

Operating instruction

Optical wheel alignment system for agricultural machinery

AXIS50LM

Optical Wheel Alignment

Laser System

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(Translation of the original manual)

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GEB 001 120



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Version Notes Page 8

1 General Safety Instructions

1.1 Operator's duty of care



The wheel alignment system AXIS50LM has been designed and constructed in accordance with a thorough selection of applicable harmonised standards. Hence, it corresponds to the current state of technology and offers the highest degree of safety during operation.

The wheel alignment system may only be structurally modified with the written authorisation of the manufacturer!

Device safety can only be implemented in practice during operation if all the required applicable measures have been taken. The operator's duty of care includes planning such measures and checking that they have been implemented.

In particular, the operator must ensure that:

- the device is only used for its intended purpose
- the device is only used in a fully functioning state and free from defects
- the complete operating instructions are permanently available in a readable condition at the operating location of the device
- only qualified and authorised personnel operate the device
- personnel are regularly instructed in all relevant work safety issues and are familiar with the operating instructions, in particular the safety instructions
- all the operating instructions and warning notices attached to the machine are not removed and are legible

1.2 Explanation of symbols

Specific safety instructions are given in these operating instructions. The following symbols are used for this purpose



This symbol indicates potential danger to the device and material.



This symbol does not indicate a safety instruction; it labels information provided for a better understanding of work procedures.

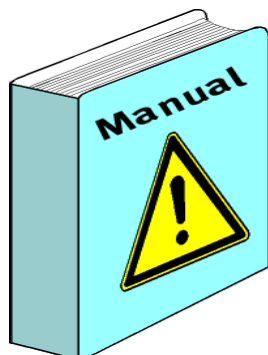
The symbols attached to the laser measuring heads are mounted so that they are positioned in the immediate vicinity of the emerging laser beam.



This symbol indicates potential danger to persons.
(Risk of injury or fatal injury)



2 Basic Safety Precautions



The wheel alignment system AXIS50LM may only be used by qualified and authorised personnel who are familiar with these operating instructions and can work in accordance with these instructions!

Prior to each use of the wheel alignment system, the system must be checked for visible damage, and it must be ensured that the device is only operated free from defects! Defects that are identified must be reported to your superior immediately!



Laser product
CLASS 2
TYPE 1



Some basic instructions must be followed for all lasers:

- **Never look directly into the beam!**
- Define the path of the beam precisely and use beam dumps to avoid stray laser radiation! Dangerous reflections are caused in particular by reflective and bright surfaces.
- Keep the beam path at one level above or below eye height if possible!
- The trajectory of the laser beam must not lie within the area of work or where people are present. If this is unavoidable, ensure that the laser area is clearly recognisable and marked with the stipulated warning notices.
- Turn off the laser after work has finished!

Please refer to the accident prevention regulation (VGB 93 *laser radiation*) for further safety instructions for working with lasers.



The user is personally responsible for proper operation and compliance with safety regulations.

3 Transporting the wheel alignment system



Illustration: AXIS50LM (#922 000 005)



Illustration: AXIS50LM (#922 000 014)

		Length x Width x Height (cm)	Transport weight (kg / gross)
AXIS50LM	922 000 005	143 x 100 x 72	145
AXIS50LM	922 000 014	80 x 60 x 95	115

3.1 Information on general handling and storage



To prevent damage to the device and injury during transport:

- Forklifts used to handle the load must conform to the provisions of the accident prevention regulations!
- Transport work may only be carried out by qualified and authorised personnel.
- Severe shocks must be avoided during transport.



The system must be protected against moisture at all times.

This applies in particular during transport and storage of the entire control cabinet.
Care should be taken to ensure that the storage location is dry and dust-free.

4 Product Description

Wheel alignment system AXIS50LM

Item No. 922 000 005

Item No. 922 000 014



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4.5 edition 01 / 2023

Images: HAWEKA GmbH / D-30938 Burgwedel

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4.1 Authorised intended use

- The wheel alignment system AXIS50LM has been developed to align the axles of agricultural machinery.
- It is designed solely for rapid measurement of the chassis geometry.
For front axle and steered axles:
 - Total toe
 - Partial toe
 - Camber *
 - Toe difference angle *

* (Optional accessories required)

- The wheel alignment system AXIS50LM allows you to measure in “drive position”, i.e. the vehicle does not have to be raised.



