



Operating Instructions

Laser Wheel Aligner

AXIS500

Optical Wheel Alignment

Laser System

(Translation of the original manual)

D-30938 Burgwedel • Kokenhorststr. 4 • Phone: +49 / 5139 / 8996-0 • www.haweke.com • info@haweke.com

GEB 001 081

Table of contents

1	General safety precautions	3
1.1	Operator's responsibility.....	3
1.2	Description of applied symbols	3
1.3	General safety measures	4
2	Shipment.....	5
2.1	Dimensions and Weight	5
2.2	Information's for general handling and storage	5
3	Product Description	6
3.1	Agreed functionality	7
3.2	Design of laser measurement head	8
3.3	Description	9
3.4	Button assignment	9
3.5	Preparatory measures before the 1st commissioning	10
3.6	Technical Data	11
4	Equipment.....	12
4.1	Part list basic version of AXIS500	12
4.2	ccessories	15
5	Front Wheel Alignment.....	17
5.1	Preparations.....	17
5.2	Alignment of „Straight ahead position“	18
5.3	Set-up of Toe Scales	19
5.4	Toe Measurement and Alignment.....	20
5.5	Check of Steering Wheel Center Position	22
5.6	Camber measurement	23
5.7	Caster and Inclination	24
5.8	Max. Steering Angle.....	25
5.9	Relative Steering Angle (toe out on turns)	26
5.10	Rim Run-Out Check.....	27
6	Rear Wheel Alignment	28
6.1	Camber Measurement of the Rear Wheels.....	28
6.2	Total Toe / Rear Axle	28
6.3	Measurement of Axle Mismatch in relation to the Frame:	29
6.4	Axle Mismatch in relation to Vehicle's Longitudinal Axis	30
7	Alignment of Twin Steering Front Axles	31
7.1	Preparations.....	31
7.2	Reading of total toe	31
7.3	Toe Alignment of the Second Axle	33
8	Trucks with independent suspensions	35



8.1	Measurement of Individual Toe -Trucks with Two Adjustable Toe Rods	35
9	Adjustment by Run-out compensation	37
10	Checking the Wheel Alignment Clamp	39
11	Maintenance	40
11.1	Maintenance	40
11.2	Replacing the batteries in the laser housing	40
11.3	Replacing the batteries in the inclinometer	41
12	Error description.....	42
12.1	Error description and causes	42
13	Annex.....	43
13.1	Conversion Table from Millimetres into Degrees	43
13.2	Diagram for Determination of Axle Mismatch (optical measurement) Dia. 1	45
13.3	Diagram for Determination of Axle Mismatch (optical measurement) Dia. 2	46
13.4	Measurement report	47
14	EC-Declaration of Conformity.....	48

HAWEKA GmbH

Kokenhorststraße 4
Germany - 30938 Burgwedel
Tel.: +49 5139 / 8996-0

info@haweka.com
www.haweka.com

Burgwedel 19.01.2023
For version see page 7

1 General safety precautions

1.1 Operator's responsibility



Laser Aligner AXIS500 has been designed and manufactured in accordance with harmonized standards. It is thus state of art and provides maximum security during operation.

Structural changes of Laser Aligner require written approval of manufacturer!

Operational safety can only be achieved, if all required measures are carried out. It is due to the responsibility of the operator to consider these measures and to control their implementation.

In particular the operator has to ensure that

- the device is only used appropriately to its agreed functionality
- the device is only used if proper functionality is provided
- complete operating instructions are provided in legible form at point of location of device
- only suitably trained and authorized personnel operates the device
- the personnel is regularly instructed in all aspects of operational safety and familiar with operating instructions and contained safety precautions
- all warning and safety precaution labels maintain attached to the device in legible form

1.2 Description of applied symbols

These operating instructions contain accurate safety precautions, following symbols have been applied for indication



Attention

This symbol indicates general risk for the device and materials.



Warning of hazardous electric voltage

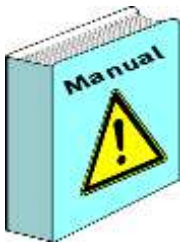
This symbol indicates risks for humans, device and materials.

**Note**

Symbols attached to laser measuring heads are placed close to laser beam output opening.

**Laser radiation warning**

This symbol indicates that, above all, dangers to people are to be expected.

**Information sign with the laser class markings****1.3 General safety measures**

Laser Aligner AXIS500 must only be operated by suitably trained and authorized personnel that is familiar with these operating instructions and capable of proper implementation.

Check Laser Aligner before any operation for visual damage and ensure proper functionality of device! In case of defect inform manager of workshop!

Laser devices require general considerations:



**Laser
CLASS 2
TYP 1**

- **Do never look directly into laser beam!**
- Define laser beam paths accurately, use laser absorbing means to avoid stray laser irradiation! Hazardous reflections are particularly caused by reflecting and shining surfaces.
- Level laser beam path above or below eye level if possible!
- Laser beam paths should not cross operational areas. If this is inevitable mark laser operating area significantly and set up required warning signs.
- Switch off laser after operation!

You can find more safety precautions in:

Safety of laser products; Part 1: Equipment classification, requirements and user's guide (IEC 825-1:1993)

It is the responsibility of the operator to ensure proper operation and implementation of safety precautions.

**Note**

2 Shipment

2.1 Dimensions and Weight

Length x Width x Height

120 cm x 80 cm x 90 cm

Shipment weight:

170 Kg



2.2 Information's for general handling and storage

Avoiding damages and injuries during shipment:



Attention

- industrial trucks must be in accordance with regulations for prevention of accidents
- shipment activities must only be carried out by suitably trained and authorized personnel
- heavy impacts during shipment must be avoided



Keep device always dry.

This applies in particular to shipment and storage of complete instrument cabinet.

Ensure that storage location is dry and dust free.

3 Product Description

Laser Aligner AXIS500

Part No. 922 000 050



These operating instructions are subject to alterations.

8.1 revised version 2023

Illustration: HAWEKA GmbH / 30938 Burgwedel

This publication may not be reproduced in any form or by any means.

3.1 Agreed functionality

- Laser Aligner AXIS500 is designed for wheel alignment of motor vehicles.
- Only for the fast measurement of the chassis geometry.

Front wheel alignment and steering axle:

- Total Toe / Single Toe
- Camber
- Caster
- KPI
- Relative steering angle
- Steering wheel centre position

Rear wheel alignment:

- Toe
- Camber
- Offset
- Out of square

- Laser Aligner AXIS500 enables measurements while in driven position. No lifting of vehicle is required.
- Measurements can be taken fast and reliable on all types of motor vehicles (with specific accessories provided).



Attention

Safe operation of Laser Aligner AXIS500 cannot be ensured if not used appropriately to its agreed functionality!



Note

The operator-and not the manufacturer- is responsible for all damages and injuries resulting from inappropriate use to its agreed functionality.



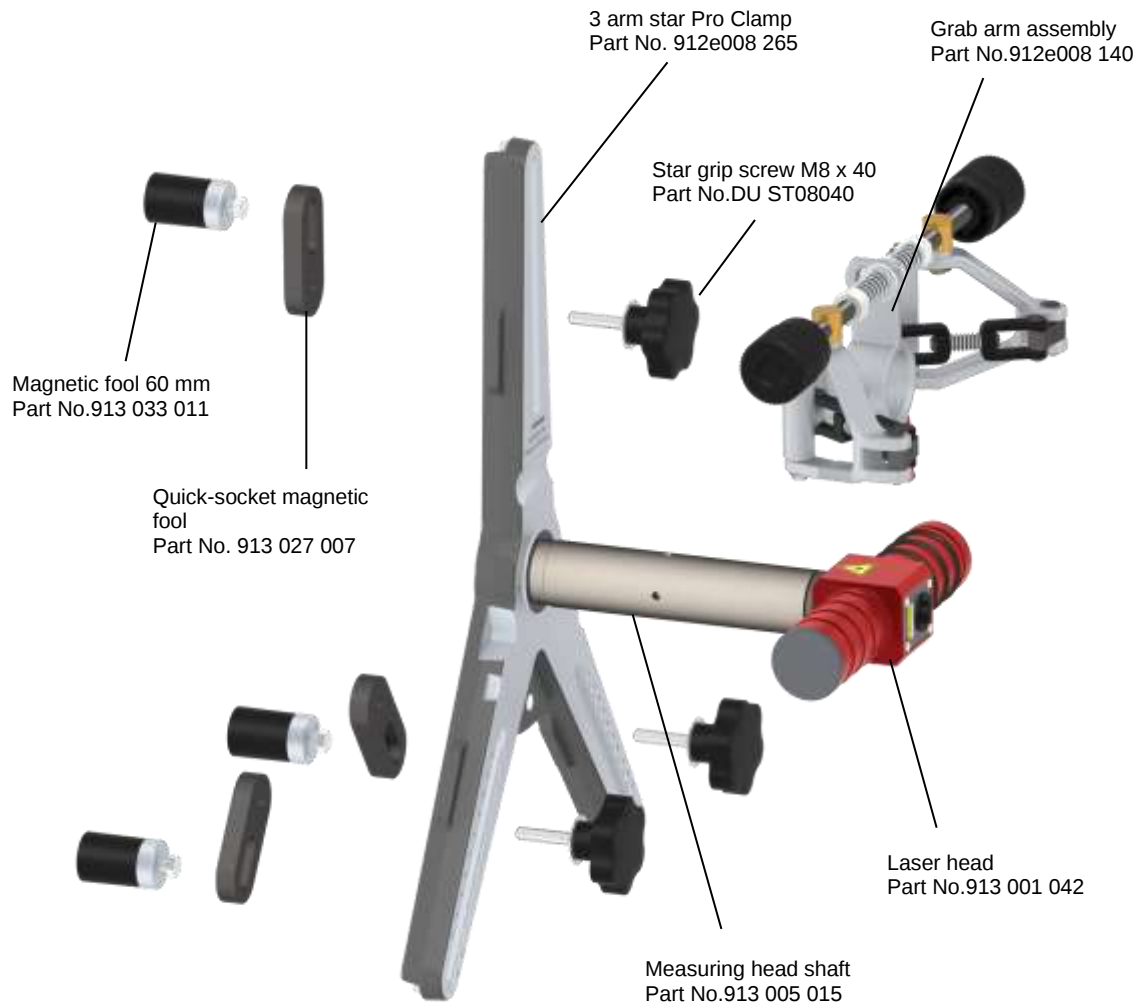
Applied laser of laser measuring head is a class 2 laser. Short-term laser beam impact (up to 0,25 s) proves not to be harmful to human eyes. Eye blink reflex prevents the eye from injury during short-term, unintentional exposure to laser beam.

DO NEVER LOOK INTENTIONALLY INTO LASER BEAM!

In case of suspected eye injury through laser beam impact consult a ophthalmologist immediately!

3.2 Design of laser measurement head

Laser head and main components:



Laser head is free rotatable. Ensure that laser beam output opening is directed downward to the floor after mounting of laser heads and before switch on of diode laser.

Inclinometer

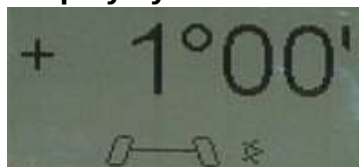
Required for camber and caster measurement during front wheel alignment. Electronic inclinometer is mounted on measuring head shaft.



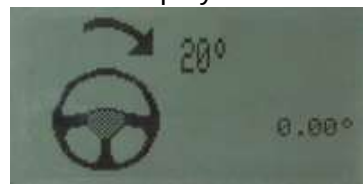
3.3 Description

The electronic inclinometer is used to record angle values on the vehicle geometry. This device enables the camber, caster and included angle to be determined. Angles can be measured in the horizontal and vertical plane depending on the attachment face.

