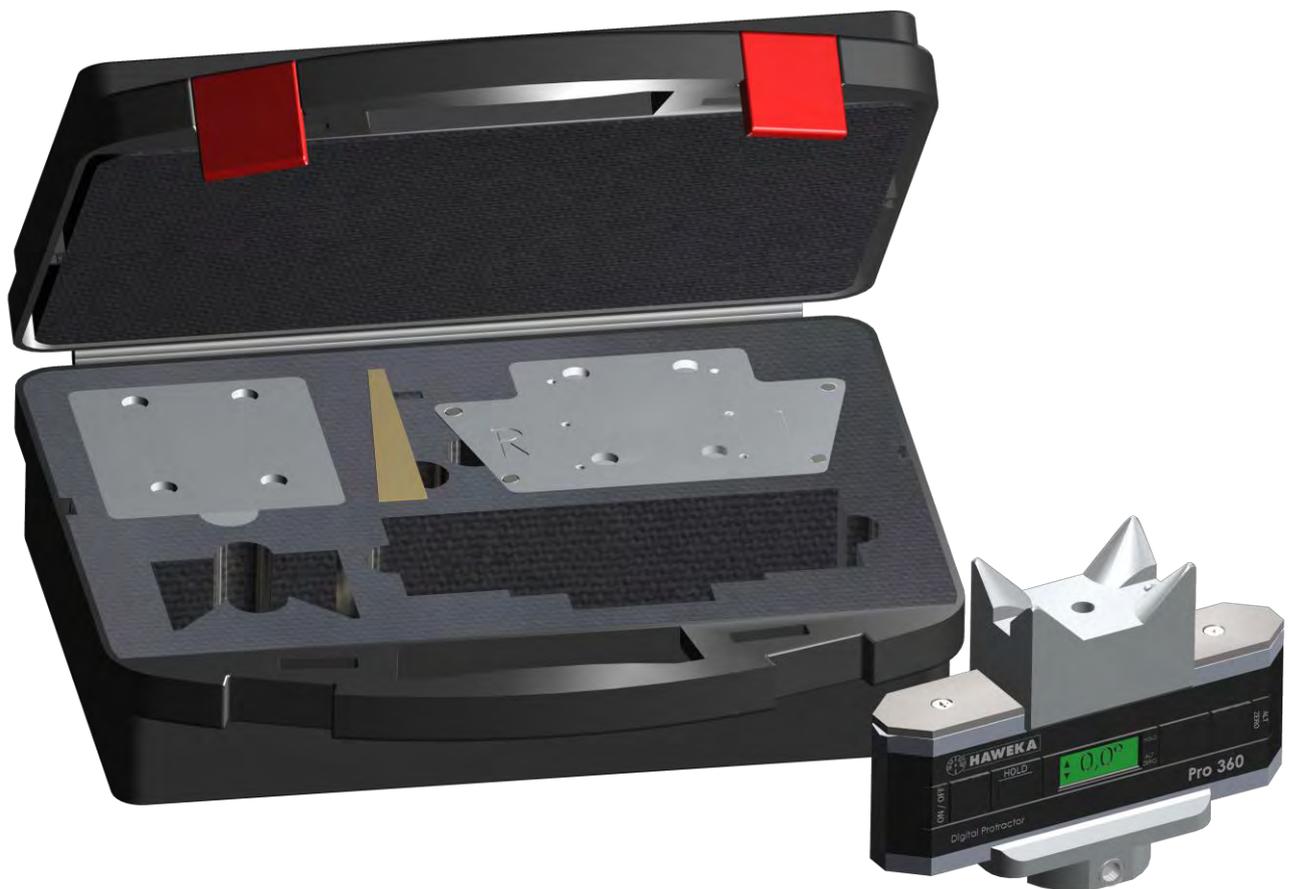


# Operating instructions

## Inclinometer for Electronic Wheel Alignment Machines

Part-Number 913 009 024



(Translation of the original manual)

GEB 001 017

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These operation instructions are subject to alteration.