If the wheel alignment system AXIS50LM is not used as per this intended use, there is no guarantee that operating the device will be safe!



The operator of the wheel alignment system, and not the manufacturer, shall be liable for all damage to persons and property caused by incorrect use!



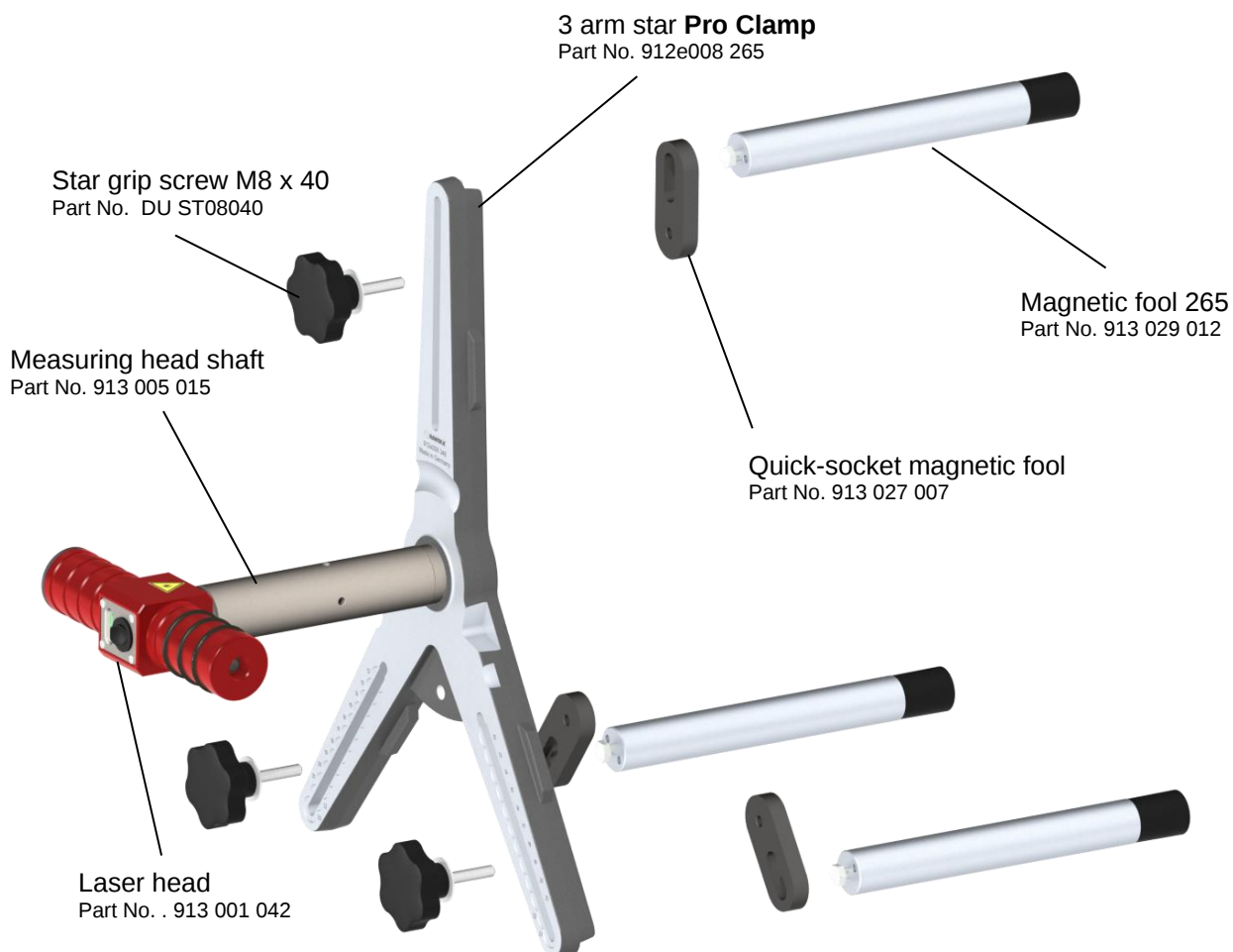
The laser used in the measuring head is a Class 2 laser product. The laser radiation produced is not hazardous to the eyes for short periods of exposure (up to 0.25 s). If you accidentally look into the laser beam for a short period, the eye is protected by the blink reflex.