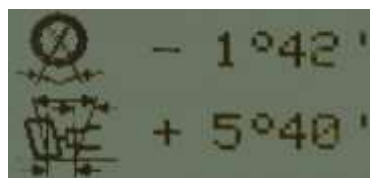
Display symbols:



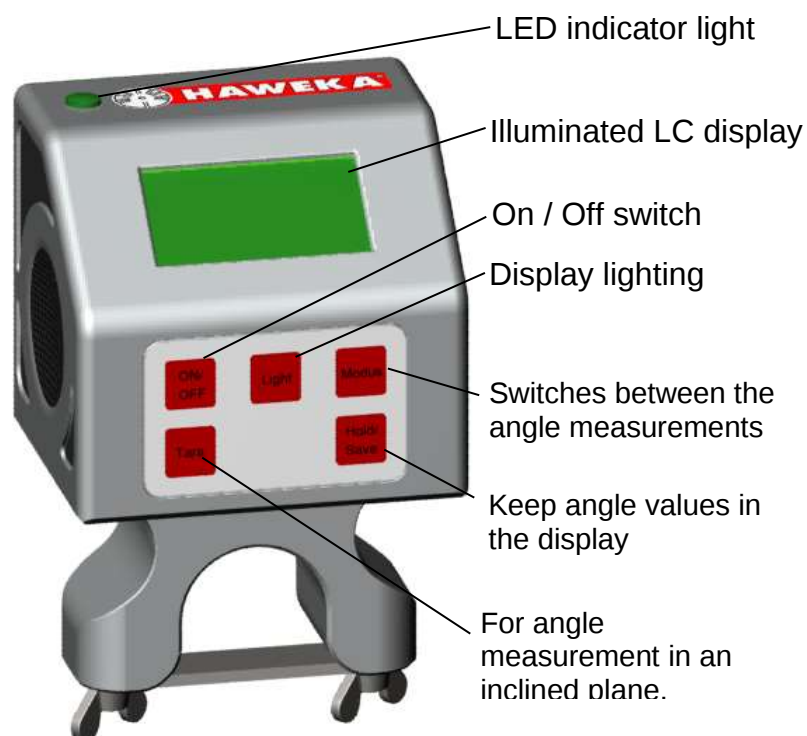
Camber display



Request for value recording
Caster / KPI



Angle value display:
Upper line: Caster
Lower line: KPI



3.4 Button assignment

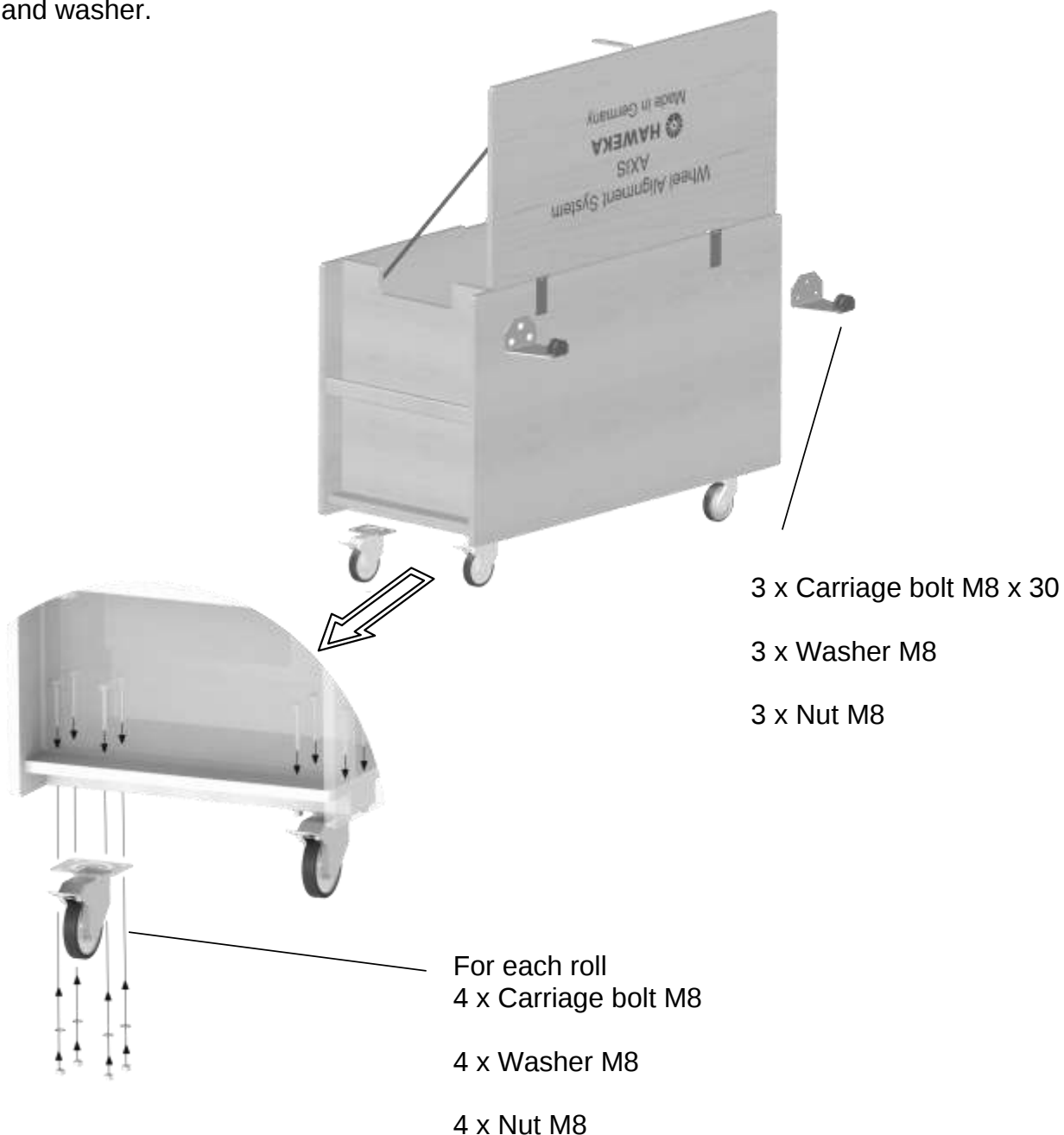
	On / Off button
	Switch on background lighting for 30 seconds.
	Switches between the camber measurements, caster / KPI and max. steering. The first mode is the camber measurement, where the result of the angle is directly shown. In caster / KPI mode, LED's light signals confirm the recorded angle changes and after the procedure has ended the display automatically switches to the display values for caster (upper line) and KPI (lower line). The third mode is for calculating the max. steering angle. Press the button again to switch back to the camber display.
	Press this button to adjust the angle measurement to an inclined plane. The angles in both measuring directions are thus adjusted to zero. This operating state is indicated by a symbol in the bottom right-hand corner. Press this button again to switch back to display of the absolute angle.
	Press this button to "freeze" the angles in the display. This operating state is indicated by a symbol in the bottom left-hand corner. If the button is pressed again the display switches back to continuous display of the measured values.

3.5 Preparatory measures before the 1st commissioning

Initial operation of Laser Aligner requires following measures:

Mounting of rolls and scale holding device on mobile instrument cabinet.

Fit in fastening screws M8 x 65 from top and tighten with nut and washer.



3.6 Technical Data

Measuring Accuracy:

Toe	< 0,5 mm
Camber	$\left\{ \begin{array}{l} 0 \dots 10^\circ: \pm 0^\circ 03' \\ 10 \dots 45^\circ: \pm 0^\circ 12' \end{array} \right.$
Caster	
Steering	
Relative steering angle	$\pm 15 \text{ min.}$
Axle mismatch	$\pm 1 \text{ mm}$
Axle torsion	$\pm 5 \text{ min.}$

Toe measurement range	$\pm 28 \text{ mm}$
Camber measurement range	to 5 degrees
KPI measurement range	to 18 degrees
Castor measurement range	to 12 degrees

Turning plate carrying capacity	6 t / piece
---------------------------------	-------------

Laser:

Model LG650-7 (80)	
Operating voltage	3 Volt (2 x Mignon Typ AA 1,5 Volt)
Power P_o	0,91 mW
Wave range λ	650 nm
Range	20 m
Laser class	2DIN EN 60825-1:1994-07

Electronic inclinometer:

Operating voltage	6 volt (4 x Mignon Type AA Batteries 1.5 volt)
Current input during operation	10 mA (without lighting), 60 mA (with lighting)
Closed-circuit current (unit switched off)	< 10 μA
Running time with one set of batteries	without lighting: approx. 50 - 60 h. with lighting: approx. 30 h.
Specified measuring range	$\pm 45^\circ$ for both axes
Extended measuring range	$\pm 90^\circ$ for both axes
Accuracy of the specified measuring range	0... 10°: $\pm 0^\circ 03'$ 10 ... 45°: $\pm 0^\circ 12'$
Resolution	$0^\circ 01'$
Temperature range	-5 to +50 °C (in use) -20 to 65 °C (storage)
Shock resistance of the sensor	3.500g

4 Equipment

4.1 Part list basic version of AXIS500

2 pcs. Laser measuring heads

1 pcs. Part No. 922 001 006



4 pcs. Grab arms for trucks

1 pcs. Part No. 912e008 303



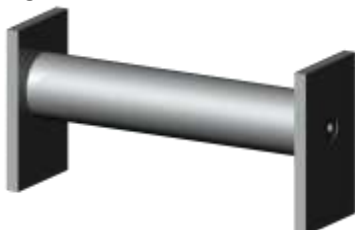
1 pcs. Electronic inclinometer

Part No. 913 009 048



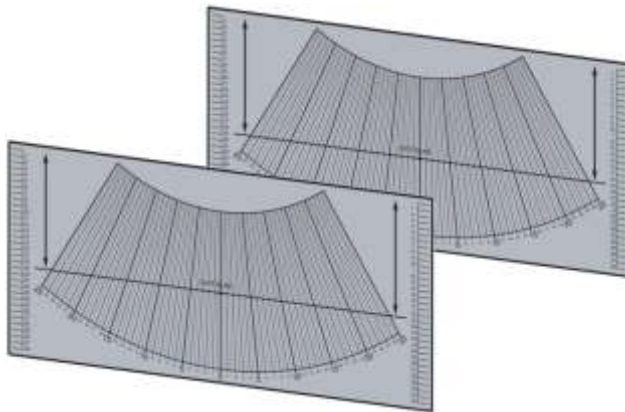
1 pcs. Alignment block for uneven floors

Part No. 913 010 000



2 pcs. 20° scales

1 pcs. Part No. 913 018 000



2 pcs. Turning plates

Left and Right
1 pcs. Part No. 913 011 050



6 pcs. Magnetic feet for rear-axe measuring (315mm)

1 pcs Part No. 913 030 012



6 pcs. Magnetic feet for front-axe measuring (60 mm) with quick socket

1 pcs. Part No. 913 033 011

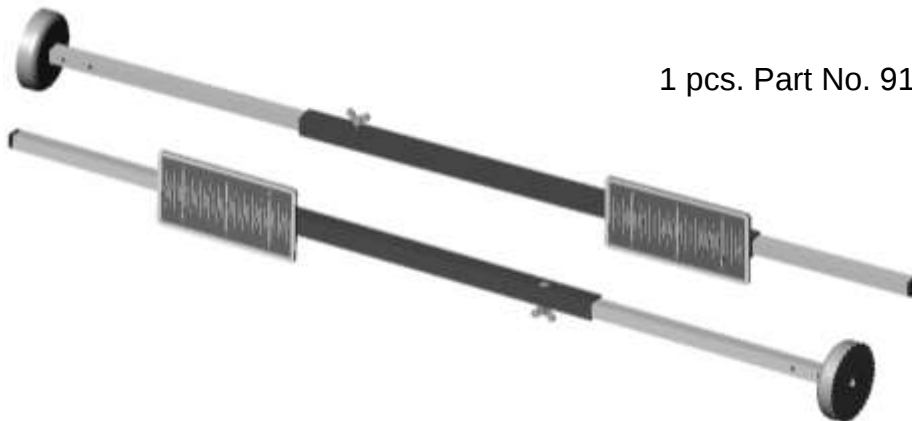


2 pcs. Toe scales (min 3.110 – max. 4.440) mm



1 pcs. Part No. 913 051 030

2 pcs. Magnetic scales



1 pcs. Part No. 913 013 000

1 pcs. mobile instrument cabinet and fastening material



1 pcs Part No. 913 052 009

2 pcs. holding device for scale

Part No. 912e008 212 (1 piece)



1pcs. Tape measure

Part No. 900 008 04



QR-Code for Download Measurement protocol



Also available on the CD

1 pcs. CD Rom
"Test-Record"
 Part No. VID 922 002



Insert your company name Address ZIP and town Telephone	
Manufacturer:	Model:
chassis number:	Driven km / miles:
Licence plate no.:	Tyre pressure: (psi) left part: _____ right part: _____
Vehicle owner:	

Measurement report for wheel alignment

Camber, Caster, SAI / KPI, Toe-out-on-turns, Out of square Single Toe, Total Toe, Axle Offset		measured data in degrees [°] measured data in millimetre [mm]	
before alignment	after alignment	before alignment	after alignment
Camber		Camber	
Toe left		Toe right	
Caster		Caster	
SAI / KPI		SAI / KPI	
Toe-out-on-turns		Toe-out-on-turns	
before alignment	after alignment	before alignment	after alignment
Camber		Camber	
Toe left		Toe right	
Caster		Caster	
SAI / KPI		SAI / KPI	
Toe-out-on-turns		Toe-out-on-turns	
before alignment	after alignment	before alignment	after alignment
Camber		Camber	
Out of square		Out of square	
Axle Offset		Axle Offset	
before alignment	after alignment	before alignment	after alignment
Camber		Camber	
Out of square		Out of square	
Axle Offset		Axle Offset	

Mechanic:	Date:
Notes for Vehicle:	


HAWEKA AG
 Falkenbergstraße 4
 30918 Burgwedel
 Tel.: +49 5130 8996-0
 Fax: +49 5130 8996-222
 www.haweka.com
 info@haweka.com
 HAWEKA 0001

<https://www.haweka.com/dokumentenbibliothek/achsvermessung/axis500/protokolle>

4.2 Accessories

Upgrade kit for double steering axles

Part No. 922 000 002

2 pcs. Additional turning plates

2 pcs. Laser heads with magnetic feet and grab arms for trucks



Upgrade kit for special truck wheels (Trilex / Dayton)

6 pcs. Adapters for rim run-out compensation

Part No. 922 000 004



Upgrade Kit for trailer and semitrailer alignment

Scale unit with king pin and king pin adaptor incl. 6 special magnets (265 mm)

Part No. 922 000 021



Upgrade Kit for passenger car alignment

2 passenger car adaptors, 2 measuring heads, 8 telescoping cross arms

Part No. 922 000 016



5 Front Wheel Alignment

5.1 Preparations

- Carry out alignment on level ground.
- Remove protective caps of wheel nuts or caps respectively.



Attention

- Clean rim between wheel nuts.
- Check tire pressure and, if necessary, adjust as specified.

Drive vehicle onto turning plates

- Place turning plates centrally in front of the wheels.
- Fasten turning plates with bolt to avoid torsion.
- Drive vehicle on turning plates. The wheel centre shall be positioned in the turning plate centre.

Mounting of laser measuring heads

- The magnetic feet of the 3-arm-star have to be adjusted to the proper rim diameter. It is recommended to fix the laser measuring head onto a mounting stand of instrument cabinet (*Illustration 1*).
- Adjust magnetic cams by turning and shifting to achieve all-over attachment of rim flange diameter between wheel nuts.
- Put the measuring heads with the magnets onto the rim flange. Two magnets shall be placed above the wheel centre and one below. (*Illustration 2*).

