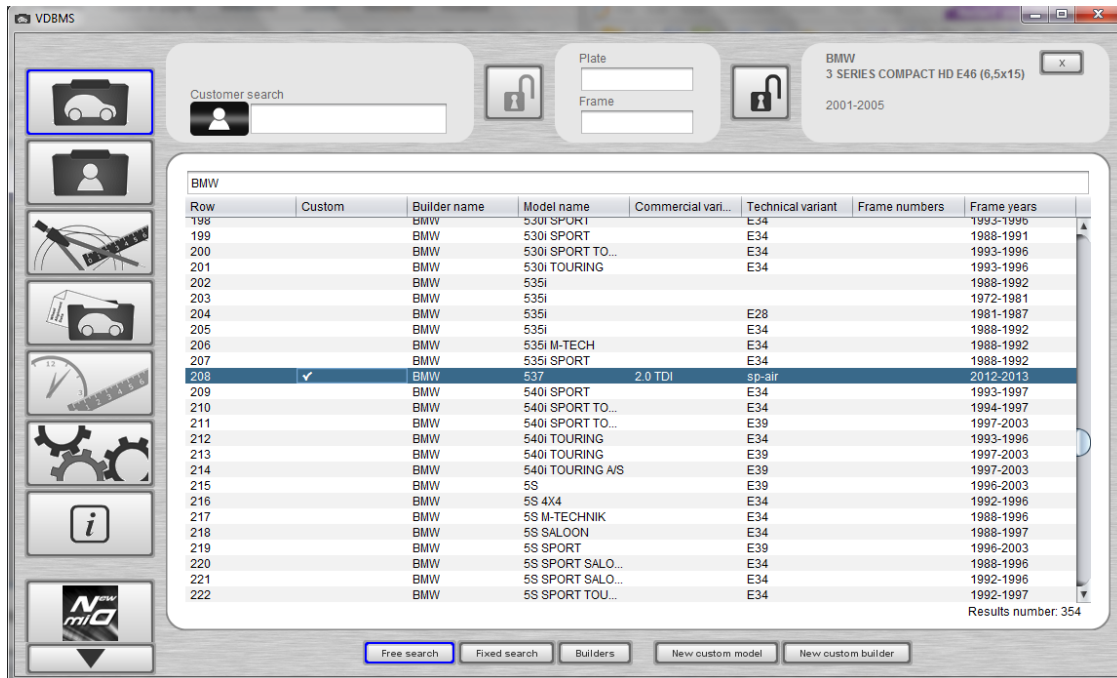
With a tick in the "Customized" column.

When entering a new manufacturer by clicking on the related key this form will be displayed to to fill in.

Manufacturer Name and Description are required with eventually the Logo, which identifies the manufacturer with "Choose file".

After clicking on "Save", the new Brand (or manufacturer) will be entered, now add the model(s) for that new manufacturer.

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8.2 DATABASE USE

The database contains the data regarding the adjustable and non-adjustable angles, as well as specific instructions and drawings for determined models.
For some vehicles as for example French vehicles, heights are to be checked and set according to the technical data.
For example for Renault Clio, the date base will display the TABLES indicated below:

Select in this page the suitable height (upon measurement of the related vehicle) with double click on the right line.
Scroll the mouse on the stylised image of the vehicle, it becomes larger:

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Moreover, clicking on "Wheels" (option at the end of the page), you will find the information regarding the dimensions of the tyres that can be used in that specific vehicle as well as tyre pressures.
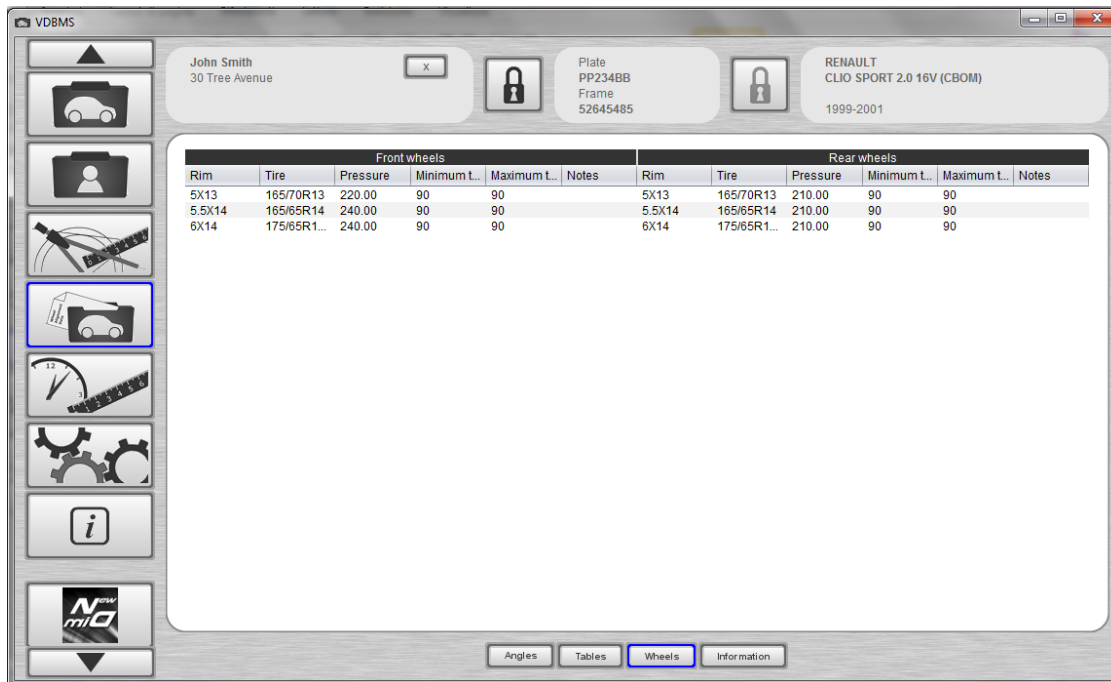
It is possible to obtain more information regarding the vehicle clicking on "Information" as from the page indicated hereunder.
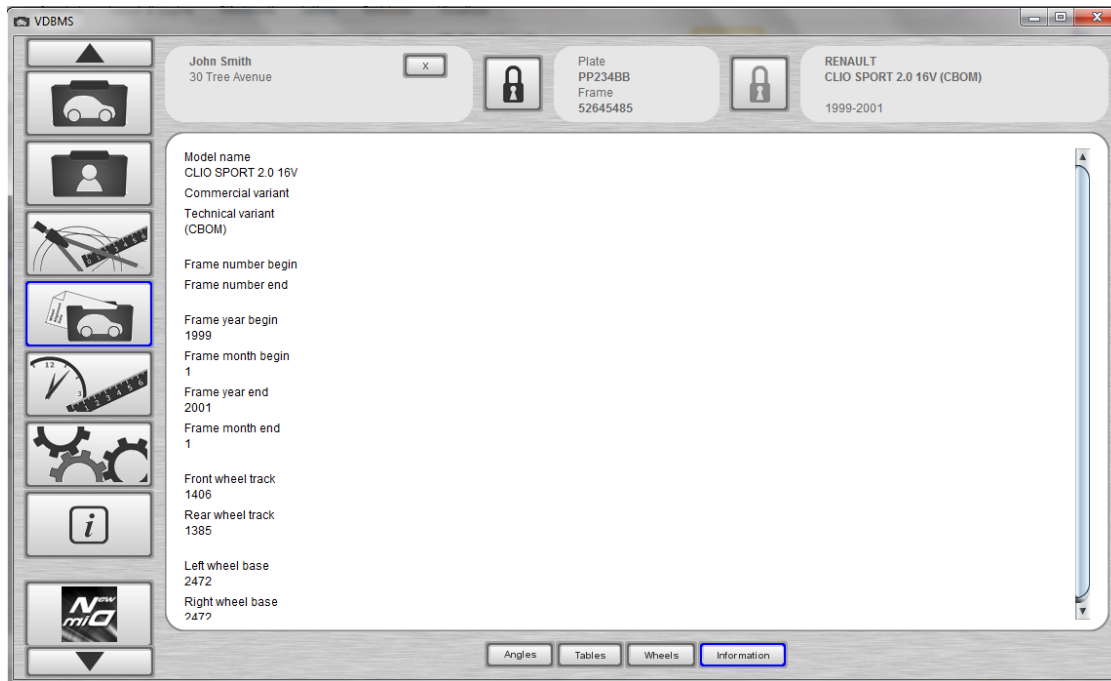
For some vehicles there is also a page to give information regarding the weights needed to simulate the load.

9 – DIAGNOSIS AND ADJUSTMENT OF A VEHICLE

9.1 PRESENTATION PAGE

Turning on the Computer, 4 icons will show, where one is for the database and another one is for the ND alignment software.