NEVER INTENTIONALLY LOOK INTO THE LASER BEAM!

If you have reason to believe that an eye has been damaged by the laser beam, seek the advice of an eye specialist immediately.

4.2 Design of the laser measuring head

Laser measuring head with its most important individual parts:
(The item numbers are each for 1 piece)



The laser housing can be rotated freely. Ensure that the laser beam exit opening is pointing downwards to the ground after mounting the laser heads and before switching on the laser diode.



Attention

Never remove the measuring column from the 3-arm clamping star!

The measuring column has been mounted and aligned to the 3-arm clamping star with great care.

If you suspect that the measuring column is no longer perpendicular to the 3-arm clamping star, please contact your sales representative!

Electronic inclinometer (optional accessory)

Required for measuring the camber

The electronic inclinometer is mounted on the laser head's measuring column.



4.3 Technical Data

Measuring accuracy:

Toe	< 0.5 mm
Camber*	+/- 6 min.
Toe difference angle*	+/- 15 min.

Measuring range:

for toe measurement	+/- 28 mm
for camber measurement*	up to 5 degrees

* (electronic inclinometer required)

Load capacity of the turning plates	6 tonnes each
-------------------------------------	---------------

Laser:

Model LG650-7(80)	
Input voltage	3 volts (2 x 1.5 volt AA batteries)
Radiated power Po	0.91 mW
Wavelength λ	650 nm
Operating range	20 m
Laser class	2 DIN EN 60825-1:1994-07

Electronic inclinometer: #913 009 048 (optional accessory)

Power:	6 V (4 x batteries Mignon AA)
Charging rate in use	10 mA (without lighting) 60 mA (with lighting)
Closed current (inclinometer switched off)	< 10 μ A
Operating time with one set of batteries	Without lighting: approx. 50-60 hours With lighting: approx. 30 hours
Specified measuring range	+/- 45° for both axles
Extended measuring range	+/- 90° for both axles
Accuracy of the specified measuring range	0 ... 10°: +/- 0° 03' 10 ... 45°: +/- 0° 12'
Resolution	0° 01'
Temperature	-5 to +50 °C (operating) -20 to 65 °C (storage)
Shock stability of the sensors	3.500g

5 Equipment provided

5.1 Parts List AXIS50LM Basic Version

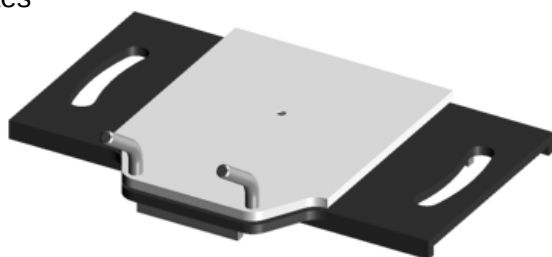
2x Laser measuring heads

1x Item No. 922 001 002



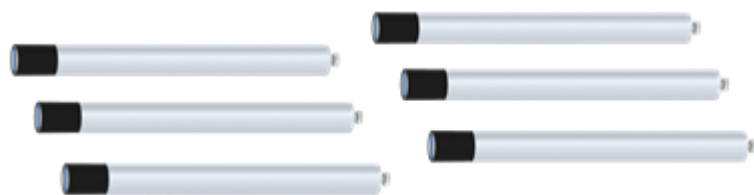
2x Turning plates

Right / left
1 x Item No. 913 011 000



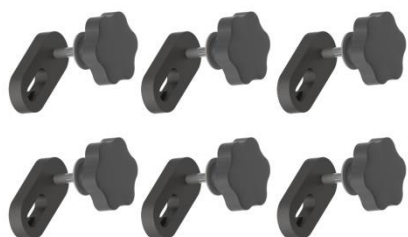
6x Special magnets for rear axle alignment (265 mm)