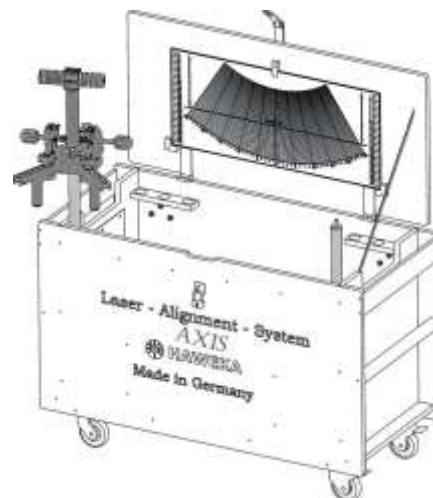
Fitting of magnetic scales

- Put the front wheels in the straight ahead position by turning the steering wheel.
- Fix the first scale on the right-hand side of the frame, if possible in the middle (regarding lengthwise direction).
- Switch on laser on the right-hand side.
(left hand drive vehicles, vice versa for RTA)



Pay attention to laser beam output opening before switch on!

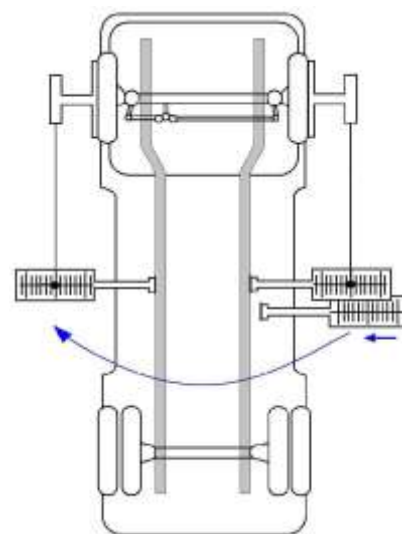
- Turn right-hand laser until the laser point gets visible on the magnetic scale.
- Adjust scale with wing nut until the laser point indicates »0«.
- Repeat the same procedure with the second scale on the right-hand side. Now the magnetic scales have the same length and must not be changed again!
- Attach one of the two scales on the left-hand side, if possible in the same place (*Illustration 3*).



(Illustration 1)



(Illustration 2)



(Illustration 3)

• Front Wheel Alignment

Fitting of magnetic scales (continued)

- Switch on left-hand laser.



Pay attention to laser beam output opening before switch on!

- Turn left-hand laser until the laser point gets visible on the scale.

5.2 Alignment of „Straight ahead position“

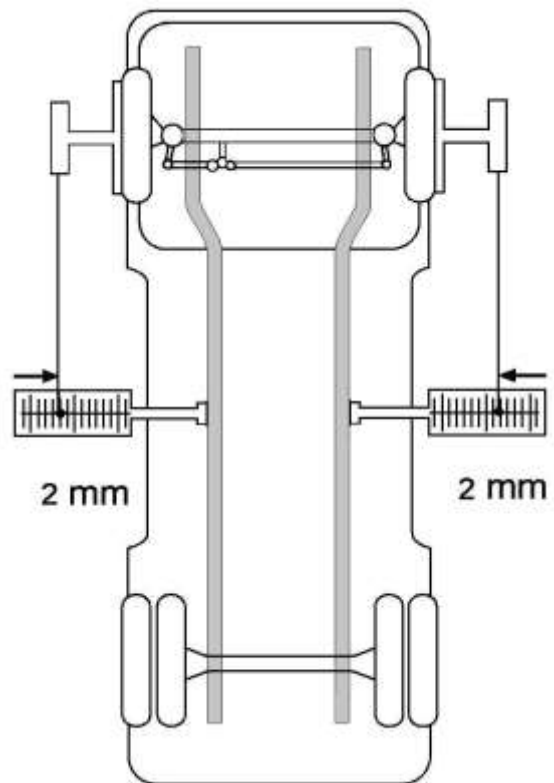
- Should the laser point on the left-hand scale not point at zero, turn steering wheel until the value indicated on the scale is halved. Laser points on the same value on both scales.

Example:

Indication right: 0

Indication left: 4 scale lines out

Turn steering wheel until both laser points point at 2 scale lines outward (*Illustration 4*)



(Illustration 4)

Now the front wheels are in alignment with the frame, seen in driving direction.

- Adjust magnetic scales with the wing nuts until both laser points point at zero.

This procedure is important for all following measurements.

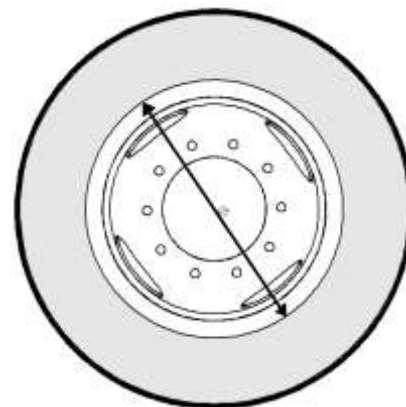
Front Wheel Alignment

5.3 Set-up of Toe Scales

- Align both laser housings by using the bubble gauge so that the outlet of the laser points vertically at the floor.
- In order to define the measuring rectangle the calculated distance between the toe scales has to be drawn twice on the floor.

Important: The following formula is applied in order to be able to read the value on the toe scale in mm (illustration 5)

$$\frac{\text{Rim diameter} \cdot 10}{2} = \text{Distance of scale in front of front axle or behind front axle}$$



(Illustration 5)

- Starting from the laser points, each calculated length is measured from the front and the rear of the laser point by a measuring tape. Mark the spots on the floor by a line drawn by chalk (or use adhesive tape).

Example:

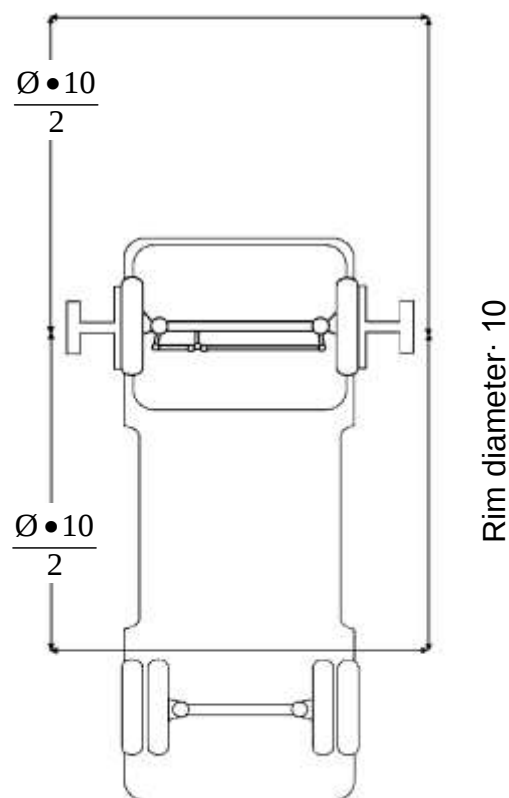
$$\frac{(\text{Rim diameter } 60 \text{ cm}) \cdot 10}{2} = \frac{600}{2} = 300 \text{ cm} = 3 \text{ m}$$

In the Example, draw lines with chalk on the bottom on the right and left-hand side 3 m in front of and behind the laser point.

The total distance between the laser points and the markings behind the front axle and in front of the front axle always has to result in the rim diameter multiplied by 10. (illustration 6).

I.e. 1 long scale line on the toe scale corresponds to 1 mm.

If this is not possible due to an obstacle in its place, a distance of 2 m to the front and 4 m to the rear can be measured from the laser points. However, the total distance must always be 6 m!



(Illustration 6)

Front Wheel Alignment

Set-up of Toe Scales (continued)

- The toe scales are shifted on the chalk marking in front of the front axle until both scales indicate zero.



Turn the laser housing so that the laser beam can travel above the floor.

- Fix the length of the toe scale by using the wing screw and repeat procedure with the second toe scale – both scales are now of identical length (*illustration 7*).
- Now take one scale onto the marking behind the front axle. – without changing the length.
- Turn the left-hand laser to the rear and shift the total scale to zero.

Value rear left = 0

Value front left = 0

Value front right = 0

5.4 Toe Measurement and Alignment

Reading of Total Toe:

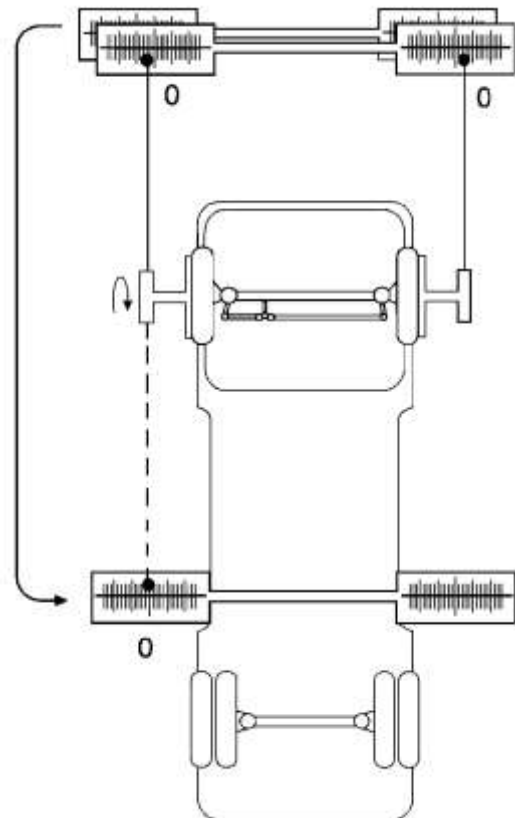
- Direct the right-hand laser to the rear onto the toe scale.
- Read the measuring result:

1 long scale line	$\triangleq$ 1,00 mm
1 half scale line	$\triangleq$ 0.50 mm
1 quarter scale line	$\triangleq$ 0.25 mm

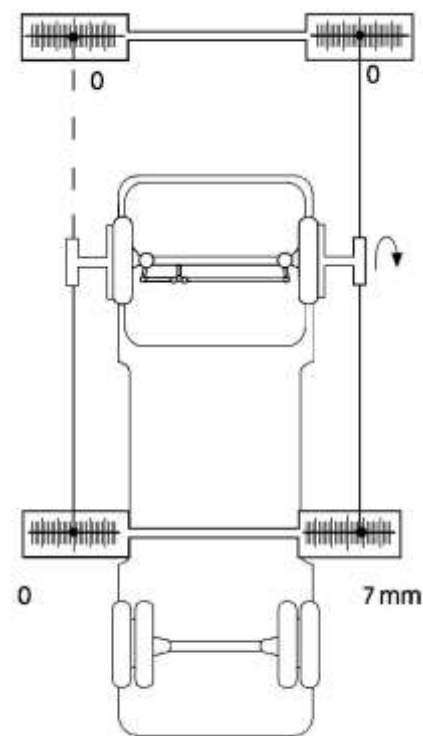
The laser point points at zero = The toe is zero
 The laser point points inward from zero = toe-out
 The laser point points outward from zero = toe-in
- Proceed as follows, if the toe corresponds to the specified values:
 - Note measured value in the test record.
 - Check „straight ahead position“ and steering wheel center position
 - look point 5.2 (Alignment of „Straight ahead position“)
- If the toe does not correspond to the specified values, toe alignment.

Example:

The laser point on the right-hand side behind the front axle points at the 7th long outward scale line, i.e. the front axle has a toe-in of 7 mm. (*Illustration 8*)



(Illustration 7)



(Illustration 8)

Front Wheel Alignment

Toe Alignment:

Example: The desired toe value is zero.

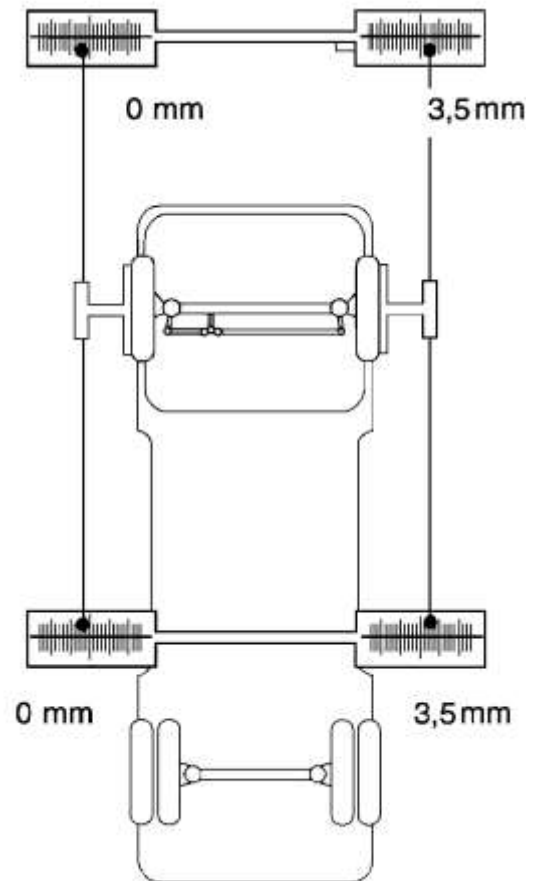
- Loosen the toe rod searing nuts.
- Turn the toe rod until the laser point on the right-hand side behind the front axle indicates the halve of the difference (in this example: 3.5 long scale lines outward).

Now the total toe is zero.

Important:

The position of the laser point on the front left-hand side toe scale must not be changed - adjust, if necessary! (Left front wheel at zero)

- To check this, direct the right-hand laser to the front toe scale. The value measured in front must be identical with the one measured at the rear (3.5 scale lines outward).
- This results in a toe value of zero (*Illustration 9*).
- Lock the toe rod searing nuts.
- Then check the adjusted value !