Firstly, start the program of the Database and then as stated in the previous paragraph:

Enter the customer's name; if the customer is new, press "New Customer" at the bottom of the page, fill in the necessary fields and then click twice on the customer's name, select the vehicle and enter the plate and frame.

It is now possible to associate the customer with the vehicle under check using the "Lock" icon.

N.B. Vehicle and customer may be selected, modified and cancel in any time during the alignment. The alignment check can also be dono without selecting any vehicle; the vehicle selection can be made later on at any time.

9.2 PRELIMINARY OPERATIONS

On the main display the alignment men pops up by right clicking

1- Run-out compensation
2- Caster swing
3- Wheel alignment data
4- Additional chassis measurement

The operator can choose any phase of his choice at any time. The sequence of the operations will be given by the professional choices of the operator.

9.2.1 PRELIMINARY VEHICLE PREPARATION

According to practice the following check are required on the vehicle before starting wheel alignment
- check and adjust eventual plays on the suspensions and steering systems.
- check and adjust the tyres pressure in compliance with the manufacturer values.
- put the eventual loads as required by the manufacturer.

9.2.2 Vehicle setting

The software guides the operators during the different phases, such as the preparation phase for the vehicle measures.
The image below shows for example the necessity to apply the Targets to the wheels and remove the blocks on the turntables.
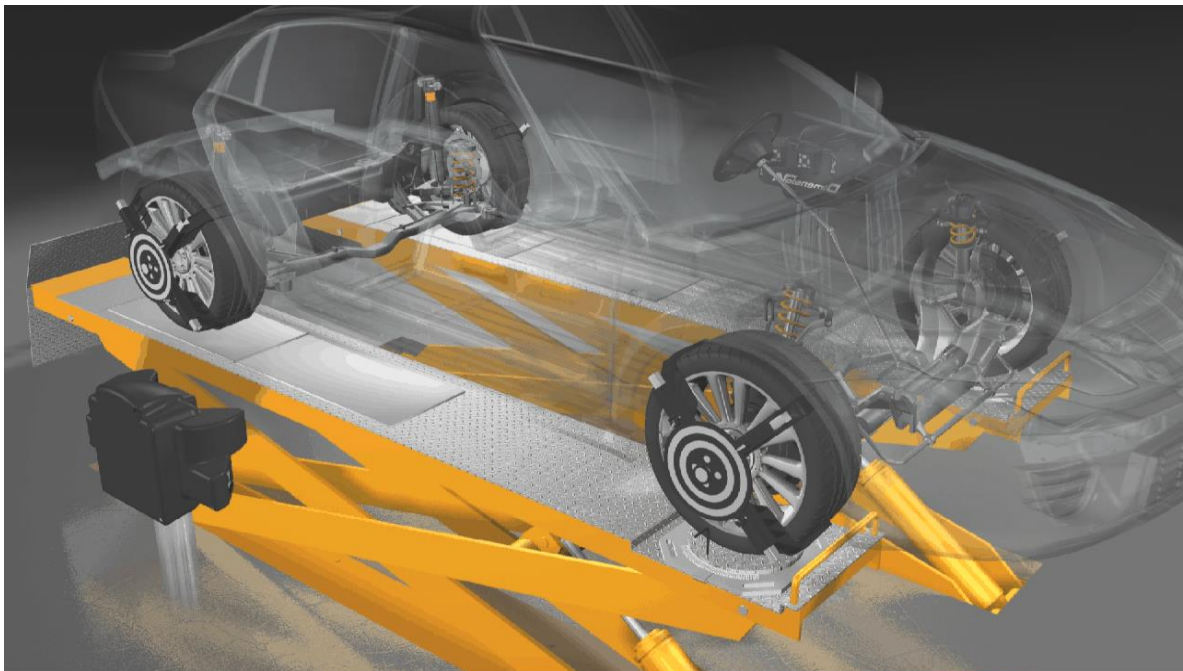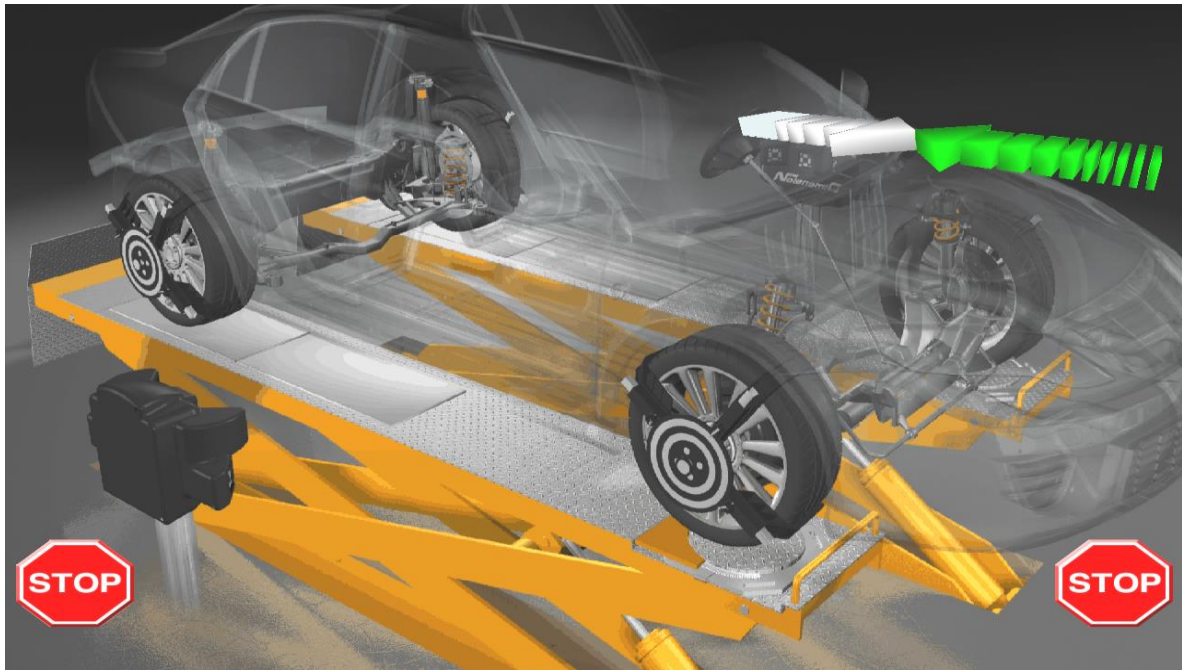

Instructions are supplied with an initial video.

9.2.3 RUN-OUT COMPENSATION

The run-out compensation is useful to compensate the possible coupling errors between the clamps and rim. Press Enter on the keyboard to skip the procedure.
Display the following page to carry out the run-out compensation.

The Green Arrow indicates that the vehicle must be pulled back slowly until the white arrow backwards becomes green and two "STOP" symbols show. The vehicle will be pulled back, for about 90° ±5.
Then pull the vehicle forward on the turntables, until the two arrows become green and the two "STOP" symbols light up.
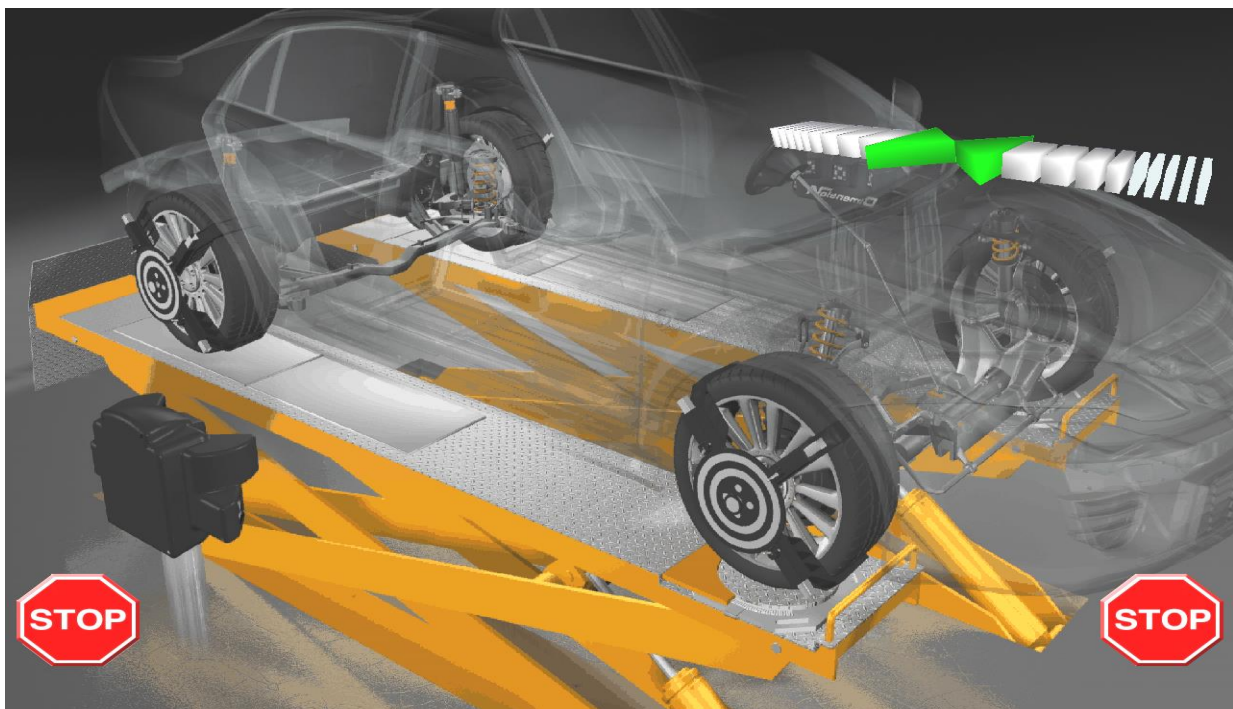
9.3 – PREPARATION FOR THE MEASURES