**7a th Edition**

Illustrations HAWEKA / 30938 Burgwedel

These operating instructions may not be reproduced in any form or by any means

## 1. Important!



Note



- Take good care of this measurement instrument.
- Read the manual carefully before using the inclinometer.
- Ensure that the inclinometer has not been damaged during transport.
- Do not use the inclinometer in a humid environment.
- Do not immerse in water.
- Store the inclinometer in a dry and dust-free place.
- Re-cycle used batteries.



Attention

**Monitor accuracy before use.** (ref. Point 3)

## 2. Feature Overview

### 2.1 Use of Inclinometer

The electronic protractor is designed to measure angles.

It enables you to determine the inclination of the suspension arm or of the axle drive shaft to the horizontal.

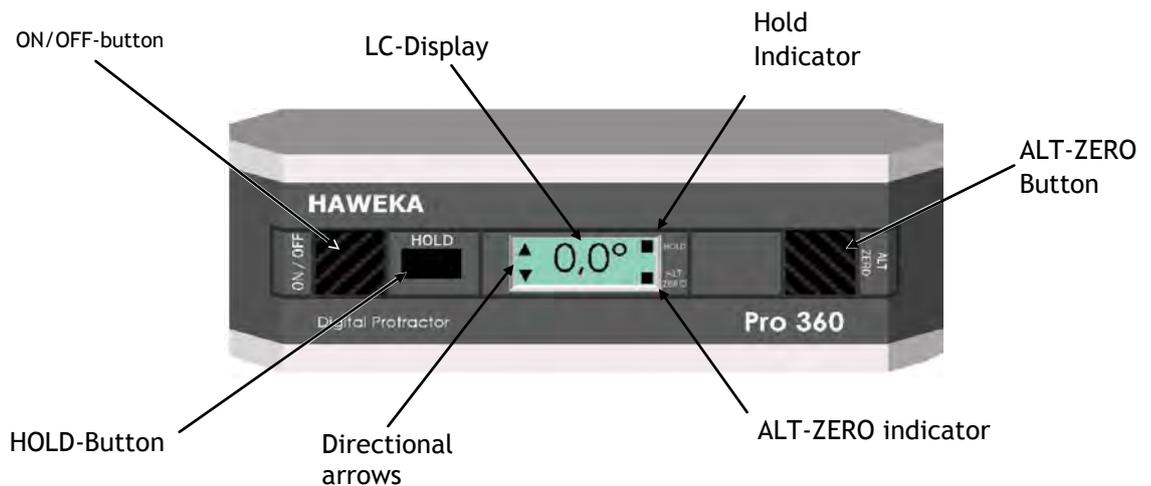
Measured data can be put in the electronic wheel alignment machine. Thus camber, caster and toe scale can be adjusted.

It allows to measure angles on a vertical and horizontal surface.

### 2.2 Specifications

Range:	360° (4 x 90°)
Accuracy:	0,1°
Repeatability:	± 0,1°
Temperature Operating	-5° C to+ 50° C
Power:	9 Volt alkaline Battery / Battery Life 500 hrs. typical
Weight:	725 Grams (incl. Position adaptor)

## 2.3 Description



### Angle Measuring:

Make sure that the surface is dry and clean.

Push the **ON/OFF**-button. The displayed angles will be in standard reference mode-level i.e. true horizontal is displayed as  $0,0^\circ$  and true vertical is displayed as  $90,0^\circ$ . Set the inclinometer on the surface to be measured and read the angle. To get the most accurate reading, allow the unit to settle for 10 seconds before noting the angle.

The inclinometer can take measurements on a horizontal as well as on a vertical surface. An arrow on the left side of the display will indicate which way to move the inclinometer. Between  $0^\circ$  and  $44,9^\circ$  the arrow will point towards down. Between  $45^\circ$  and  $89,9^\circ$  the arrow will point towards up.

If you continue to rotate the unit, the numbers on the display „flip over“ when the unit is upside-down, allowing for easy reading in any position.

### ALT-ZERO Button:

The **ALT-ZERO** Button allows you to set an angle as a  $0.0^\circ$  reference point from which to make measurements.

Example: You may want a surface that is actually  $3^\circ$  off horizontal displayed as  $0^\circ$  so you can measure all other angles from that benchmark.