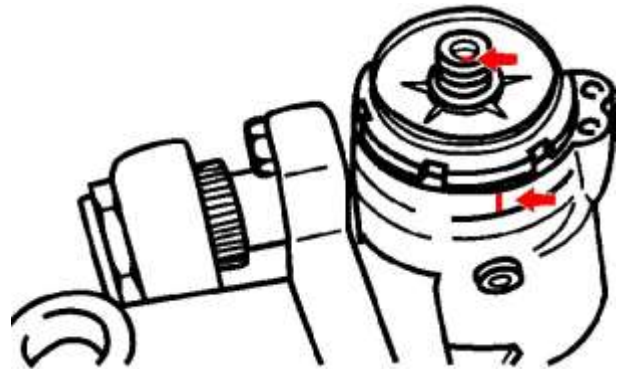


(Illustration 9)

Front Wheel Alignment

5.5 Check of Steering Wheel Center Position

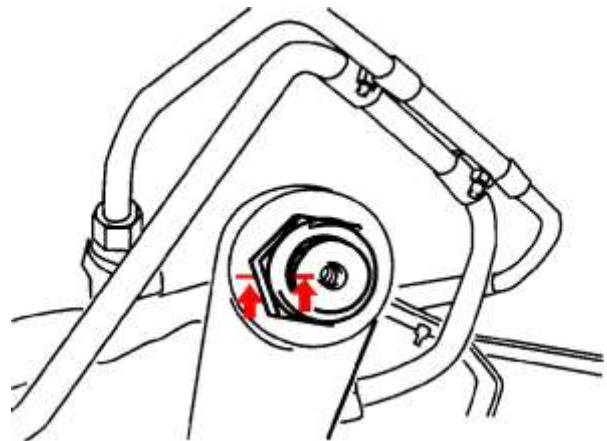
- Check the steering wheel center position at the steering box.
- If the mark at the steering box is off-center, the drag link has to be adjusted until both marks are in alignment. (box neutral position).



(Illustration 10)

Important:

The position of the two laser points on the magnetic scales must change. Adjust, if necessary.



(Illustration 11)

Front Wheel Alignment

5.6 Camber measurement

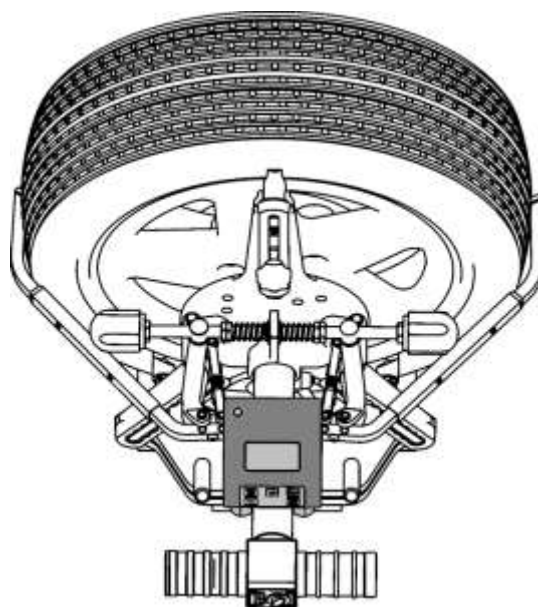


If the camber has to be adjusted at the vehicle, this step must be carried out **BEFORE** the toe adjustment as the toe changes when the camber is adjusted.

- Turn the steering wheel until the front wheels are in „straight ahead position“ (the magnetic scales on the left and right sides are showing the same value).
- Put the electronic inclinometer onto the measuring head shaft and lock with the knurled screws.
- Switch on the inclinometer using the **ON / OFF** button (*Illustration 13*).
- After the welcome screen, the current camber value immediately appears in the display. Read off the camber value from the display and enter it in the measurement sheet. (*Illustration 14*).

Positive camber value = arrow points upward

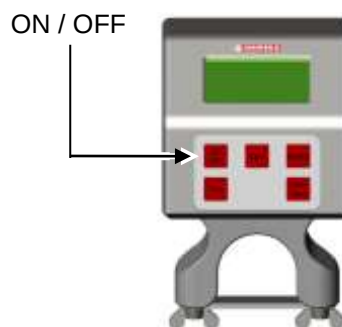
Negative camber value = arrow points downward



(Illustration 12)

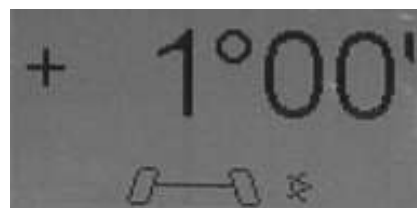


For "freezing" the actual angle values, press the "HOLD"-button. Now it is possible to remove the inclinometer from the measuring column without changing the results. For new measurements, press the "HOLD"-button again.



(Illustration 13)

Repeat the same procedure (after acquiring all measurements) on the other side of the vehicle.



(Illustration 14)

Front Wheel Alignment

5.7 Caster and Inclination

- After the camber measurement the inclinometer stays on the measuring column of the wheel alignment clamp.
- The unit is still switched on and displays the last determined camber value.
- Turn the steering wheel until the front wheels are in „straight ahead position“. Both lasers have to point at the same value on the magnetic scales attached to the frame.



Note

To measure the caster and the steering angle inclination it is necessary to block the vehicle's wheels, so that the result is not distorted by rolling when the wheels are steered.

- Change the menu with the modus button into Caster / KPI.. (*Illustration 15*)
- The LED in the upper part of the housing starts to blink. When it stops, a prompt appears in the display instructing you to turn the steering wheel through 20 degrees. (*Illustration 15*)
- The wheel is turned with a uniform movement until the LED flashes again and thus confirms the steering has been turned through 20 degrees.
- Shortly after that the LED shuts off and the wheel is turned in the other direction until the LED flashes again.
- The wheel is held in this position until the LED is constantly lit and thus finishes the procedure. (*Illustration 16*)

LED indicator light:

LED – off	For measurement: Start / End
flashes	For position: reached / change
constant	For measurement: Start / End

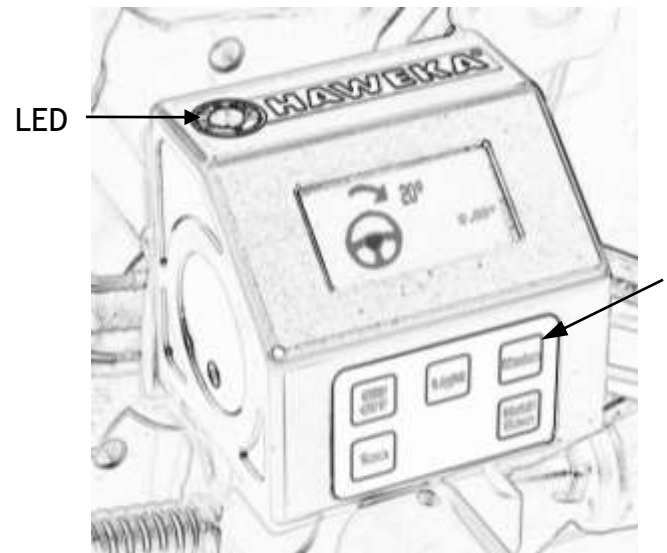
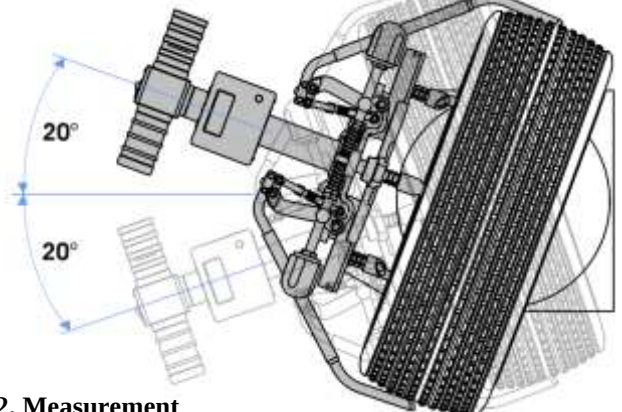


Illustration 15

1. Measurement



(Illustration 16)

Front Wheel Alignment

Caster and Inclination (continued)

After all measured values have been successfully recorded the screen display automatically changes and the absolute values for the caster and steering axis inclination are displayed in degrees and minutes. (Illustration 17)

- After the inclinometer has read the new different angel, the display changes to Caster (upper line) and KPI (lower line).
- Enter the ascertained values in the measurement sheet.



(Illustration 17)

Repeat the same procedure (after acquiring all measurements) on the other side of the vehicle.

5.8 Max. Steering Angle

- If the caster and the inclination are determined, change the area steering angle by pressing the "Mode"-button.
- Now, the display shows the steering angle.
- The steering wheel is turned to the max. steering lock and the angle value for the max. steering angle can be read. (Illustration 18)

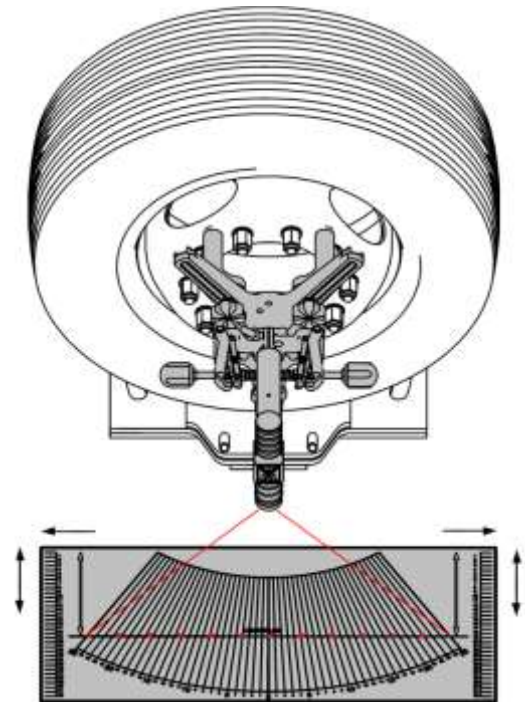


(Illustration 18)

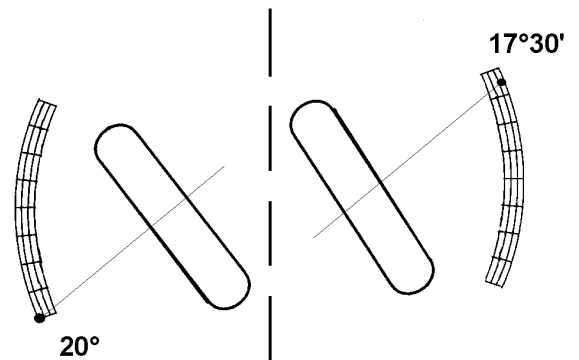
Front Wheel Alignment

5.9 Relative Steering Angle (toe out on turns)

- Turn the steering wheel until the front wheels are in „straight travelling position“. Both lasers have to point at the same value on the magnetic scale attached to the frame.
- Turn the measuring head until the spirit level indicates a vertical line.
- Place the floor scales for setting of the 20° wheel angle on the ground beside the front wheel so that the laser point points at the zero mark on the scale. The zero mark is the intersecting point of the 0° line and the „center line“ adjusting line.
- Turn the laser to the front and rear in the range of the floor scale.
- Adjust the scale until the laser point travels along the center line parallel to the wheel. Observe the spirit level. The laser point has to point at the zero line (center line) (illustration 19).
- Repeat the procedure with the other wheel.
- Turn the left wheel to the left with the steering wheel until the laser point points at 20°. While doing so watch the laser spirit level: When the laser point points at 20° the spirit level has to indicate the vertical line.
- Also turn the laser on the right-hand wheel until the spirit level indicates the vertical line of the laser beam.
- Read the relative steering angle of the right hand wheel and write down in test record.
- Repeat the measuring procedure with the left wheel.



(Illustration 19)



(Illustration 20)

Example:

The laser points at 20° at the left wheel (wheel at the inner circle). The laser points at 17°30' at the right wheel (wheel at the outer circle). The relative steering angle at the right-hand side amounts to 2°30'. Illustration 23

Front Wheel Alignment

5.10 Rim Run-Out Check

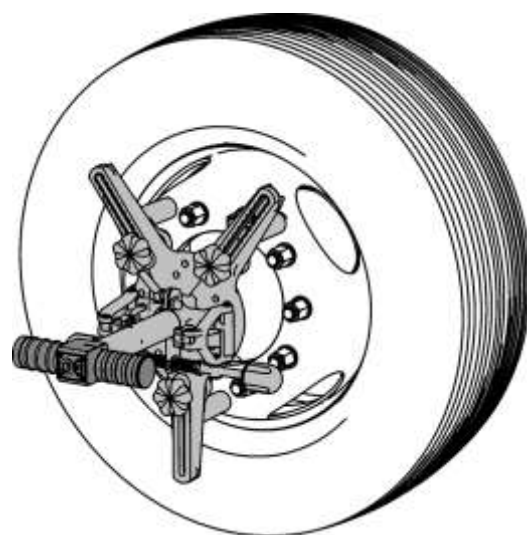
You suspected the rim has been damaged by an accident, corrosion or any other external influence, a rim run-out check should be carried out when starting the measuring procedure.

In each position on the rim the laser beam of the measuring head must indicate the same value on the toe scales or the magnetic scales respectively.