1 x Item No. 913 029 012

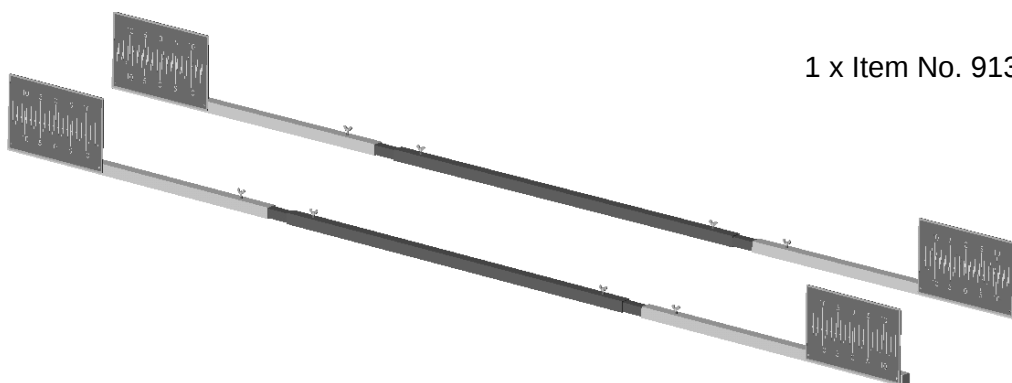


6x Clamping star grip screws with quick release fastener

1x Item No. 913 027 006

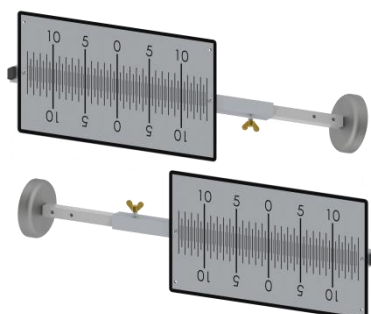


2x Track gauges (min. 3,110 – max. 4,440) mm



1 x Item No. 913 051 030

2x Magnetic gauges



1 x Item No. 913 025 007

1x Tape measure



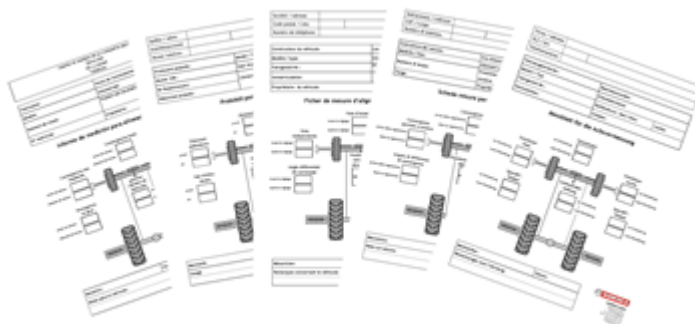
Item No. 900 008 041

1x CD-ROM

Measurement records



Item No. VID 922 003



Measurement records also available by download at:

<https://www.haweka.com/dokumentenbibliothek/achsvermessung/axis50lm/protokolle>

Just AXIS50LM # 922 000 005

1 x. Mobile trolley
Item No. 922 001 007



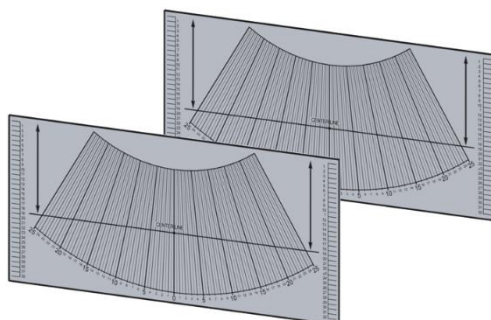
Just AXIS50LM # 922 000 014

1 x. Mobile device cabinet
Item No. 913 026 000



2x 20° floor gauges

1x Item No. 913 018 000



5.2 Accessories (optional)

1x Electronic inclinometer

Inclinometer
1x Item No. 913 009 048



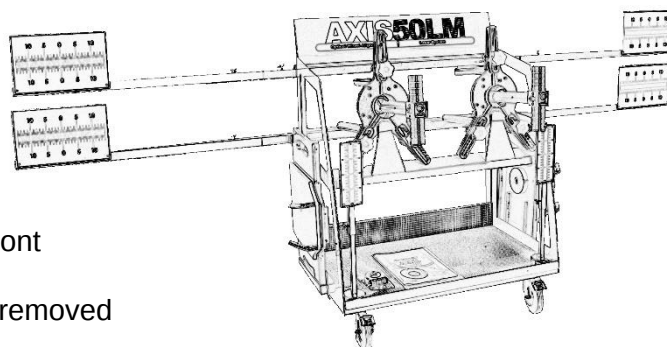
6 Front Axle Alignment

6.1 Preparation

- Carry out alignment on a level surface.
- Clean the rims between the wheel nuts.
- Check tyre pressure. If necessary, correct to the specified value.