To set an alternate reference point, place the inclinometer on the new surface and wait 5 seconds. Press the **ALT-ZERO** button once.

**ALT** will appear on the display, followed by **- 0 -**. The inclinometer will then display angles using the new reference. A flashing square will appear in the lower right hand corner of the display as long as the inclinometer is in **ALT ZERO** mode. The inclinometer returns to standard reference when it is turned off or shuts off automatically.



### HOLD-Button

Temporarily „freezing“ a reading on the display.

If you need to temporarily lock in a reading while you record it, simply press the **HOLD**-button. The readout will freeze and a flashing square appears in the right upper hand corner of the display. To release, press the **HOLD**-button again.

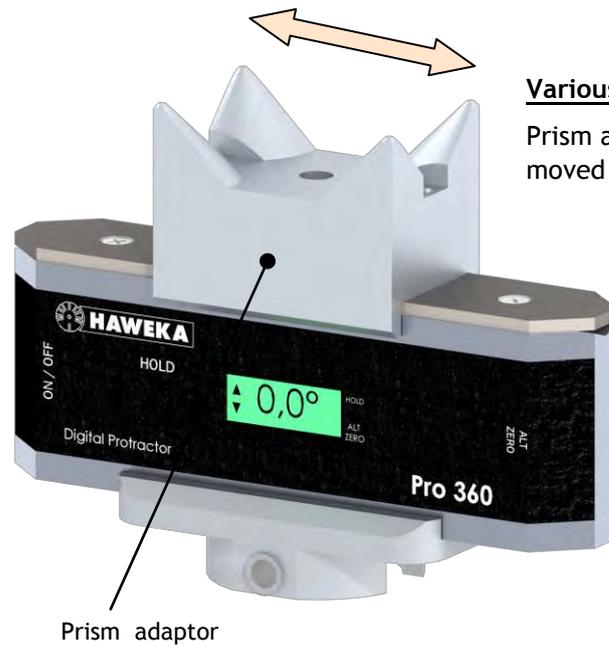
## 2.4 Position Adaptor:

According to the type of vehicle measured, you will need the position adaptor.

### Prism adaptor:

Due to its various features, the prism adaptor is suitable for the determination of an angle at the front and the rear axle.

It can be moved to the left and to right and is fixed by a magnet on the inclinometer.



### Various features

Prism adaptor can be moved sideways



Note

Vehicle manufacturers have defined the surface for taking measurements of axle geometries.



Attention

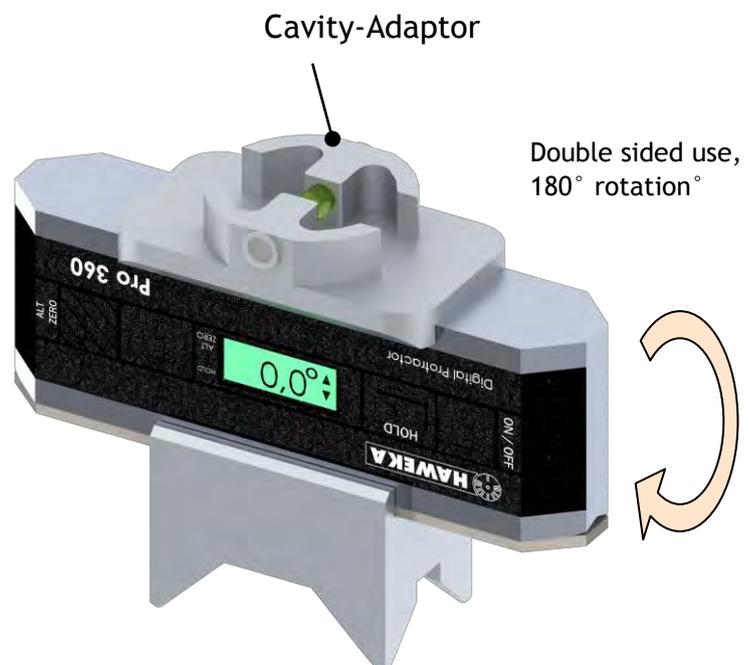
Ensure that the gliding surface on the inclinometer is always clean and that there are no metal particles on the adaptors' magnets.