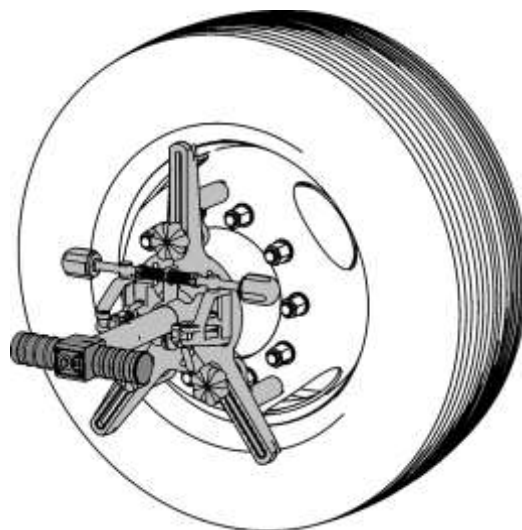
To check this, the measuring head is at first attached to the rim in the normal position (*Illustration 21*) and afterwards turned by 180° (*Illustration 22*).

During this check in the inverted position the laser beam must point at the same scale value.

A set of adjusting adapters is available as optional equipment for alignment of vehicles with damaged rims as well as for Trilex and Dayton rims.



(Illustration 21)



(Illustration 22)

6 Rear Wheel Alignment

The front wheels are aligned.

Retro-fit the measuring head on the measuring stand (on the instrument cabinet) with the long magnetic feet (315 mm).

Remark: The rims and the magnets have to be clean of excess paint, mud and corrosion.

6.1 Camber Measurement of the Rear Wheels

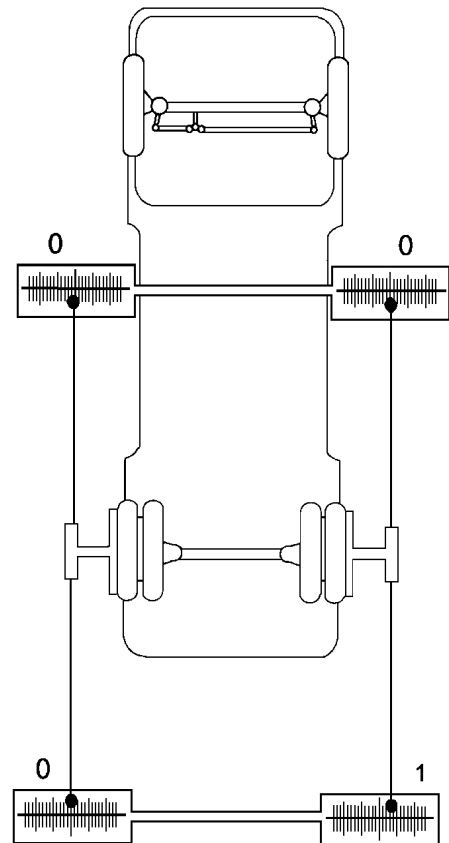
For mounting and operation of the electronic inclinometer, see point 5.6 on page 24.

6.2 Total Toe / Rear Axle

Set up the toe-scales exactly as described in section 5.3 on page 21 . both scales are set to 0 (zero) in front of rear axle.



Pay attention to laser beam output opening before switch on of laser measuring heads!



(Illustration 23)

Example, illustration 23,

Right laser beam behind right rear axle points at the first long scale line outward; indicating that the rear axle has a toe-in of 1 mm

Rear Wheel Alignment

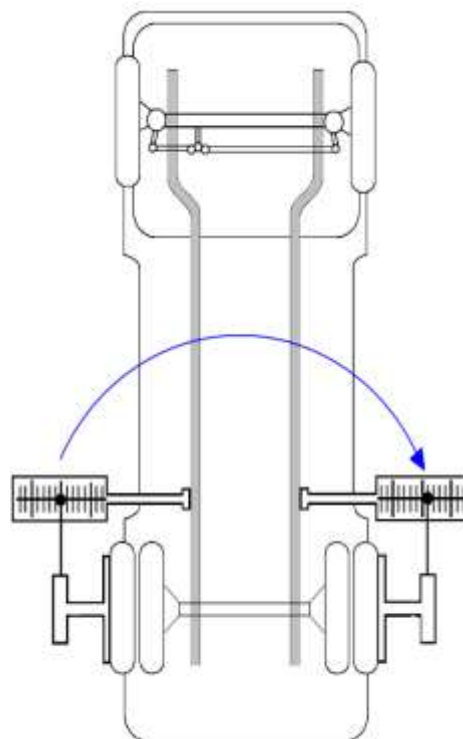
6.3 Measurement of Axle Mismatch in relation to the Frame:

- After toe measurement leave the measuring heads installed on the wheels
- Fix a single magnetic scale on the left (driving) side of the vehicle frame above the wheel.
- Direct the left laser point toward the scale and set the scale to zero.

Move the magnetic scale to the other side of the vehicle at exactly the same position and direct the laser point towards the scale. The value indicated is the "axle mismatch". The actual mismatch is this value halved.

Remark:

Remember the actual value for this axle mismatch to complete the axle inclination measurement (point 6.4)!



(Illustration 24)

- Repeat this measuring procedure with all other rear axles.

Example, illustration 24,

First, on left side of vehicle set magnetic scale to 0. Then, move magnetic scale to right side of vehicle where magnetic scale value shows the axle mismatch. This value must be halved to obtain the true deviation. Therefore, for this example half the measurement from the first long line on the scale that represents 1 centimeter is the axle mismatch in relation to the frame.

Rear Wheel Alignment

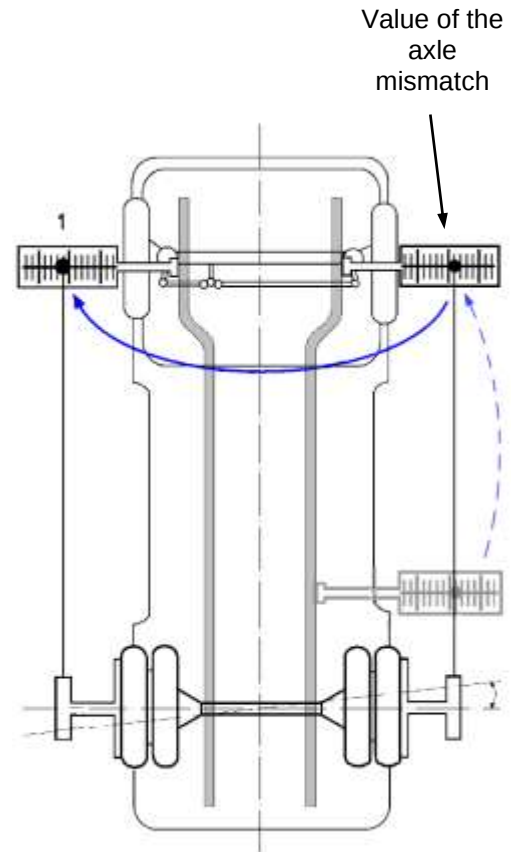
6.4 Axle Mismatch in relation to Vehicle's Longitudinal Axis

- Attach the magnetic scale to the frame in the upper range of the front axle.
- Direct the laser point to the scale and adjust the scale to the halved value indicated for the axle mismatch. Fix the scale with the wing nut.



Pay attention to laser beam output opening before switch on of laser measuring heads!

- Remove the magnetic scale and attach to the frame on the opposite side.
- Direct the laser point towards the scale. This new value indicated is halved to obtain the axle inclination value.
- Repeat this measuring procedure with all other rear axles.



(Illustration 25)

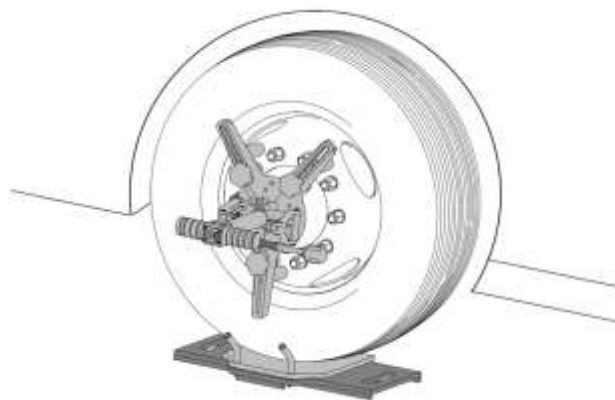
Example, illustration 25,

After completing the axle offset measurement move the magnetic scale to a position as close to the front axle as possible. Adjust the magnetic scale to the calculated value of the axle mismatch of 5mm. Next, move the magnetic scale to the left side as shown on *illustration 25* and take the reading with the laser beam. *This reading must be halved. For example purposes, if we have an axle inclination reading of 3mm that halved value is 1.5mm or the true axle inclination* To obtain the correct value in minutes refer to page 46. If the wheel base D is 6 meters and the calculated axle inclination is 1.5mm then the value in minutes is the intersection of the diagonal line for 6 meters and 1.5mm.

7 Alignment of Twin Steering Front Axles

7.1 Preparations

The mounting of laser measuring heads, fitting of magnetic scales and set-up of toe scales can be proceeded as described under point 5.1. See pages 17-20



(Illustration 26)

7.2 Reading of total toe

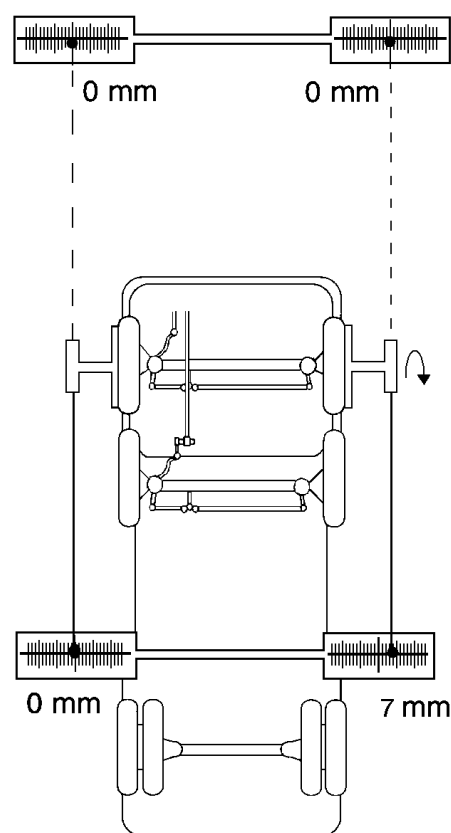
- Direct the right-hand laser to the toe scale behind the front axle.
- Read the measuring result:

1 long scale line	$\triangleq$ 1,00 mm
1 half scale line	$\triangleq$ 0.50 mm
1 quarter scale line	$\triangleq$ 0.25 mm

The laser point points at zero = The toe is zero.
 The laser point points inward from zero = toe-out.
 The laser point points outward from zero = toe-in.
- If the toe corresponds to the specified values:
 - Note measured value in the test record
 - Check „straight ahead position“ and steering wheel centre position
 - Continue with point 5.2 (alignment of „straight ahead position“).
- If the toe does not correspond to the specified values, toe has to be aligned.

Example:

The laser point on the right-hand side behind the front axle points at the 7 long outward scale line, i.e. the front axle has a toe-in of 7mm.



(Illustration 27)

Alignment of Twin Steering Front Axles

Toe alignment

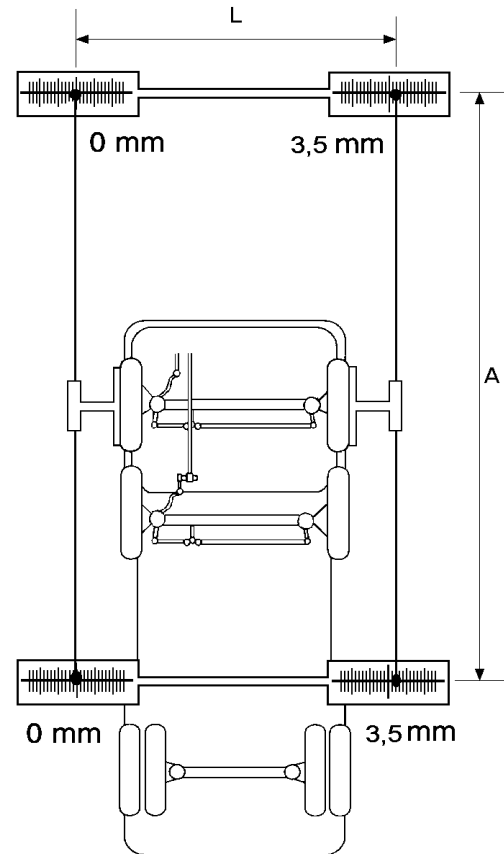
Example: The desired toe value is zero.

- Undo the toe rod searing nuts.
- Turn the toe rod until the laser points on the right-hand side behind the front axle points at 3.5 long scale lines outward. Now the total toe is zero.

Important:

The position of the left-hand laser point on the front toe scale must not be changed- adjust, if necessary! (Left front wheel at zero)

- To check this, direct the right-hand laser to the front toe scale. The front value has to be identical with the one at the rear (3.5 scale lines outward). The resulting toe value is zero.
- Lock the toe rod searing nuts.



(Illustration 28)

Alignment of Two Steered Front Axles

7.3 Toe Alignment of the Second Axle

- Mount the measuring heads onto second axle.
- Direct the left laser beam to the toe scale in front and set the entire scale at zero without changing the adjusted scale length (L). (*Illustration 31*)
- Turn the laser to the rear and also set this entire scale to zero. The toe scale length (L) has not changed (*Illustration 28*).
- The distance (A) of the toe scales has not changed (*Illustration 28*).
- Turn the laser on the right-hand side to the front.
- Read the value.

Example:

1 long scale line inward. Direct the laser beam to the rear. Read the value. 1 long scale line outward. Difference: 2mm toe in = total toe

- Undo the toe rod searing nuts and turn. The desired value to be set is zero.
- Turn the toe rod until identical values are indicated front and rear.

Important:

On the left hand side the laser point must remain permanently at zero.