After the run-out compensation, prepare the vehicle for the measure.
Unlock the turn plates and block the brake pedal with the suitable tool.

The measure software supplies the related indications.

9.4 – CASTER SWING PROCEDURE

During the measure preparation, the software proposes the use of "RoboSterz" (optional) to carry out the caster swing automatically.
If this tool is available, the procedure will be completely automated thanks to the Bluetooth connection between Robosterz and PC. (other advantage: the use of the Robosterz reduces the steering play obtaining more accurate caster and centring measures of the steering wheel).
If the Robosterz is not available, the right and left steering operations will be manually managed.


This image above shows the Robosterz applied to the steering wheel.
The caster swing procedure is useful to measure the following parameters:
- Caster

- Kingpin inclination
- Included angle

The steering angle can be set by the operator at 10° or 20° just by clicking on the numeric value in the top left corner of the display.

The caster swing procedure can be skipped by pressing ENTER on the keyboard; parameters will not be calculated.

If using the Robosterz, press R key in the keyboard to start the caster swing procedure, otherwise turn the steering wheel left.
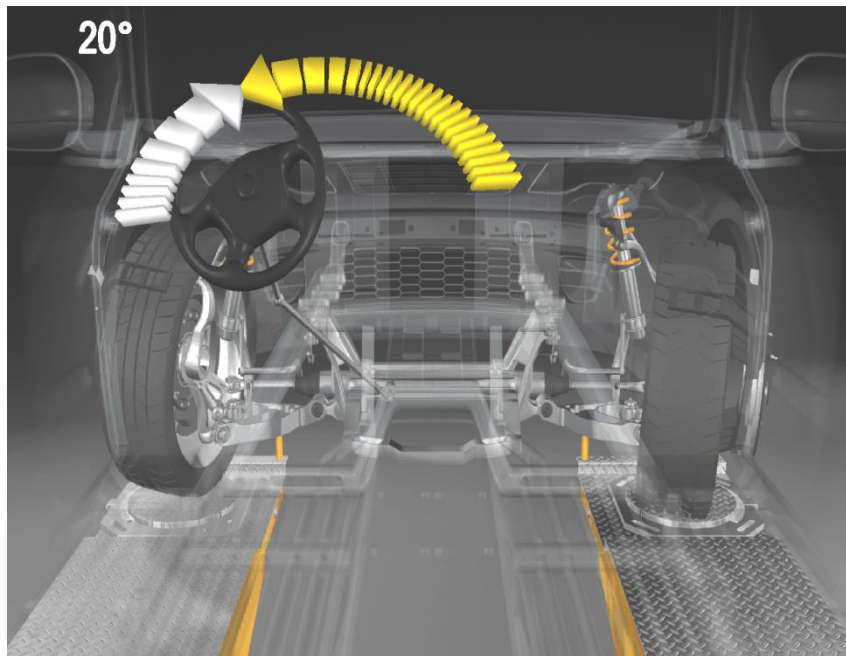
Once reached 20 (or 10) steering degrees, the screen will be the following:
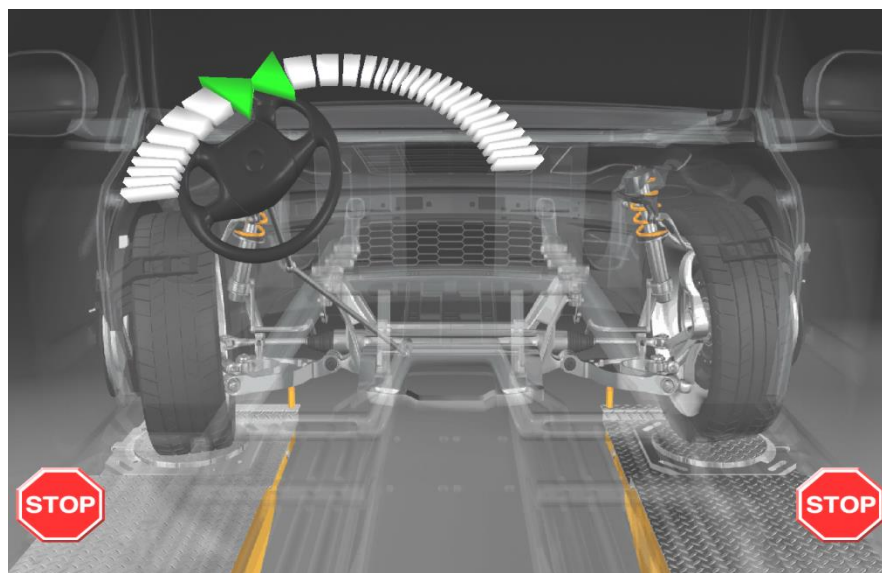
If the steering STOP symbol and the two central arrows become green, the software will indicate to steer in the opposite direction.
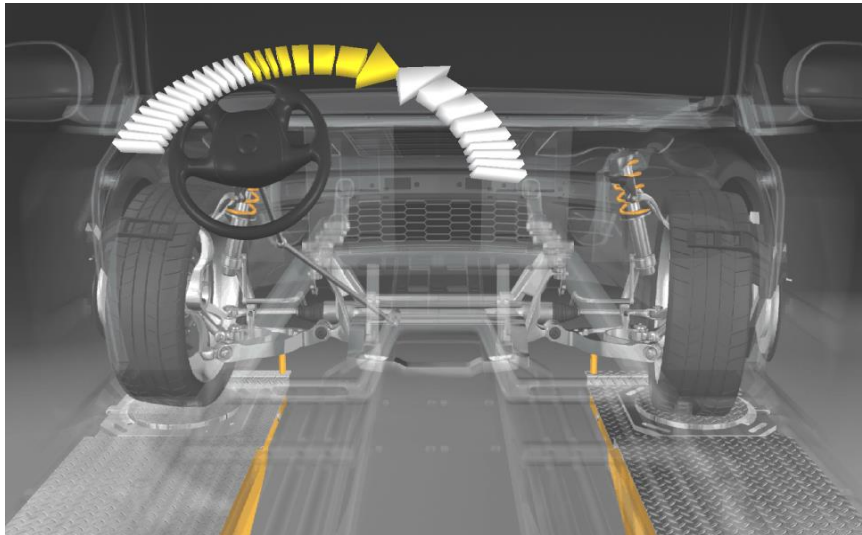
If not using the Robosterz, then turn the steering wheel clockwise until the two chevrons become green and the STOP signs show.
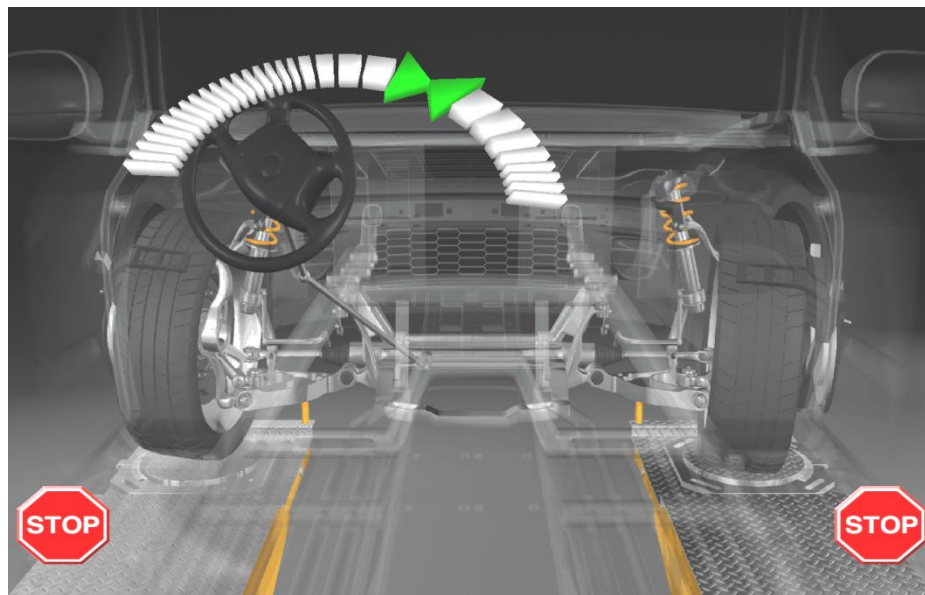
Now the software requires to return the wheel te the straight position.
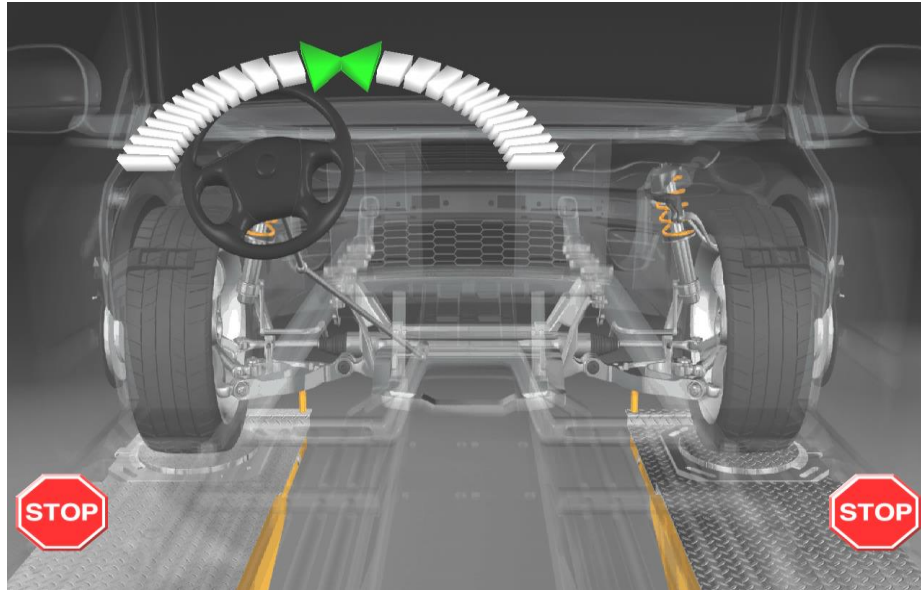
Wait for the STOP symbol indicating the straight position (green chevron in the centre).
Then the software goes directly to the vehicle alignment check page.