### Cavity-Adaptor

The Cavity-Adaptor is fixed onto the inclinometer.

It has been specially designed for the suspension arm at the front axle of the Mercedes E-Class, Type W210 (see also Examples of use).

This adaptor has an additional bubble level that is necessary for the monitoring of the vertical adjustment of the inclinometer, e.g. you want to measure the inclination at the axle drive shaft with the prism (see Examples of use).



Double sided use,  
180° rotation°

## 3. Check of Accuracy

Like all measuring instruments, the inclinometer must be periodically checked for accuracy. Follow the steps in 3.1.

If you need to re-calibrate the inclinometer proceed through the eight steps as in point 6, page 12.

### 3.1 Accuracy Test



Note

Perform this test regularly, especially any time the inclinometer has been dropped or is being used in an environment that varies more than 5° C from the environment in which it was last calibrated.

#### REMOVE THE PRISM

- 1 Position the inclinometer with the display facing you on a clean, flat horizontal surface. It doesn't have to be exactly level. You may use any horizontal surface with a max. deviation of 10°. Wait 10 seconds so the unit is completely settled and note the angle on the display.
- 2 Rotate the unit end-for-end so the display is facing away from you. Be sure to set the inclinometer in exactly the same spot, and wait 10 seconds before reading the angle wait 10 seconds, and note the angle on the display.
- 3 Now turn the unit over so that the display is facing you, but the lettering on the face of the unit is upside down. Wait 10 seconds, and note the angle on the display.
- 4 Finally, rotate the unit end-for-end so the display is facing away from you (the lettering should still be upside -down). Wait 10 seconds and note the angle on the display.



Attention

If any of the four measurements varies from any other by more than 0,1°, you must recalibrate the inclinometer (re. Point 6, page 12)

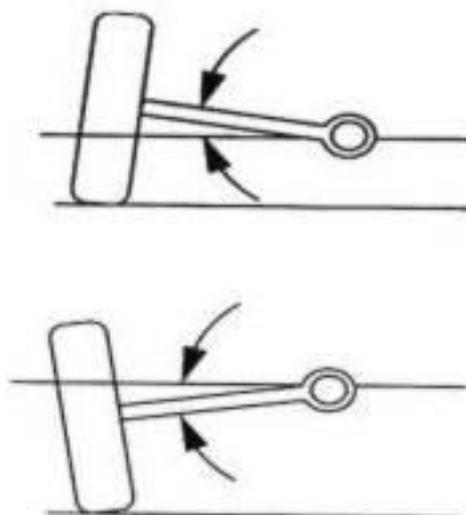
## 4. Application

### 4.1 Introduction

Due to the suspension of the chassis, the camber measurements on single wheels change. The condition of the suspension depends on the load of the vehicle or / and the execution of the chassis that has been built in the vehicle.

Example The suspension systems of some car bodies are sometimes ,Lowered'. Therefore the affect of the suspension is different from the affect of a series car body.

Simplified illustration of change of camber during suspension



Some car manufacturers have charts for alignment that assign the appropriate suspension conditions to the appropriate camber values.

These standard alignment readings are included in the software of the computers of many electronic wheel alignment machines. After determination and input of the suspension condition the appropriate camber value for measuring can be ascertained.

Another possibility to determine the affect of the suspension is the measurement of the angle on the intended chassis parts. Measurement of this angle is carried out by the electronic inclinometer.

## 5. Example for Application

### 5.1 Inclinometer with the prism adaptor or Cavity Adaptor

#### Front Axle: Mercedes A-Class

Attach the inclinometer with the prism adaptor at the 4 contact points of the suspension arm. Then press HOLD-Button. The readout freezes and the reading can be noted. Repeat on the other side of the car.



#### Rear-Axle: Mercedes A-Class

Position the inclinometer with the prism adaptor at the tie rod to the longitudinal swinging arm and ensure that the tow bar is exactly positioned between the four prisms. Adjust the inclinometer vertically with the bubble level. Press the HOLD-button to note the angle. Repeat on the other side of the car.