- Tighten the toe rod.

Now both front axles have a toe value of zero.

Alignment of Two Steered Front Axles

Parallel adjustment of both front axles

- Mount the magnetic heads fixed to the second axle onto the first axle.
- Turn the wheels into straight ahead position with the steering wheel.
- Set the magnetic scales on the right and left-hand side at the same value.
- Adjust the front toe scale again. Zero values must be indicated on front scale. (*Illustration 29*).
- Set both magnetic scales at zero.
- Detach both measuring heads and attach to second axle.
- Read value from front toe scale.

Example:

6 long scale lines at the left inward from zero.
6 long scale lines at the right outward from zero.
Mismatch of second axle to first axle
(*Illustration 30*).

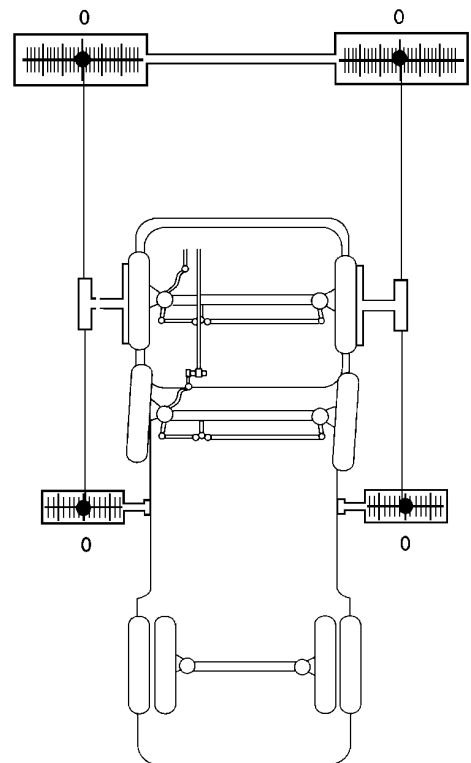
- Loosen connecting rod (drag link) between first and second axle and turn until the same value is indicated on the left and right-hand toe scales.

Important:

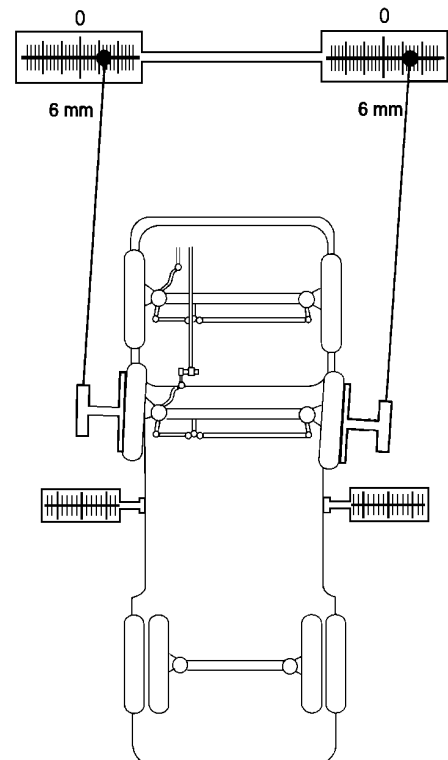
Make sure that the „straight ahead position“ value of the first axle is not changed when adjusting the second connecting rod.

Check:

Take one laser measuring head from the right-hand side of the second axle and fix it at the left-hand side of the first axle. The value on the first axle must also be zero.



(*Illustration 29*)



(*Illustration 30*)

8 Trucks with independent suspensions

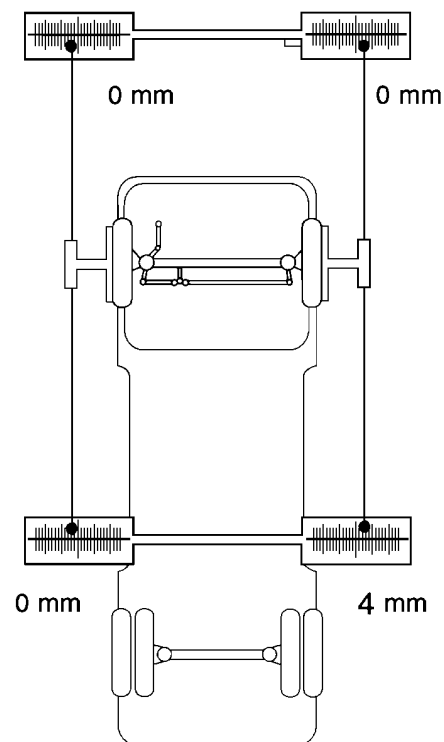
8.1 Measurement of Individual Toe -Trucks with Two Adjustable Toe Rods

The mounting of laser measuring heads, fitting of magnetic scales and set-up of toe scales can be proceeded as described under point 5.1. See pages 17-20



Pay attention to laser beam output opening before switch on of laser measuring heads!

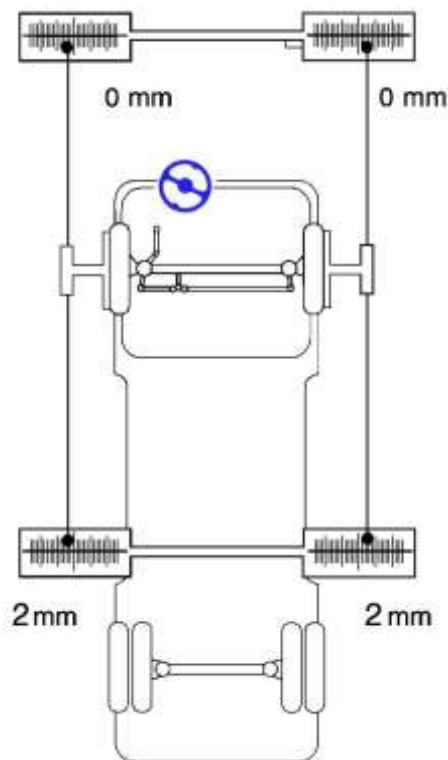
In the present example the total toe of the vehicle amounts to a toe-in of 4 mm (illustration 31). The value is read from the rear right-hand toe scale seen in driving direction.



(Illustration 31)

Now the rear toe scale is shifted until the laser point on the left and right-hand side indicates two long scale lines (illustration 32).

Thereafter the steering is set at „straight travelling“.



(Illustration 32)

Trucks with Independent Suspensions

E.g. the following values are indicated:

(Illustration 33).

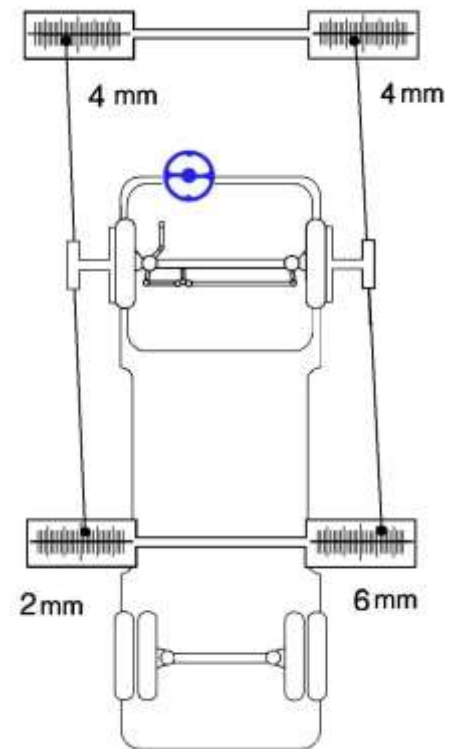
At the rear left-hand side 2 scale lines inward from zero, at the front left-hand side 4 scale lines outward from zero. This means that the left wheel has a toe-out of 6 mm.

At the rear right-hand side 6 scale lines outward from zero, at the front right-hand side 4 scale lines inward from zero. This means that the right wheel has a toe-in of 10 mm.

Now lock the steering wheel.

Note:

Make sure that the “straight ahead position” of the steering wheel is not changed when adjusting the rod.

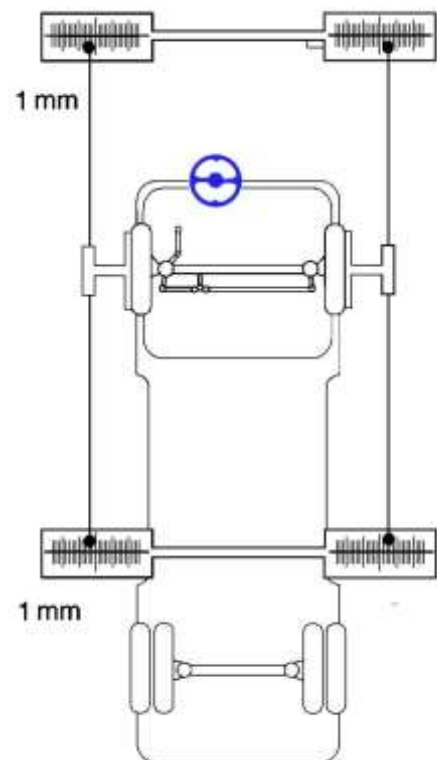


(Illustration 33)

In order to set the left wheel at a toe of zero the toe rod is turned until the laser points both on the front and rear left-hand side indicate identical values. For the present example, this means one scale line outward from zero on the front left-hand scale and one scale line outward from zero on the rear left-hand scale (illustration 34). In order to set the right wheel at a toe of zero, the right toe rod has to be turned until the laser points both on the front and rear right-hand side also indicate identical values.

Note:

After finishing procedure, the „straight ahead position“ must **automatically** be recreated.



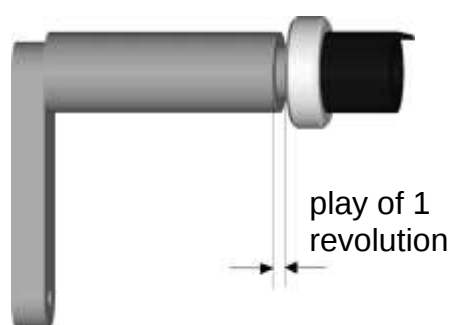
(Illustration 34)

9 Adjustment by Run-out compensation

Preparations

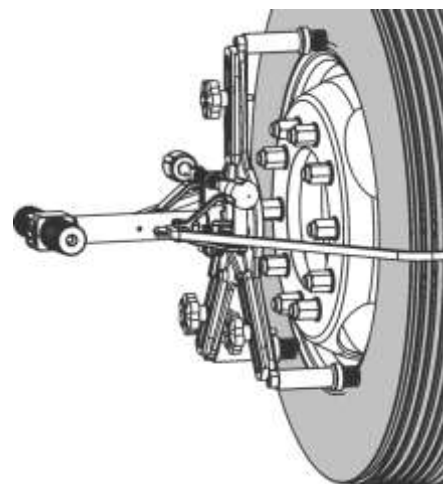
In order to change the magnetic feet for the runout compensation adaptors it is recommended to put the measuring head onto the mounting stand. Loosen the fastening screws and change the 3 magnetic feet for the 3 compensation adaptors. Tighten the adapters only insofar as you can still move them in the longitudinal slots of the 3-arm-star. Leave a play (min. 1 revolution) while fastening knurled screw of adapter.

optional accessory



(Illustration 35)

Now the grab arms are attached to the grab arm assembly. The measuring head is centrally mounted onto the rim by shifting the adaptors until they correspond to the rim flange diameter. Illustration 36 shows how the adaptor feet have to be attached to the rim flange: the feet are directed towards the wheel hub.

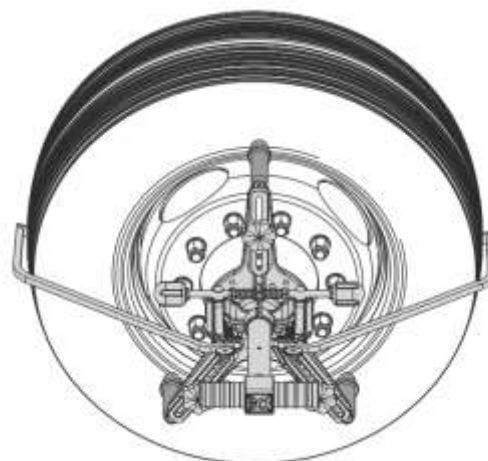


(Illustration 36)

Mounting of complete assembled measuring head to the rim

With its arms expanded, the measuring head is first attached to the lower rim flange part. The single upward arm is not attached yet, but only moved towards the rim after the lower adaptors are attached. During this process the adaptor is shifted so that it presses against the rim flange. The last locking device is then tightened.

Important: The measuring head is still not fixed to the rim. The grab arms are now pressed into the first or second exterior profile and the quick-clamping device is tightened until the three adaptors are evenly attached to the rim. Now the vehicle can be lifted until wheel is enabled to be turned.



(Illustration 37)

Adjustment by Run-out compensation

Runout adjustment of the laser head:

A toe scale is put in front of the vehicle at a distance of three meters. Switch the laser on.



Pay attention to laser beam output opening before switch on!!