9.5 – WHEEL ALIGNMENT DISPLAY

When clicking on 3 or after caster swing the wheel alignment check page shows resuming all the wheel angles; the vehicle now is ready for adjustment.

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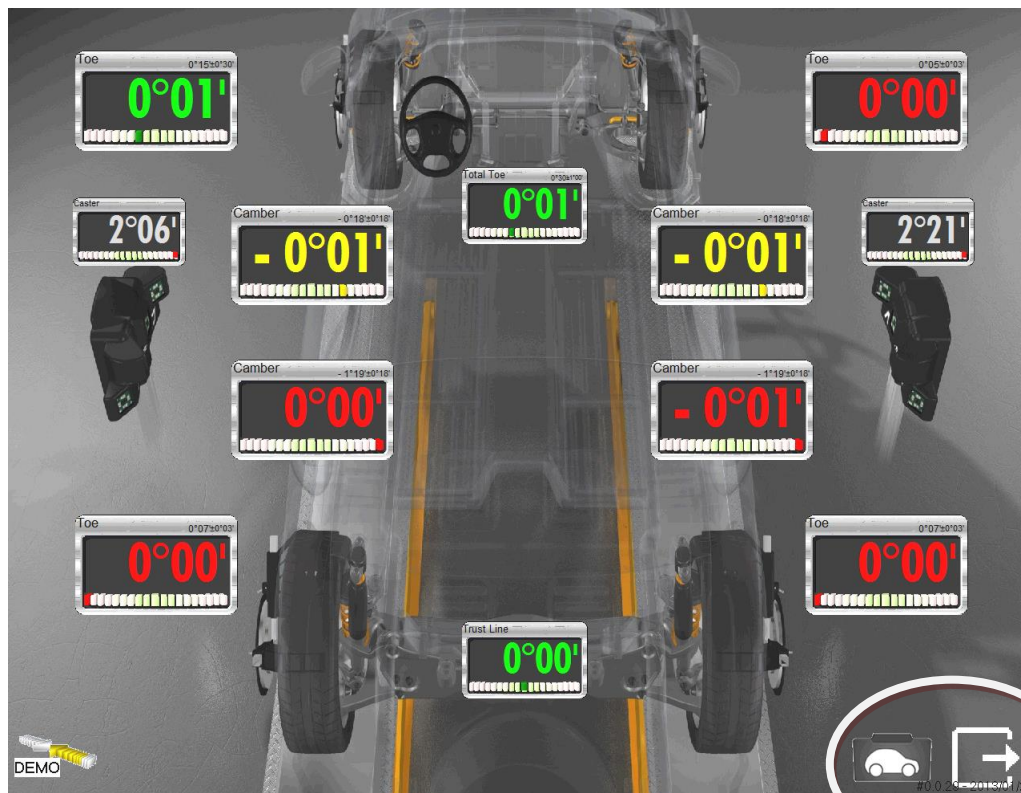
If a vehicle has been selected from the database, the values are identified with 3 colours:
Green = OK
Yellow = Limit of Acceptability
Red = out of tolerance

The reference vehicle can be changed at any time but measures remain actual.

Once finished, return to the main NewDim software display.

9.6 – REAR AXLE ADJUSTMENT

The adjustment of the rear axle can be done using the page indicated above, but for a better visualization it is more helpful to display the rear axle only. Select it by pressing the down arrow on the PC keyboard.
The rear axle display is the following:
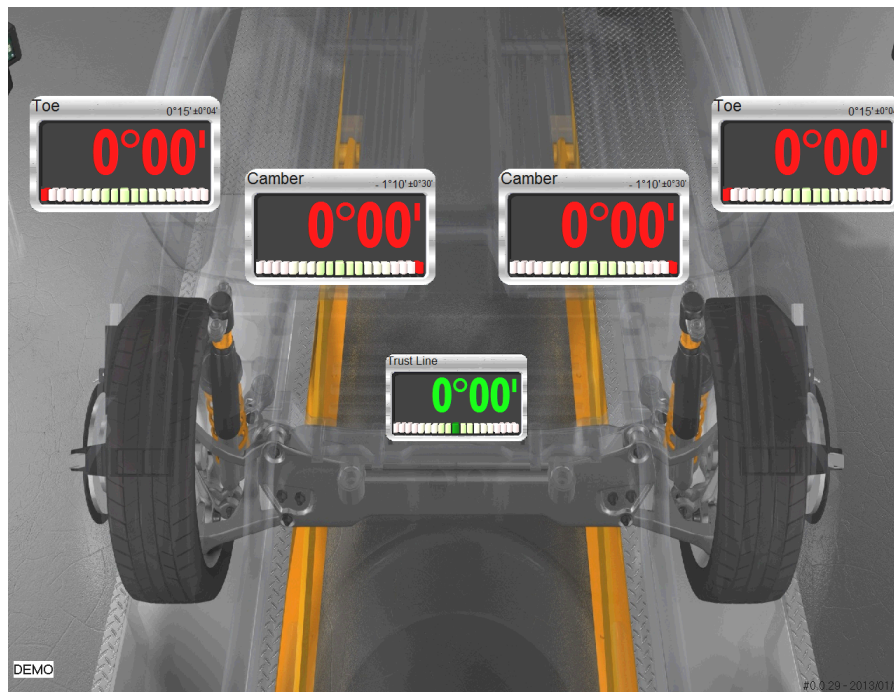
the following measures are displayed

REAR WHEEL TOE
REAR WHEEL CAMBER
THRUST ANGLE

The angineer can thus check and adjust the above parameters according to the vehicle manufacturer specification with the ND software acting as a real time monitor during adjustment.