#### Front Axle: Mercedes C-Class / Mercedes S-Class

(Example: Mercedes C-Class)

Position the inclinometer with the prism adaptor exactly between the two position points of the suspension arm and adjust the inclinometer vertically with the bubble level.

Press HOLD-button. The readout freezes and the angle can be noted. Repeat on the other side of the car.



#### Rear Axle: Mercedes C-Class / Mercedes S-Class

(Example: Mercedes C-Class)

Position the inclinometer with the prism adaptor at the rear axle shaft (axle drive shaft) so that the shaft exactly fits between the four prisms. Adjust the inclinometer vertically with the bubble level. Press HOLD-button. The readout freezes and the angle can be noted. Repeat on the other side of the car.



### Front Axle: Mercedes E-Class (Type W210)

Use the inclinometer with the Cavity Adaptor. Position the inclinometer so that the cavity adaptor is positioned in the round empty space of the suspension arm. Ensure that the inclinometer is exactly positioned perpendicular to direction. Press HOLD-button. The readout freezes and angle can be noted. Repeat on the other side of the car.



### Rear Axle: Mercedes E-Class (Type W210)

Position the Inclinometer with the prism adaptor to the rear axle shaft (axle drive shaft) so that the shaft fits between 4 points. Adjust the inclinometer vertically with the bubble level. Press HOLD-Button. The readout freezes and angle can be noted. Repeat on the other side of the car.



### Front Axle: Mercedes E-Class (Type W211)

Position the inclinometer with the prism adaptor between the two position points of the suspension arm, then adjust the inclinometer vertically with the bubble level.

Press HOLD-Button. The readout freezes and angle can be noted. Repeat on the other side of the car.



### Rear Axle: Mercedes E-Class (Type W211)

Position the inclinometer with the prism adaptor at the rear axle shaft (axle drive shaft) so that the shaft fits exactly between the four prisms. Adjust the inclinometer vertically with the bubble level- Press HOLD-button. The readout freezes and angle can be noted. Repeat on the other side of the car.



## Front Axle: Mercedes C-Class - CLA (Type 117)

Attach the inclinometer with the prism adaptor at the 4 contact points of the suspension arm. Then press HOLD-Button. The readout freezes and the reading can be noted. Repeat on the other side of the car.



## Rear Axle: Mercedes C-Class - CLA (Type 117)

Position the inclinometer with the prism adaptor at the rear axle shaft so that the shaft exactly fits between the four prisms. Adjust the inclinometer vertically with the bubble level. Press HOLD-button. The readout freezes and the angle can be noted. Repeat on the other side of the car.



## 5.2 Inclinometer with measuring adapter

### Für Mercedes Citan - (Type: 415)



Example front axle: Type 415 (Citan)



Example rear axle: Type 415 (Citan)



### 5.3 Inclinometer with crown adapter and angle adapter For Mercedes Vaneo 2001 - 2005 (Type: 414)



### 5.4 Inclinometer with adapter plate

For Mercedes CLK 1997 - 2003  
For Mercedes C-Class 1993 - 2001

(Type 208)

(Type 202)



Mercedes CLK



Mercedes C-Klasse

## 6. Calibration of the Inclinometer

Whenever the accuracy test shows a discrepancy of  $0,1^\circ$  or more, (re. Point 3) recalibration must be performed.

Press and hold the **HOLD** and the **ALT ZERO** button simultaneously. Keep them depressed for approximately three seconds. Release the buttons when the symbol **SUP** appears. A “0” within flashing brackets will appear.

For re calibration proceed as follows:



### 6.1 8-Step Calibration

#### Horizontal Settings:

**Step 1** Position the inclinometer with the display facing you on a clean, flat horizontal surface. It doesn't have to be exactly level. You may use any horizontal surface with a max. deviation of  $10^\circ$ . Unit faces you and lettering on face is right-side up. Wait 10 seconds, then press HOLD-button until „[1]“ appears.



**Step 2** Rotate unit so it faces away from you, the lettering should still be right-side up.. Align with same edge or line, wait 10 seconds. Press HOLD-button until „[2]“ appears.