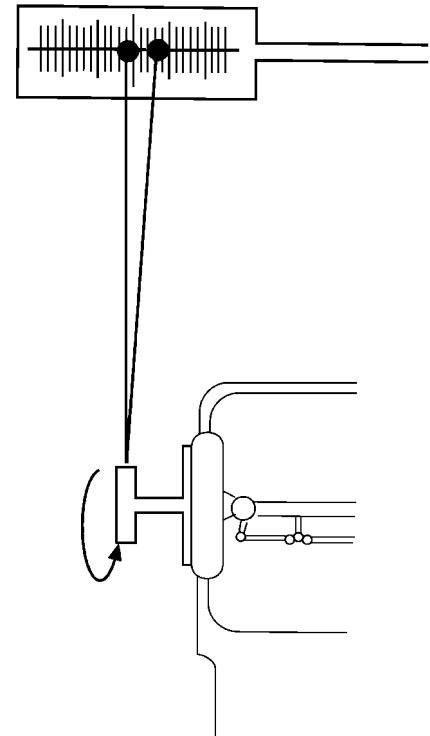
The laser point is directed towards the scale and the latter is set at zero. The rim is turned by 360° while the laser beam points at the scale. Example: while turning, the point on the scale travels to the right side of „0“, the fourth scale line being the maximum value, and to the left side of „0“, the second scale line being the other maximum value, resulting in the point's travelling over a path of six scale units

A maximum value is set by turning the wheel again. Memorize from which direction - left or right - the point approaches the set maximum. This value is fixed again by shifting the toe scale to „0“. Afterwards a new value, i.e. half the distance the point moved during the revolution, is set on the scale by adjusting the measuring adaptor. This is done with each adapter by turning the knurled rings. They have to be turned to the opposite direction from which the point approached its maximum. The three adjusting feet are adjusted up to three lines. Turn again and check whether the point still moves on the scale. If this is the case, the adjustment has to be repeated until the point no longer moves on the scale when turning the wheel.

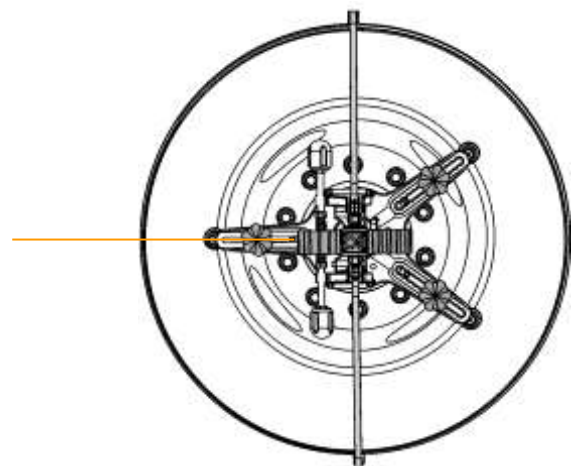
The position is always correctly adjusted, if one adaptor is located in the same direction on the laser beam. (Illustration 39)

Final Check:

The laser point must not move laterally on the toe scale when turning the wheel.



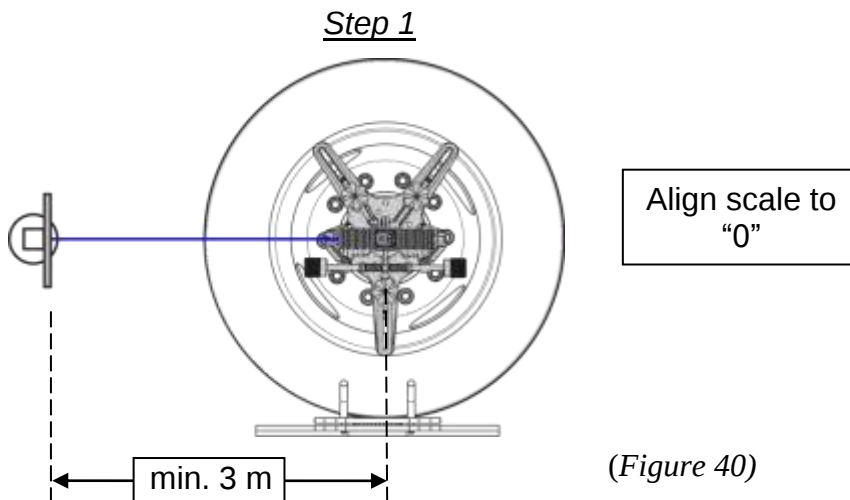
(Illustration 38)



(Illustration 39)

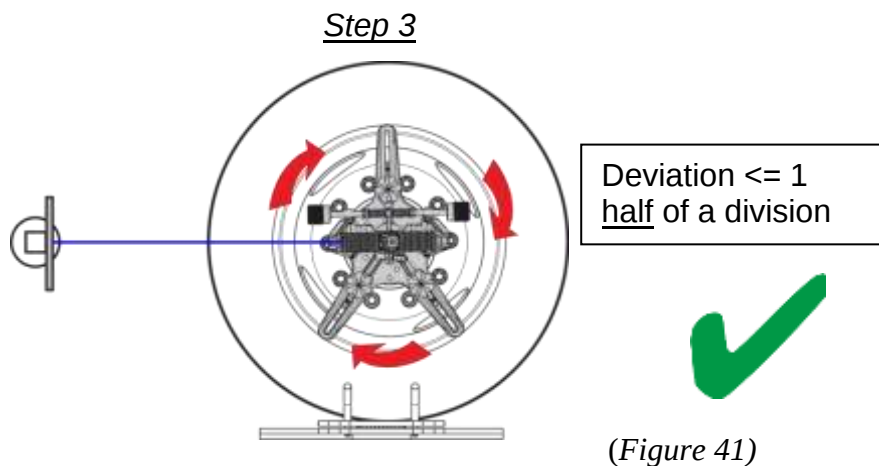
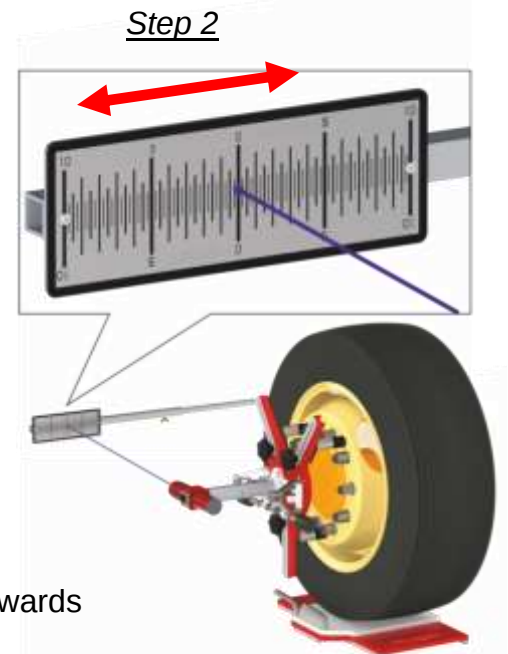
10 Checking the Wheel Alignment Clamp

The wheel alignment clamp is installed on the rim and a scale (e.g. the magnetic scale or the floor gauge) is positioned so that the laser points onto the scale at a distance of a minimum of 3 metres.



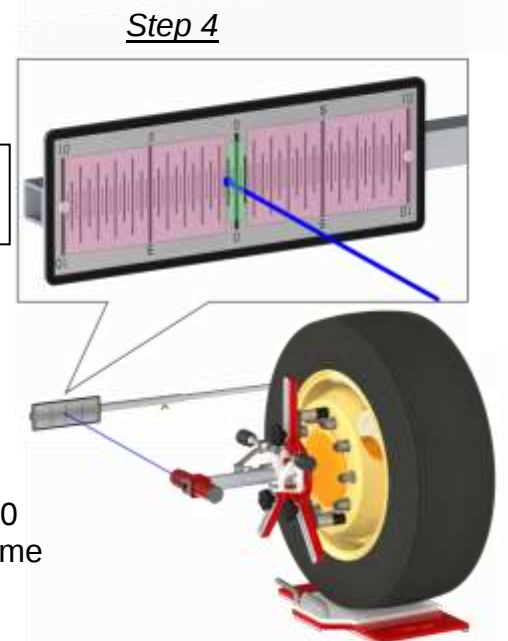
(Figure 40)

The laser is switched on and the scale is now displaced sideways until the laser beam points to the value "0".



(Figure 41)

Subsequently, remove the wheel alignment clamp and, at 180 degrees, again install on the rim and align the laser to the same scale. Now read the value on the scale.



If there is a deviation of more than 0.5 mm (here, 1 half of a division at a distance of 3 m) present between the measurements, the wheel alignment clamp must be readjusted.

For this, please contact your sales partner for the wheel alignment clamp.

Repeat the process for all wheel alignment clamps on your system.

11 Maintenance

11.1 Maintenance

Please consider that the laser measuring heads and the accessories are precision instruments. Make sure that these instruments are used and maintained with utmost care.



Attention

The surfaces of the magnetic feet have to be kept clean of dirt, as only that way an all-over and firm attachment to the rim can be ensured.

The lense of the laser head can be cleaned with a dry and soft cloth, if necessary. Do never clean with alcohol or any other liquids.



The life of the batteries for the inclinometer is approx. 60 h in normal operation (without lighting)
If the capacity of the installed batteries is no longer sufficient a battery symbol is displayed and the batteries must be replaced.



Note

The unit continues to work correctly even if the battery power is weak. It does not display any incorrect angle values in relation to the measurement taken.

11.2 Replacing the batteries in the laser housing

To open the battery compartment in the laser housing, (*Illustration 42*) unscrew the black cap. (*Illustration 43*)



(*Illustration 42*)

Battery type: Mignon Type AA 1.5V



(*Illustration 43*)

11.3 Replacing the batteries in the inclinometer

If the battery symbol appears in the display the batteries in the unit must be replaced.

(Illustration 44)



(Illustration 44)

Four standard Mignon Type AA batteries 1.5 volt are required to replace the batteries.

Open the cover of the battery compartment at the rear of the unit and replace the batteries.

(Illustration 45)



(Illustration 45)



Used batteries are to be disposed of in special collection containers for recycling.



12 Error description



Attention

Operator must only correct such malfunctions that evidently result from faulty operation or maintenance.

12.1 Error description and causes

description	possible causes	error correction
When switching on the system, the laser point becomes weaker.	Insufficient charge of accumulator pack.	Switch off Laser Aligner! Charge accumulator packs with included charging unit.
Laser Aligner is not firmly attached to the rim.	• Dirt on rim surface. • Dirt on magnetic feet. • No all-over attachment of magnetic feet to rim.	Switch off Laser Aligner! • Clean rim surface. • Clean surface of magnetic foot. • Adjust magnetic foot again
Battery symbol is indicated on display of electronic inclinometer.	Insufficient charge of integrated battery.	Open casing lid with appropriate screw driver and replace battery.
Measured values cannot be repeated.	• Defective adjustment of laser measuring head • Faulty calibration	Check as on page 40 Adjustment of laser measuring head. Please call your HAWEKA distributor!

13 Annex

13.1 Conversion Table from Millimetres into Degrees

Toe in mm	Wheel Size						
	10"	12"	13"	14"	15"	16"	17,5"
0,5	0° 07'	0° 06'	0° 05'	0° 05'	0° 05'	0° 04'	0° 04'
1,0	0° 14'	0° 11'	0° 10'	0° 10'	0° 09'	0° 08'	0° 08'
1,5	0° 20'	0° 17'	0° 16'	0° 15'	0° 14'	0° 13'	0° 12'
2,0	0° 27'	0° 23'	0° 21'	0° 19'	0° 18'	0° 17'	0° 15'
2,5	0° 34'	0° 28'	0° 26'	0° 24'	0° 23'	0° 21'	0° 19'
3,0	0° 41'	0° 34'	0° 31'	0° 29'	0° 27'	0° 25'	0° 23'
3,5	0° 47'	0° 39'	0° 36'	0° 34'	0° 32'	0° 30'	0° 27'
4,0	0° 54'	0° 45'	0° 42'	0° 39'	0° 36'	0° 34'	0° 31'
4,5	1° 01'	0° 51'	0° 47'	0° 44'	0° 41'	0° 38'	0° 35'
5,0	1° 08'	0° 56'	0° 52'	0° 48'	0° 45'	0° 42'	0° 39'
5,5	1° 14'	1° 02'	0° 57'	0° 53'	0° 50'	0° 47'	0° 43'
6,0	1° 21'	1° 08'	1° 02'	0° 58'	0° 54'	0° 51'	0° 46'
6,5	1° 28'	1° 13'	1° 08'	1° 03'	0° 59'	0° 55'	0° 50'
7,0	1° 35'	1° 19'	1° 13'	1° 08'	1° 03'	0° 59'	0° 54'
7,5	1° 42'	1° 25'	1° 18'	1° 13'	1° 08'	1° 03'	0° 58'
8,0	1° 48'	1° 30'	1° 23'	1° 17'	1° 12'	1° 08'	1° 02'
8,5	1° 55'	1° 36'	1° 29'	1° 22'	1° 17'	1° 12'	1° 06'
9,0	2° 02'	1° 42'	1° 34'	1° 27'	1° 21'	1° 16'	1° 10'
9,5	2° 09'	1° 47'	1° 39'	1° 32'	1° 26'	1° 20'	1° 13'
10,0	2° 15'	1° 53'	1° 44'	1° 37'	1° 30'	1° 25'	1° 17'
10,5	2° 22'	1° 58'	1° 49'	1° 42'	1° 35'	1° 29'	1° 21'
11,0	2° 29'	2° 04'	1° 55'	1° 46'	1° 39'	1° 33'	1° 25'
11,5	2° 36'	2° 10'	1° 60'	1° 51'	1° 44'	1° 37'	1° 29'
12,0	2° 43'	2° 15'	2° 05'	1° 56'	1° 48'	1° 42'	1° 33'