It is also possible to display one single wheel only, by pressing the LEFT arrow (for the left wheel) or the RIGHT arrow (for the right wheel).
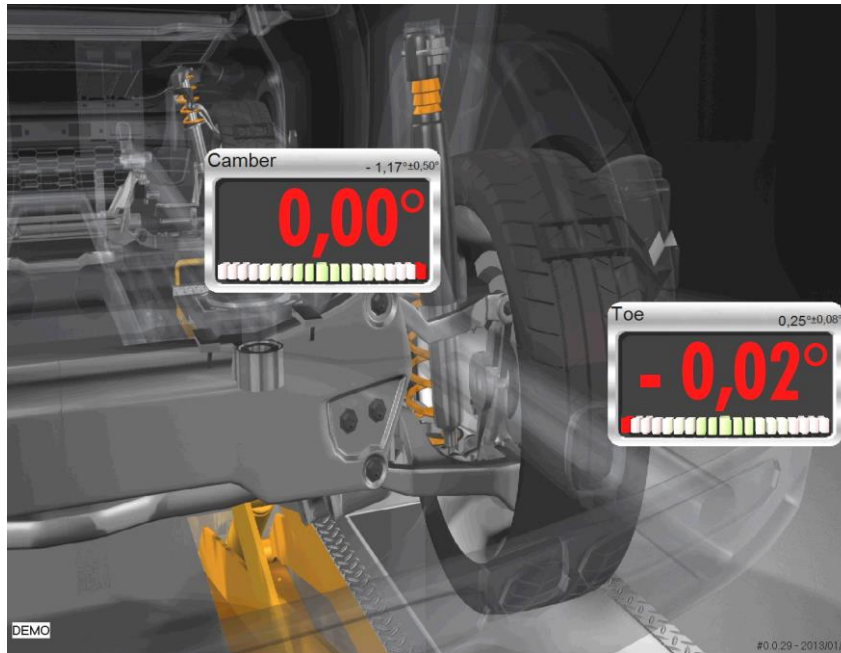
9.7 – FRONT AXLE ADJUSTMENT

The front axle adjustment is entered by pressing UP ARROW on the keyboard**.**

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This page displays the following measurements:

PARTIAL TOE
CASTER (ONLY IF CASTER SWING PREVIOUSLY DONE)
CAMBER

Also in this case it is possible to display the single RIGHT or LEFT wheel by pressing the corresponding arrows on the PC Keyboard.
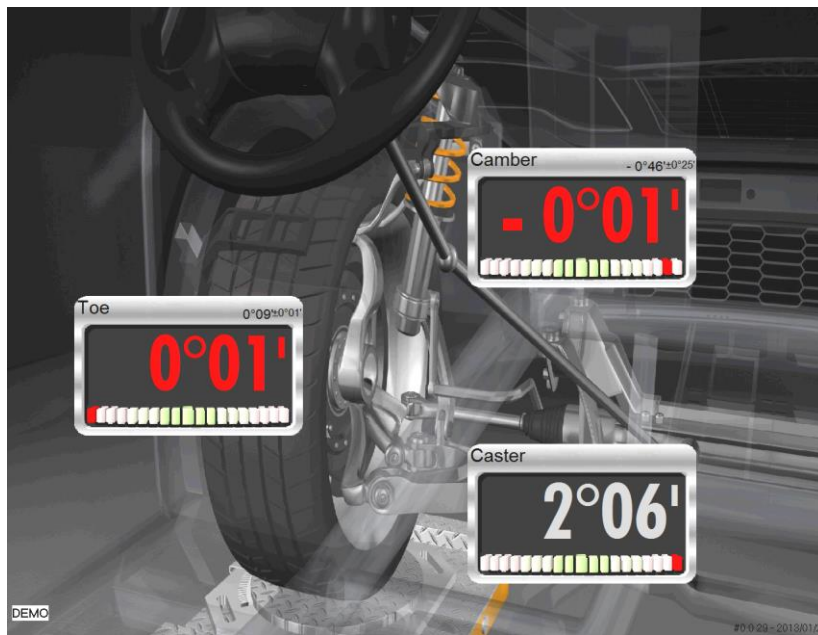
Using the Right or Left Arrows from the main diagnosis page, you will display the page regarding the vehicle frame with Wheelbase, wheeltracks, and Heights:

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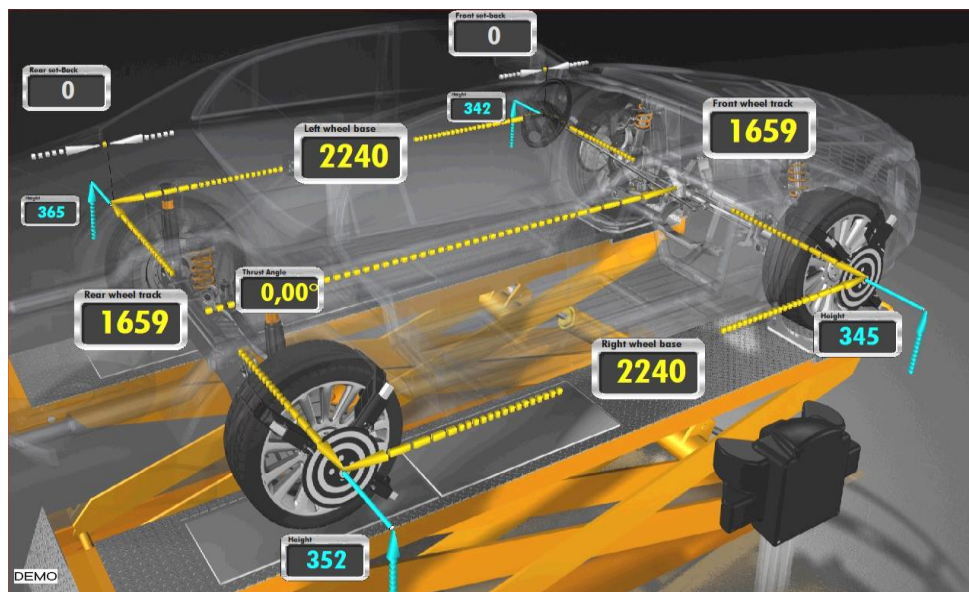
For vehicles having height-related alignment data, like many French cars, the actual height has to be measured (see drawing below) and a suitable look-up table for geometrical parameters has to be used for adjustment.
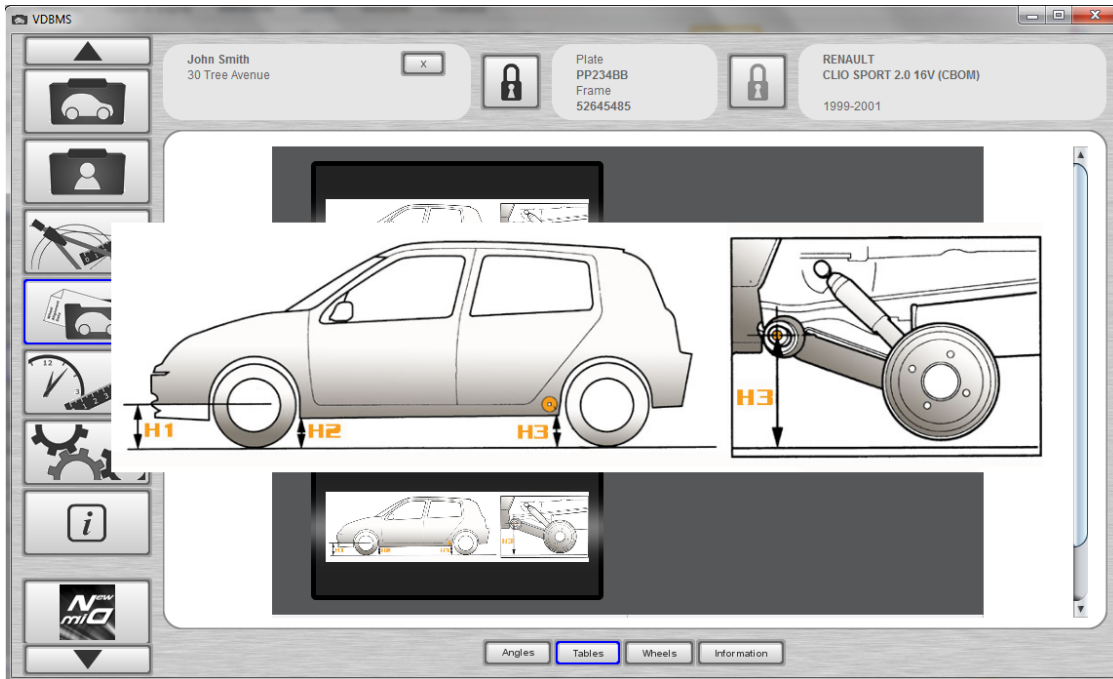
10 SUMMARY OF ALIGNMENT CHECK AND ADJUSTMENT DATA

The page including the overall data and measurements can be displayed at any time by entering the data base regarding the global results of all measures carried out on the vehicle.
Enter the database software and click "CURRENT MEASURES"