**Step 3** Roll unit so it faces you. The lettering should now be upside-down. Align with same edge or line - wait 10 seconds. Press HOLD-button until „[3]“ appears.



**Step 4** Rotate unit so it faces away from you, the lettering should still be upside down. Align with the same edge or line - wait 10 seconds. Press HOLD-button until „[4]“ appears.



## Vertical Settings

Step 5 Place unit against vertical surface so it faces you, the lettering on the face should read from bottom to top. Align with an edge or line - wait 10 seconds. Press HOLD button until „[5]“ appears.



Step 6 Roll the unit so it faces away from you. The lettering should still read from bottom to top. Align with same edge or line - wait 10 seconds. Press HOLD-button until „[6]“ appears.



Step 7 Rotate unit end-for-end so it faces you, the lettering should now read top to bottom. Align with the same edge or line - wait 10 seconds. Press HOLD-button until „[7]“ appears.



Step 8 Roll the unit so it faces away from you, the lettering should still read top to bottom. Align with same edge or line - wait 10 seconds. Press. HOLD-button until „[8]“ appears.



„ [8]“ will very briefly appear, followed immediately by regular angle measuring. Calibration is now finished.

## 7. Maintenance

### 7.1 General

Store the inclinometer in a clean and dust-free environment, storage temperature must not be below or above +65°C.

The device is in general maintenance-free and it is designed to stand up to the rigours of industrial use.



Attention

Do not use solvents directly on any of the inclinometer's parts!



Attention

Store the inclinometer from extreme temperature: Never below -20°C or above + 65°C.

### 7.2 Replacement of Battery

The alkaline battery will provide 500 hours of use.

When the L/C display flashes „Lo bAt“, the battery is low and must be changed.



Note

The inclinometer does not display inaccurate angles due to a weak battery.

Install an alkaline 9 -volt battery. Unscrew the battery compartment cover screw. Remove the cover. Install the battery, replace the cover and tighten the screw.



Note

A Lithium Battery can be used for even longer life.

## 8. Example of Use

There are different measurement programs, depending on the manufacturer of the wheel alignment machine.

Please find below an example of how to enter the values that have been measured by the inclinometer into the particular parts of the program.

### 7.1 Hunter series 611 with wheel alignment program *WinAlign*

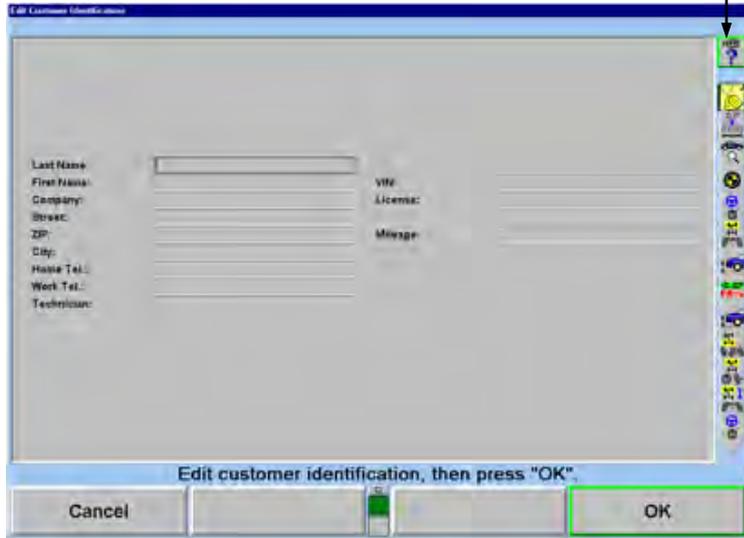
After starting the program choose the *Mercedes-Benz Account*



Then begin *Alignment*.