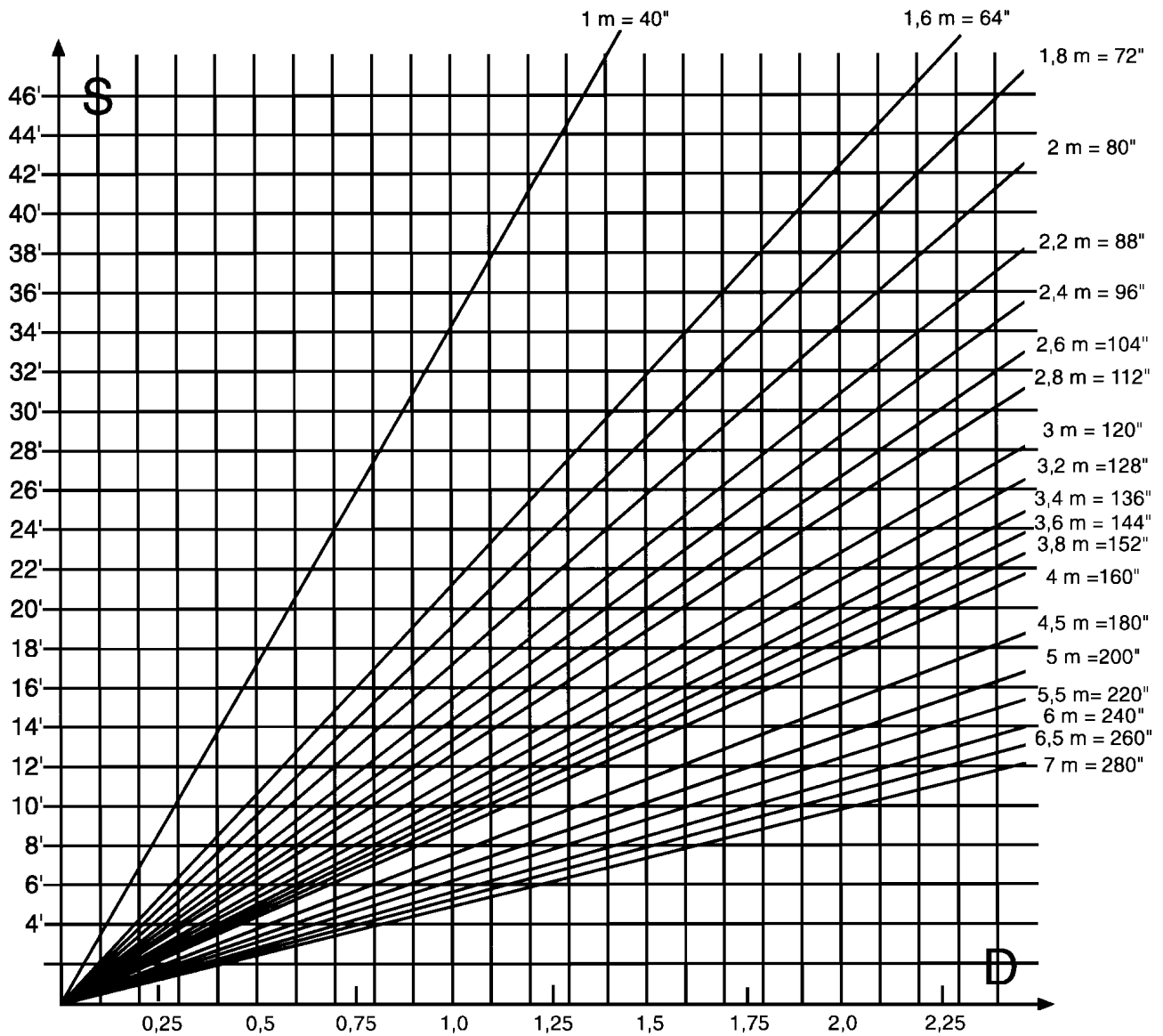
Annex

Conversion Table from Millimetres into Degrees

Toe in mm	Wheel Size					
	19,5"	20"	22"	22,5"	24"	24,5"
0,5	0° 03'	0° 03'	0° 03'	0° 03'	0° 03'	0° 03'
1,0	0° 07'	0° 07'	0° 06'	0° 06'	0° 06'	0° 06'
1,5	0° 10'	0° 10'	0° 09'	0° 09'	0° 08'	0° 08'
2,0	0° 14'	0° 14'	0° 12'	0° 12'	0° 11'	0° 11'
2,5	0° 17'	0° 17'	0° 15'	0° 15'	0° 14'	0° 14'
3,0	0° 21'	0° 20'	0° 18'	0° 18'	0° 17'	0° 17'
3,5	0° 24'	0° 24'	0° 22'	0° 21'	0° 20'	0° 19'
4,0	0° 28'	0° 27'	0° 25'	0° 24'	0° 23'	0° 22'
4,5	0° 31'	0° 30'	0° 28'	0° 27'	0° 25'	0° 25'
5,0	0° 35'	0° 34'	0° 31'	0° 30'	0° 28'	0° 28'
5,5	0° 38'	0° 37'	0° 34'	0° 33'	0° 31'	0° 30'
6,0	0° 42'	0° 41'	0° 37'	0° 36'	0° 34'	0° 33'
6,5	0° 45'	0° 44'	0° 40'	0° 39'	0° 37'	0° 36'
7,0	0° 49'	0° 47'	0° 43'	0° 42'	0° 39'	0° 39'
7,5	0° 52'	0° 51'	0° 46'	0° 45'	0° 42'	0° 41'
8,0	0° 56'	0° 54'	0° 49'	0° 48'	0° 45'	0° 44'
8,5	0° 59'	0° 58'	0° 52'	0° 51'	0° 48'	0° 47'
9,0	1° 02'	1° 01'	0° 55'	0° 54'	0° 51'	0° 50'
9,5	1° 06'	1° 04'	0° 58'	0° 57'	0° 54'	0° 52'
10,0	1° 09'	1° 08'	1° 02'	1° 00'	0° 56'	0° 55'
10,5	1° 13'	1° 11'	1° 05'	1° 03'	0° 59'	0° 58'
11,0	1° 16'	1° 14'	1° 08'	1° 06'	1° 02'	1° 01'
11,5	1° 20'	1° 18'	1° 11'	1° 09'	1° 05'	1° 04'
12,0	1° 23'	1° 21'	1° 14'	1° 12'	1° 08'	1° 06'

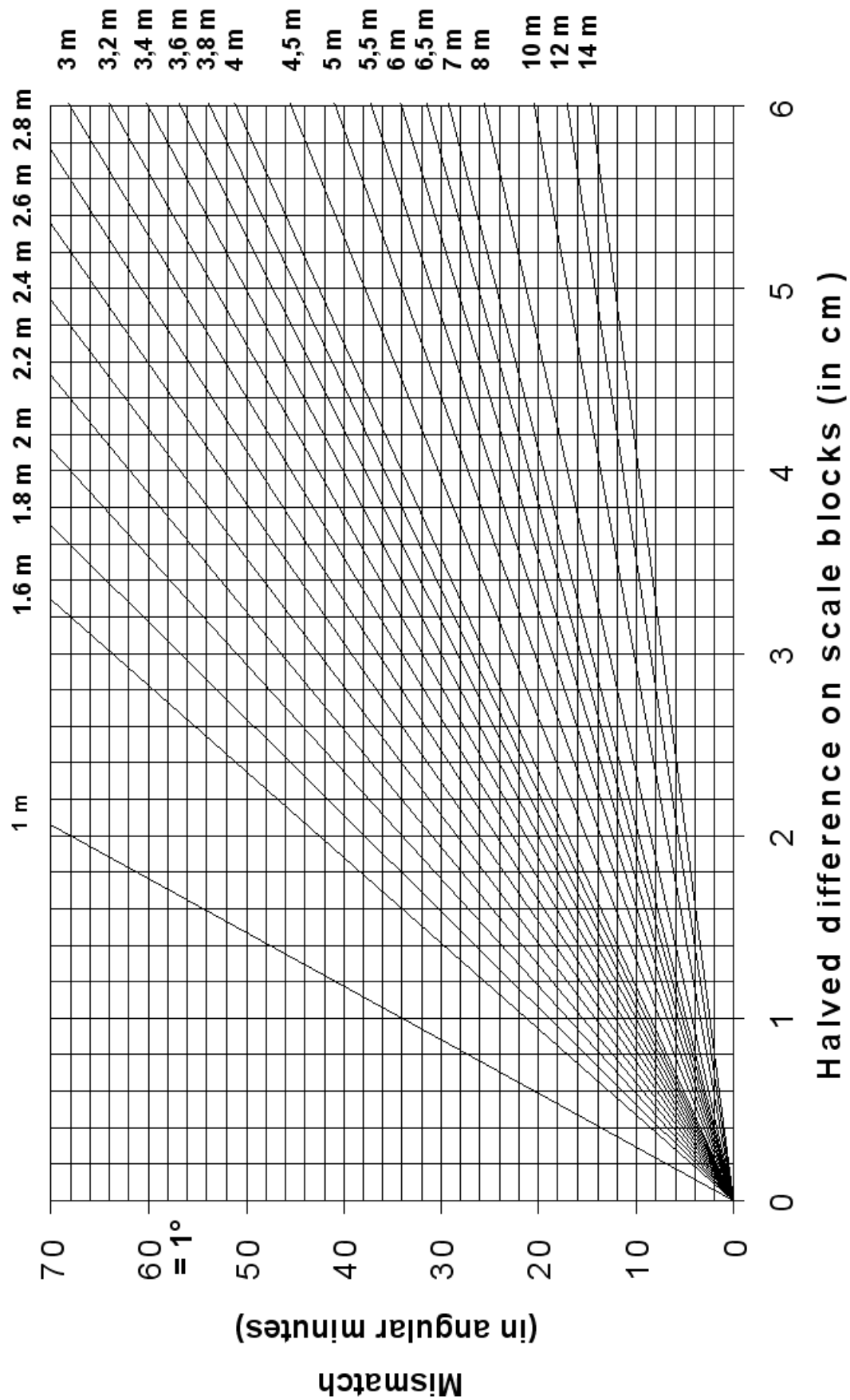
Annex

13.2 Diagram for Determination of Axle Mismatch (optical measurement) Dia. 1



- S** = Mismatch (in minutes)
D = Halved difference on scale blocks (in mm)
R = Wheel base (in meters)

13.3 Diagram for Determination of Axle Mismatch (optical measurement) Dia. 2



Annex

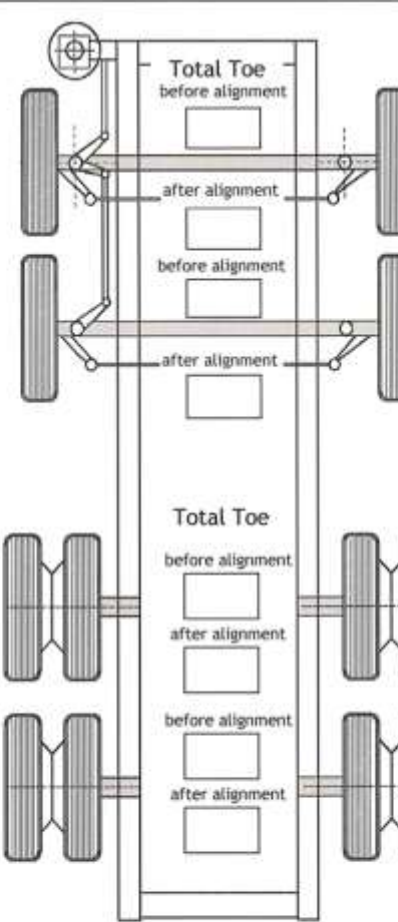
13.4 Measurement report

QR-Code for Download the Measurement protocol see page 15

Insert your company name Address ZIP and town Telephone	
Manufacturer:	Model:
chassis number:	Driven km / miles:
Licence plate no.:	Tyre pressure: (psi)left part: _ _ _ _
Vehicle owner:	right part: _ _ _ _

Measurement report for wheel alignment

Camber, Caster, SAI / KPI, Toe-out-on-turns, Out of square Single Toe, Total Toe, Axle Offset				measured data in degrees [°] measured data in millimetre [mm]			
before alignment	after alignment			before alignment	after alignment		
	Camber				Camber		
	Toe left				Toe right		
	Caster				Caster		
	SAI / KPI				SAI / KPI		
	Toe-out-on-turns				Toe-out-on-turns		
before alignment	after alignment	before alignment		after alignment	before alignment	after alignment	after alignment
	Camber					Camber	
	Toe left					Toe right	
	Caster					Caster	
	SAI / KPI					SAI / KPI	
	Toe-out-on-turns					Toe-out-on-turns	
before alignment	after alignment	before alignment		after alignment	before alignment	after alignment	after alignment
	Camber					Camber	
	Out of square					Out of square	
	Axle Offset					Axle Offset	
before alignment	after alignment	before alignment		after alignment	before alignment	after alignment	after alignment
	Camber					Camber	
	Out of square					Out of square	
	Axle Offset					Axle Offset	



Mechanic:	Date:
Notes for Vehicle:	


HAWEKA
 HAWEKA AG
 Kökenhorststraße 4
 30938 Burgwedel
 Tel.: +49 5139/8996-0
 Fax: +49 5139/8996-222
 www.haweka.com
 info@haweka.com
 truck-axes.doc

14 EC-Declaration of Conformity

The manufacturer:

**Haweke GmbH
Kokenhorststraße 4
D-30938 Burgwedel
Germany**

herewith declares, that following
described device

Laser Wheel Aligner AXIS500

complies with safety and health
requirements of following EC guidelines

**EMC – Directive 2004/108/EC
NSR - 2006/95/EG**

Applied harmonized standards:

Immunity	EN 61000-6-1
Emission	EN 61000-6-3

Applied national standards and technical specifications:

Laser irradiation	BGV B2
Safety of laser devices	DIN EN 60825 – Part 1

In case of structural alterations that effect technical data and agreed functionality as described in these operating instructions this declaration will lose its validity.

President
Dirk Warkotsch

Burgwedel, 17.11.2022



(signature)



HAWEKA GmbH

Kokenhorststr. 4 ♦ 30938 Burgwedel

 +49 5139-8996-0

www.haweke.com ♦ Info@haweke.com