Officina ABC

Via dell'industria n100

21100 Varese

Italy

Dati cliente

Nome	gino putrella	Targa	cb740yy
Telefono	20202020	Telaio	
Indirizzo	via alberto da giussano milano		

Veicolo

Costruttore	AUDI	Anno	2007-2007
Modello	A4 All Road Sport		

Informazioni aggiuntive

Km

Note

Ruote anteriori

	Prima			Valori di riferimento	Dopo		
	Sinistra	S / D	Destra		Sinistra	S / D	Destra
Convergenza	3,68°		-2,38°		3,68°		-2,38°
Convergenza totale		1,3°		0,32° +0,16° -0,16°		1,3°	
Arretramento ruota		-14				-14	
Campanatura	1,31°	0,56°	0,75°	-1,21° +0,37° -0,37° [0,5°]	1,31°	0,56°	0,75°
Incidenza	-0,5°	-2,38°	1,88°		-0,5°	-2,38°	1,88°
Inclinazione	4,56°	-1,07°	5,63°		4,56°	-1,07°	5,63°
Divergenza in sterzata	-0,27°	0,2°	-0,47°	1,81° +0,5° -0,5°	-0,27°	0,2°	-0,47°
Sterzata massima interna				39,6° +1,5° -1,5°			
Sterzata massima esterna				33,2° +1,5° -1,5°			
Angolo incluso	5,87°	-0,51°	6,38°		5,87°	-0,51°	6,38°

Ruote posteriori

	Prima			Valori di riferimento	Dopo		
	Sinistra	S / D	Destra		Sinistra	S / D	Destra
Convergenza	-0,51°		1,6°		-0,51°		1,6°
Convergenza totale		1,09°		0,32° +0,16° -0,16°		1,09°	
Campanatura	-0,56°	-2,1°	1,54°	-1,32° +0,41° -0,41° [0,5°]	-0,56°	-2,1°	1,54°
Angolo di spinta		-1,09°				-1,09°	
Arretramento ruota		-2				-2	

At the end of the job, i.e. after the rear and front adjustment, press F4 in New Dimension to confirm the end of the job.

Now "Current Measures" page is displayed showing all data, checks and initial and final results.

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Informazioni aggiuntive

Km

Note

Ruote anteriori

	Prima			Valori di riferimento	Dopo		
	Sinistra	S / D	Destra		Sinistra	S / D	Destra
Convergenza	3,68°		-2,38°		0,36°		0,28°
Convergenza totale		1,3°		0,32° +0,16° -0,16°		0,64°	
Arretramento ruota		-14				23	
Campanatura	1,31°	0,56°	0,75°	-1,21° +0,37° -0,37° [0,5°]	1,13°	0,89°	0,24°
Incidenza	-0,5°	-2,38°	1,88°		-0,5°	-2,38°	1,88°
Inclinazione	4,56°	-1,07°	5,63°		4,56°	-1,07°	5,63°
Divergenza in sterzata	-0,27°	0,2°	-0,47°	1,81° +0,5° -0,5°	-0,27°	0,2°	-0,47°
Sterzata massima interna				39,6° +1,5° -1,5°			
Sterzata massima esterna				33,2° +1,5° -1,5°			
Angolo incluso	5,87°	-0,51°	6,38°		5,7°	-0,16°	5,86°

Ruote posteriori

	Prima			Valori di riferimento	Dopo		
	Sinistra	S / D	Destra		Sinistra	S / D	Destra
Convergenza	-0,51°		1,6°		-0,6°		1,58°
Convergenza totale		1,09°		0,32° +0,16° -0,16°		0,98°	
Campanatura	-0,56°	-2,1°	1,54°	-1,32° +0,41° -0,41° [0,5°]	-0,29°	-1,7°	1,41°
Angolo di spinta		-1,09°				-1,09°	
Arretramento ruota		-2				-3	

**The result page of the results is updated every time the F4 key is pressed.**

11 JACK-UP PROCEDURES

The jack-up procedure allows to adjust the alignment parameters with the vehicle lifted up and suspensions discharged, i.e. for toe-in adjustment. This feature requires the measurements to be frozen before lift up.

12 SECOND POINT TOTAL TOE

Some vehicles, for example Volkswagen and Audi, require a two-point total toe adjustment to be carried out using a special tool. The tool has to be put below the front axle.
The software provides for guidance to do that as shown below:
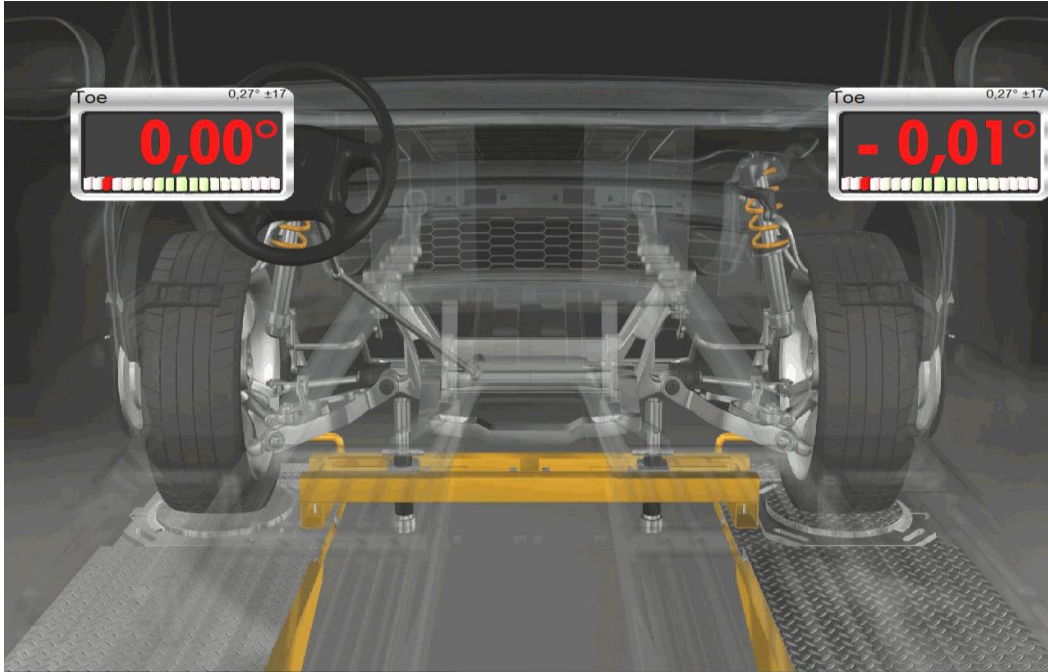
after having adjusted toe, press enter on the PC keyboard to exit the procedure
The animated graphics will show that the tool can then be removed. The following page with results is then displayed:

13 ALIGNMENENT REPORT PRINT OUT

A job report can be complied to be printer after the alignment adjustment. To generate the report to contain the final adjustment data, click on the key   located in the bottom right corner of the main page, then press F4.

Then go to the database software and click on Print.
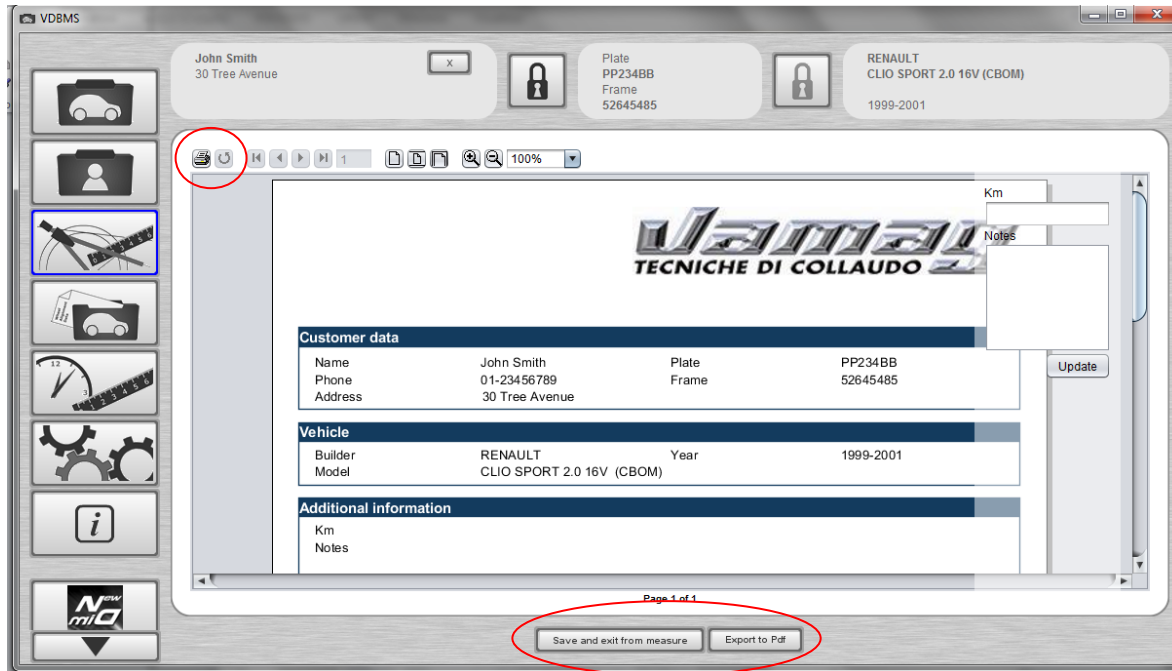
Moreover, the job report can also be exported in PDF format; then press Save and exit.