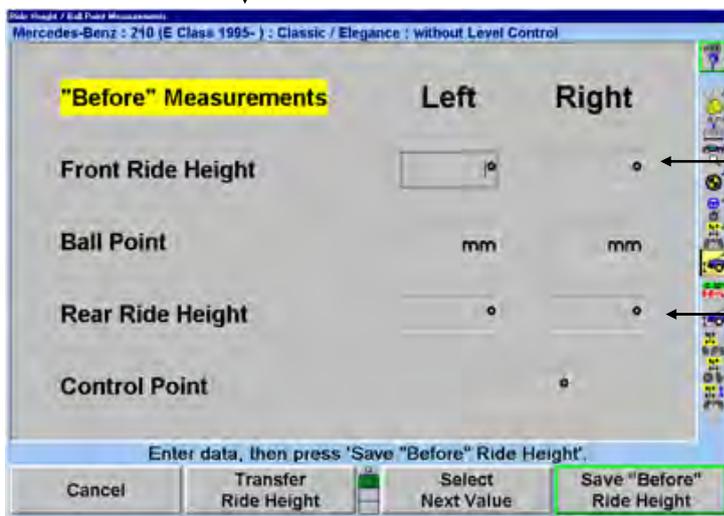
Use the following procedure as indicated in the program:

The right column shows you which part of the program you are using.



- Pos.1 Enter customer data
- Pos.2 Choose Vehicle and desired values
- Pos.3 Date of vehicle inspection
- Pos.4 Choose alignment clamp
  - ↳ According to your choice, Rim run out compensation may be necessary
- Pos.5 Caster and Inclination
- Pos.6 Toe alignment

Pos.7 Ride Height Measurement



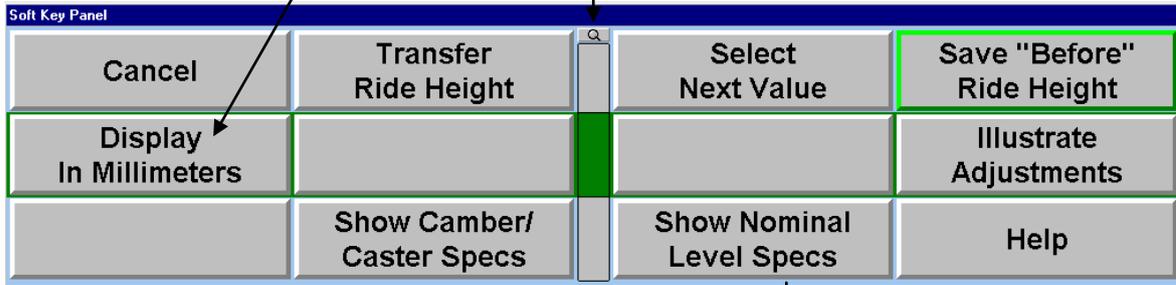
For the ride height measurement the necessary measurements are made with the inclinometer as described in 4.2.

Enter the ride height measurements manually.

If necessary, you can change from degrees to mm.

In order to control the program use the option *fade in all function keys*.  
Click on symbol *magnifying glass*.

Choose button *Display in mm*  
You can change between **degrees** and **mm** .



When choosing function *Show Nominal Level Specs*, the relevant nominal level specs for the selected vehicle can be shown as below (chart).

Mercedes-Benz : 210 (E Class 1995- ) : Classic / Elegance : without Level Control

Checking and Adjusting Values for Ride Height

Ready to drive	Front Axle		Rear Axle	
	MM	Deg.	MM	Deg.
<b>Tolerance</b>	<b>+10mm/-15mm</b>	<b>+1.44°/-2.15°</b>	<b>±10mm</b>	<b>±1.02°</b>
210 Classic/Elegance	9mm	6.01°	14mm	1.17°
210 Classic/Elegance (NH/SLS)	9mm	6.01°	5mm	0.26°
210 Sport/Avantgarde	-18mm	2.13°	-5mm	-0.76°
210 Sport/Avantgarde (NH/SLS)	-18mm	2.13°	-10mm	-1.27°
210 Hart (Hard)	24mm	8.17°	37mm	3.51°
210 Allrad (AWD)	9mm	6.01°	5mm	0.26°
210 LWB	17mm	7.16°	15mm	1.27°

View the illustration, then press "OK".

Print All Illustrations      OK

By pressing button 'Save Input Level', this part of the program is completed.