14 GENERAL CONCEPTS ABOUT THE CAR WHEEL ALIGNMENT

14.1 SUSPENSIONS

Suspensions is an elastic assembly which links the wheels to the body or frame of a vehicle; it absorbs the unevenness of the ground and guarantees a constant adherence of the wheels. The suspension system is responsible for the comfort, manoeuvrability and roadholding.

14.2 GEOMETRIC ALIGNMENT OF THE MOTOR VEHICLES

The term "GEOMETRIC ALIGNMENT OF THE MOTOR VEHICLE" refers to the geometric condition of the vehicle body, which contribute to determine the position of the wheels on the ground both when driving straight and when turning. The wheel aligner is an equipment able to check the vehicle alignment in static conditions, that means with vehicle standing idle. In dynamic conditions (vehicle rolling on the road) the alignment changes according to different factors such as load, shock absorbers conditions, the body structure, tyre pressure, etc. The data supplied by the vehicle manufacturers refer to the vehicle in static condition and are related to settings that are good for dynamic condition either. However due to the fact that the dynamic conditions influence the wheel alignment anyway, a good engineer practice is needed to interpret the measures taken by the wheel aligner and ensure that the vehicle manufacturer data are observed and the vehicle is set to optimal wheel alignment for any driving condition.

## 14.3 CHARACTERISTIC ANGLES OF VEHICLE GEOMETRIC ALIGNMENT

The angles related to the front axle of a vehicle are:

- Wheel toe
- Wheel camber (inclination)
- Axle deviation
- Caster
- Kingpin inclination
- Included angle
- Max internal steering
- Max external steering
- Steering symmetry

The angles related the rear axle of a vehicle are:

- Wheel toe
- Wheel camber (inclination)
- Axle deviation
- Thrust angle

14.3.1 TOTAL TOE
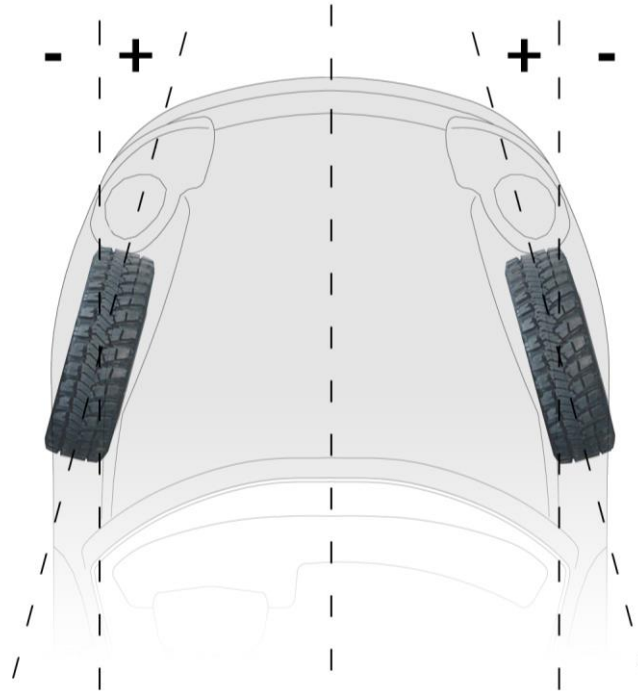
Looking at the vehicle from above, the wheel toe is the angle formed by the longitudinal axle of the vehicle and the vertical plane passing through the centre-line of the wheel. Toe is positive (close wheels) when this angle is towards the longitudinal axle.

The wheel toe is called "PARTIAL TOE".

The "TOTAL TOE" is the sum of the left and right partial toes of the wheels of the same axle. Even if, according to the definitions, toe values are supposed to be expressed in degrees, vehicle manufacturers usually give tolerance values in millimetres. To express the partial toe in millimetres, the two A and B measures must be taken as shown below:
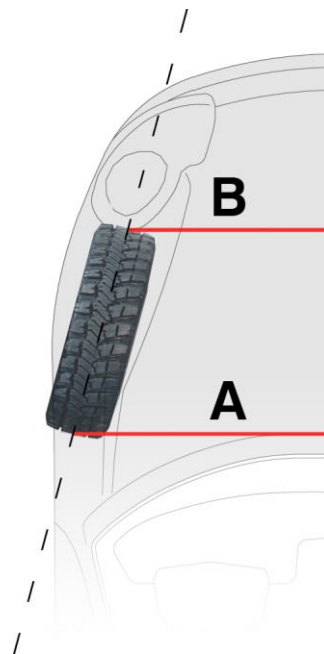
The wheel (partial) toe in mm is the difference between the measure A and B.
The wheel diameter influences the wheel toe measurement taken in mm.

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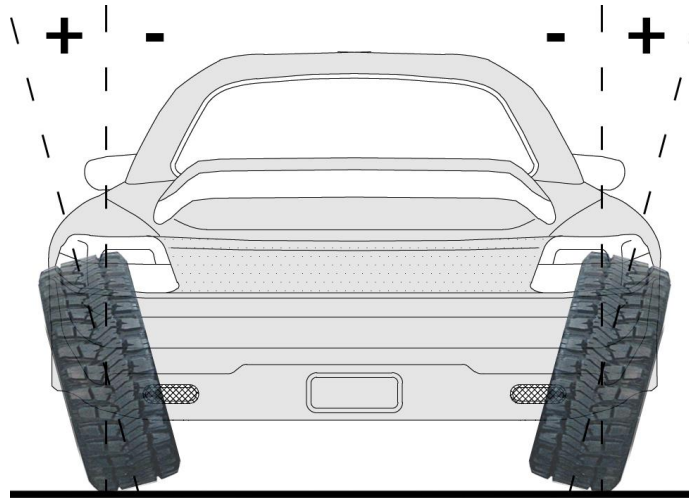
14.3.2 WHEEL CAMBER

Looking at the vehicle from the front or rear side, the wheel camber is the angle included between the centre-line of the wheel and the vertical line from the ground.
Camber is positive when the upper part of the wheel leans outwards.
Camber is negative when the upper part of the wheel leans inwards.

14.3.3 Axle deviation

The axle deviation is the value of asymmetry of a wheel with respect to the opposite wheel on the same axle compared with a line orthogonal to the longitudinal axle.

The axle deviation is positive when the right wheel is ahead of the left wheel with respect to the driving direction. The axle deviation can also be expressed in millimetres.

14.3.4 Caster
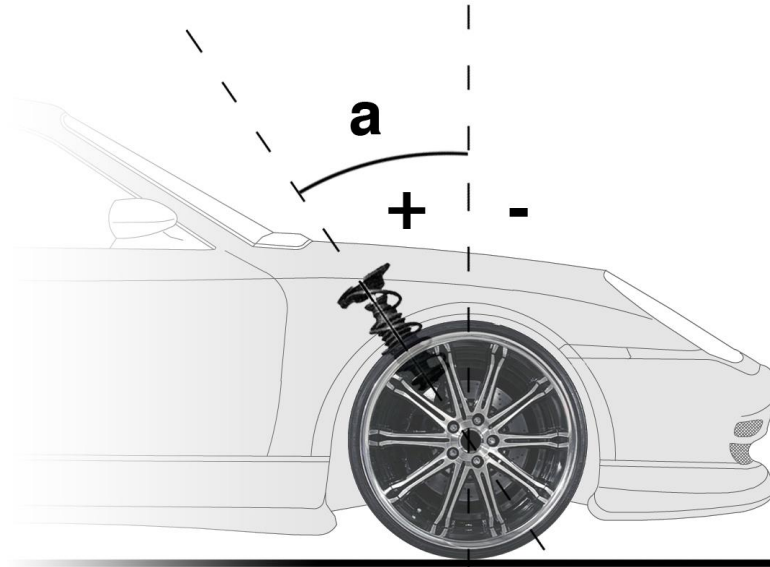
Caster is the angle made by the centre-line of the wheel kingpin and the vertical line coming from the ground when looking at the vehicle from the side.

Caster is positive the angle falls ahead of the wheel with respect to the driving direction.

14.3.5 Kingpin inclination
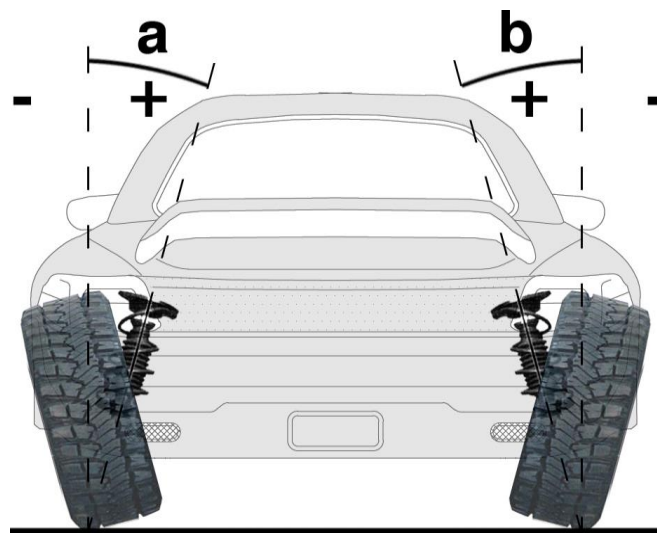
The kingpin inclination KPI (or SAI) is the angle included between the centre-line of the wheel kingpin (kingpin axle) and the vertical line coming from the ground when looking at the vehicle from the front of the rear.

Kingpin inclination is positive when the angle leans inwards, negative when it leans outwards
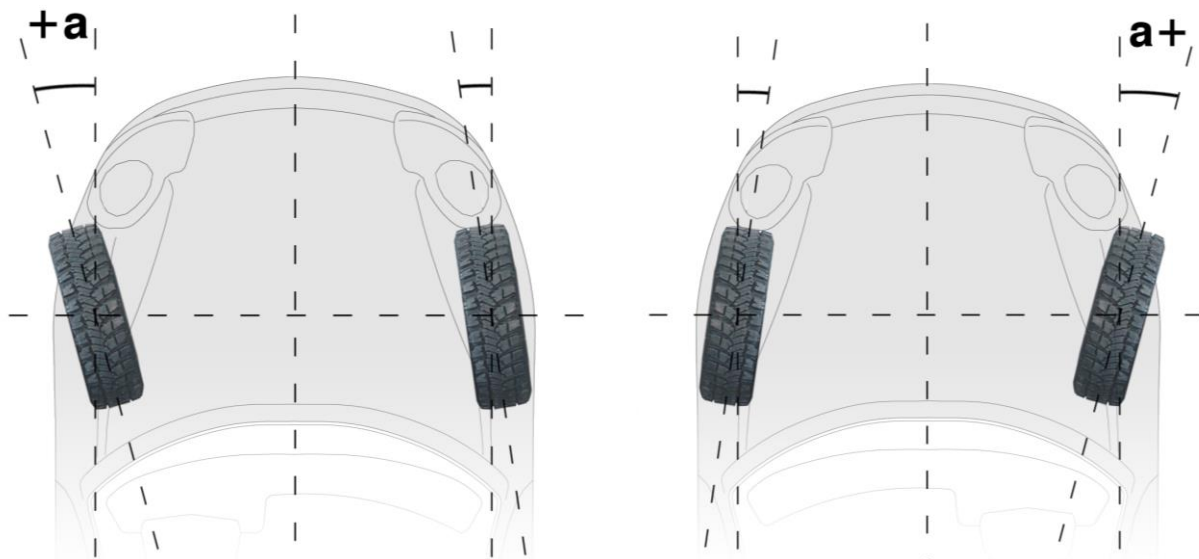
14.3.6 Included angle
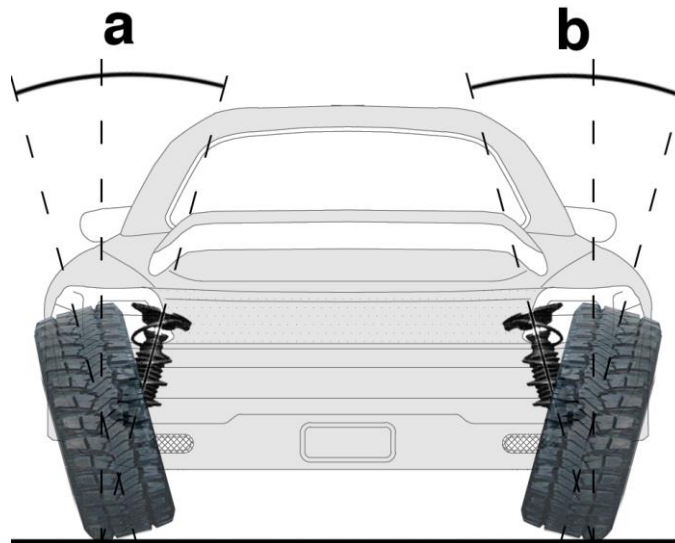
The included angle is the angle included between the centre-line of the wheel kingpin (axle of the kingpin) and the centre-line of the wheel.
The included angle is the algebraic sum of camber and kingpin inclination.

14.3.7 Toe-out on turns or steering symmetry

When a vehicle turns, the wheels make different trajectories; the internal wheel must steer more than the external one; moreover values have to be symmetric either when steering to the right or to the left.
The measurement of toe-out on turn is carried out as follows:
Left steering: measure the steering angle of the internal wheel (left) when the external wheel (right) steers 20° left.
Right steering: measure the steering angle of the internal wheel (right) when the external wheel (left) steers at 20° right.

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The steering boxes of vehicles are normally designed so that the internal wheel steers at least °÷1°30' more than the external one when the latter steers at 20°.

When adjusting the steering angle and system It is useful to check the condition and assess the behaviuor of the steering box.

14.3.8 Max lock angle

The max lock angle check is performed the same way as the steering at 20°: the steering-wheel is steered until the limit, then the steering values of the internal and external wheels, when steering on the right and on the left are measured.

14.3.9 Thrust angle
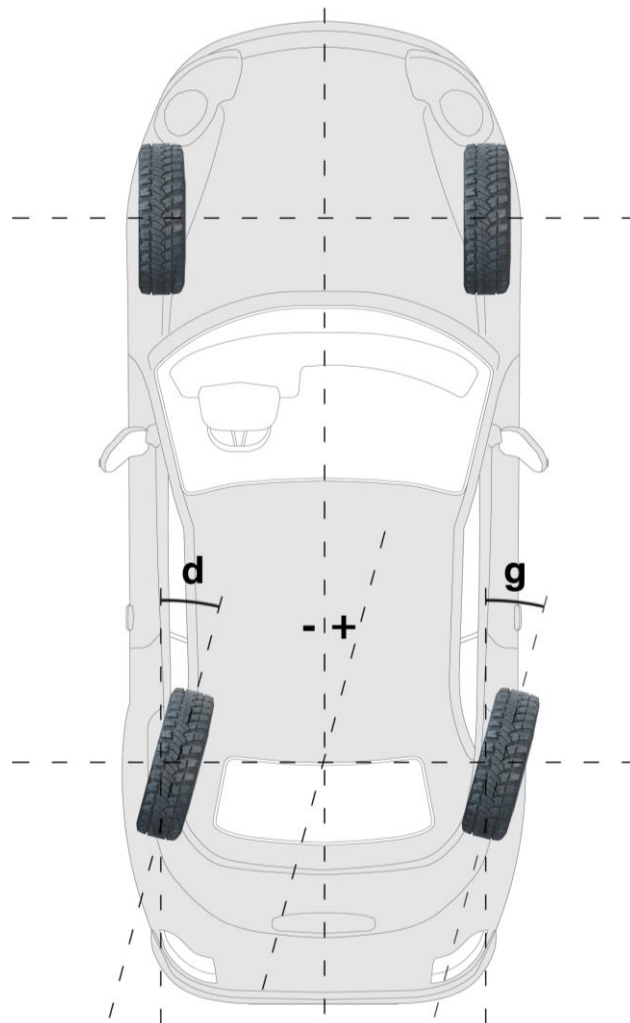
The direction of the rear axle called *thrust angle* is determined by the total toe angle of the rear wheels. The thrust angle is defined as the angle generated by the difference between the vehicle symmetry axle and the thrust line.

The thrust angle is negative when it is to the left of the drive line, positive when to the right.

If the thrust angle is not zero, the front wheels of the vehicle steer automatically in the same direction of the rear wheels, making the vehicle drive straight anyway even if with the body inclined compared to the direction of the drive line.