## 9. Conversion Table from Degrees to Angular Minutes

Degrees	Angular Minutes
<b>0,01°</b>	0°0'36"
0,02°	0°1'12"
0,03°	0°1'48"
0,04°	0°2'24"
0,05°	0°3'00"
0,06°	0°3'36"
0,07°	0°4'12"
0,08°	0°4'48"
0,09°	0°5'24"
<b>0,10°</b>	<b>0°6'00"</b>
0,11°	0°6'36"
0,12°	0°7'12"
0,13°	0°7'48"
0,14°	0°8'24"
0,15°	0°9'00"
0,16°	0°9'36"
0,17°	0°10'12"
0,18°	0°10'48"
0,19°	0°11'24"
<b>0,20°</b>	<b>0°12'00"</b>
0,21°	0°12'36"
0,22°	0°13'12"
0,23°	0°13'48"
0,24°	0°14'24"
0,25°	0°15'00"
0,26°	0°15'36"
0,27°	0°16'12"
0,28°	0°16'48"
0,29°	0°17'24"
<b>0,30°</b>	<b>0°18'00"</b>
0,31°	0°18'36"
0,32°	0°19'12"
0,33°	0°19'48"

Degrees	Angular Minutes
0,34°	0°20'24"
0,35°	0°21'00"
0,36°	0°21'36"
0,37°	0°22'12"
0,38°	0°22'48"
0,39°	0°23'24"
<b>0,40°</b>	<b>0°24'00"</b>
0,41°	0°24'36"
0,42°	0°25'12"
0,43°	0°25'48"
0,44°	0°26'24"
0,45°	0°27'00"
0,46°	0°27'36"
0,47°	0°28'12"
0,48°	0°28'48"
0,49°	0°29'24"
<b>0,50°</b>	<b>0°30'00"</b>
0,51°	0°30'36"
0,52°	0°31'12"
0,53°	0°31'48"
0,54°	0°32'24"
0,55°	0°33'00"
0,56°	0°33'36"
0,57°	0°34'12"
0,58°	0°34'48"
0,59°	0°35'24"
<b>0,60°</b>	<b>0°36'00"</b>
0,61°	0°36'36"
0,62°	0°37'12"
0,63°	0°37'48"
0,64°	0°38'24"
0,65°	0°39'00"
0,66°	0°39'36"

Degrees	Angular minutes
0,67°	0°40'12"
0,68°	0°40'48"
0,69°	0°41'24"
<b>0,70°</b>	<b>0°42'00"</b>
0,71°	0°42'36"
0,72°	0°43'12"
0,73°	0°43'48"
0,74°	0°44'24"
0,75°	0°45'00"
0,76°	0°45'36"
0,77°	0°46'12"
0,78°	0°46'48"
0,79°	0°47'24"
<b>0,80°</b>	<b>0°48'00"</b>
0,81°	0°48'36"
0,82°	0°49'12"
0,83°	0°49'48"
0,84°	0°50'24"
0,85°	0°51'00"
0,86°	0°51'36"
0,87°	0°52'12"
0,88°	0°52'48"
0,89°	0°53'24"
<b>0,90°</b>	<b>0°54'00"</b>
0,91°	0°54'36"
0,92°	0°55'12"
0,93°	0°55'48"
0,94°	0°56'24"
0,95°	0°57'00"
0,96°	0°57'36"
0,97°	0°58'12"
0,98°	0°58'48"
0,99°	0°59'24"
<b>1,00°</b>	<b>0°60'00"</b>

## 10. EC-Declaration of Conformity

Haweke AG  
Kokenhorststraße 4  
30938 Burgwedel  
Germany

We herewith declare that the machine described in the following is designed , manufactured and placed by us in the market according to the relevant EC guidelines.

This declaration becomes null and void if the machine is not used as set forth under „Use and description of Inclinometer“ of this operation manual, or if any constructive modification or changes whatsoever are made to the machine without prior written approval from our side.

**Name of Machine:** Inclinometer

**Model:** Test and Measuring Instrument

**Relevant EC-Guidelines:** Directive 2014/32/EC measuring instruments  
EN 61326-1:2013

**Applied national standards:** VDI 4500 Blatt 1

**Date / Signature:** 13.06.2016




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