Driving the vehicle onto the turning plates

- Lay the turning plates centrally in front of the front wheels.
- The safety bolts on the turning plates must be removed based on the tyre width.
- Drive the vehicle onto the turning plates. The middle of the wheel must stand above the middle of the turning plate.



(Figure 1)

Mounting the laser measuring heads

- The magnetic feet on the 3-arm clamping star must be adjusted to the correct wheel diameter before mounting.
- The eccentrics must be turned so that the wheel nuts are fully in contact on the diameter of the rim flange.
- Attach the measuring heads to the rim flange using the magnets. Two magnets should be located above the centre of the wheel and one magnet below (Figure 2).



(Figure 2)

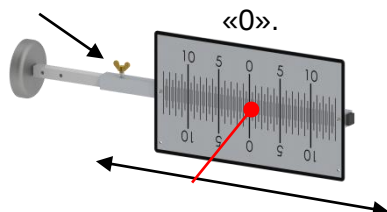
Setting up the magnetic gauges

- Set the steering wheel straight by sight.
- Attach the first gauge in the right driving direction as centrally as possible (with reference to the lengthways direction) on the flat surface of the rear wheel rim.
- Switch on the right laser.

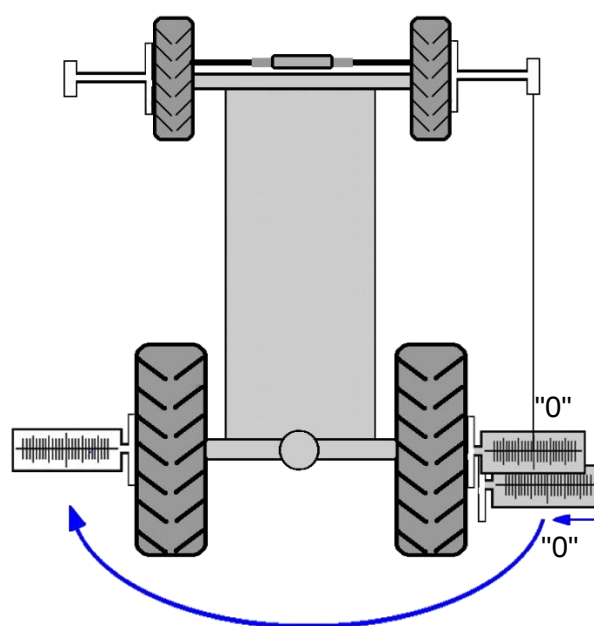


Note the position of the laser beam exit opening before switching it on!

- Rotate the right laser above the ground until the laser point can be seen on the magnetic gauge.
- Set up the gauge so that the laser point is pointing to "0" and fix it in place with the wing screw.



- Repeat the procedure with the second gauge on the right side. The magnetic gauges are now the same length and must not be changed!
- Attach one of the two gauges to the left side of the vehicle as close to the same position as possible.



(Figure 3)

Front Axle Alignment

Setting up the magnetic gauges (continued)

- Switch on the left laser.



Note the position of the laser beam exit opening before switching it on!

- Rotate the left laser over the ground until the laser point can be seen on the gauge.

6.2 Setting Up "Travel Straight Ahead"

- If the laser point is not at zero on the left gauge (*Figure 4*), rotate the steering wheel until the displayed gauge value has halved. The lasers now have the same value on both sides. (*Figure 5*)

Example:

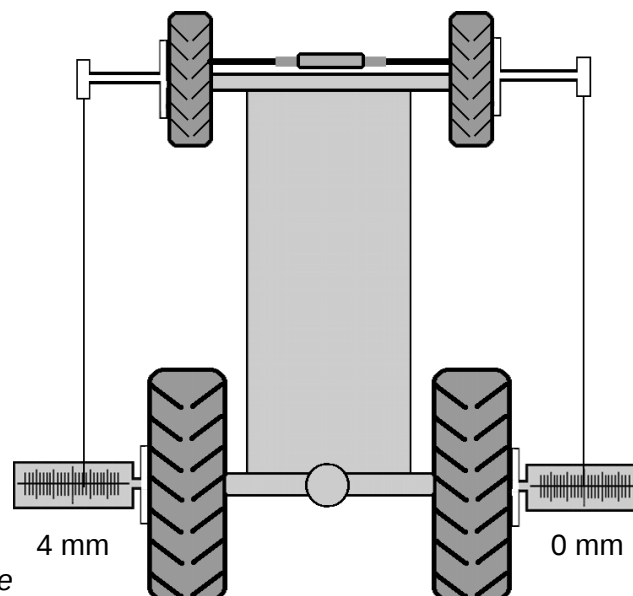
Right display: 0

Left display: 4 scale lines inwards

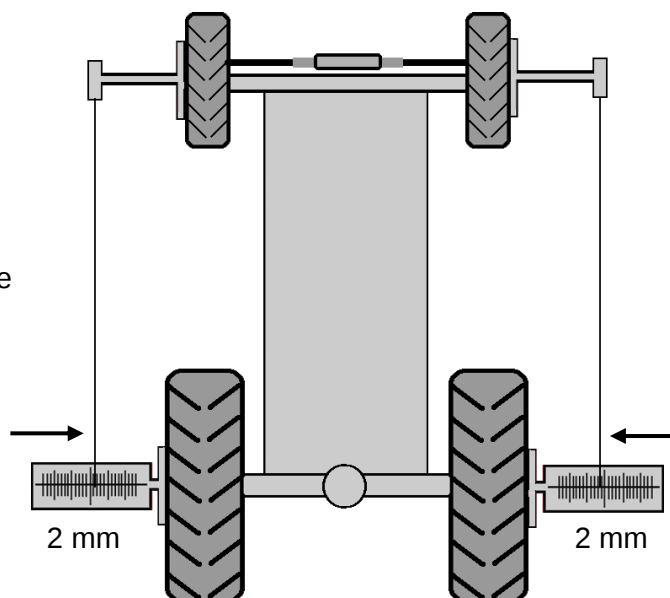
Rotate steering wheel until both laser points are 2 scale lines inwards.

(*Figure 5*)

The front wheels are now in line with the rear axle in the driving direction.



(*Figure 4*)



(*Figure 5*)

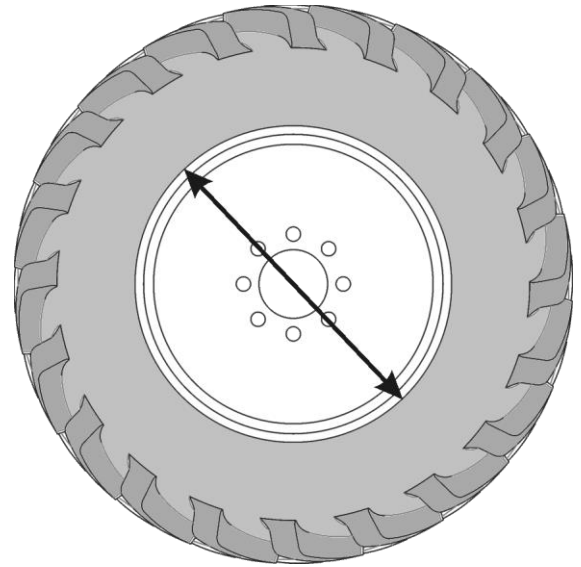
Front Axle Alignment

Setting Up the Track Gauges

- Both laser housings must be aligned using the level so that the laser beam exit opening is pointing perpendicular to the ground.
- The calculated track gauge clearance distance must be recorded twice on the ground to define the measurement rectangle.

Please note: To read off the value in mm on the track gauge, use the following formula (Figure 6):

$$\frac{\text{Wheel diameter} \bullet 10}{2} = \text{Clearance distance of the gauge in front of or behind the front axle}$$



(Figure 6)

- From the laser points, the calculated length is measured to front and rear using a tape measure. Mark the positions on the ground with a chalk line (or adhesive tape).

Example:

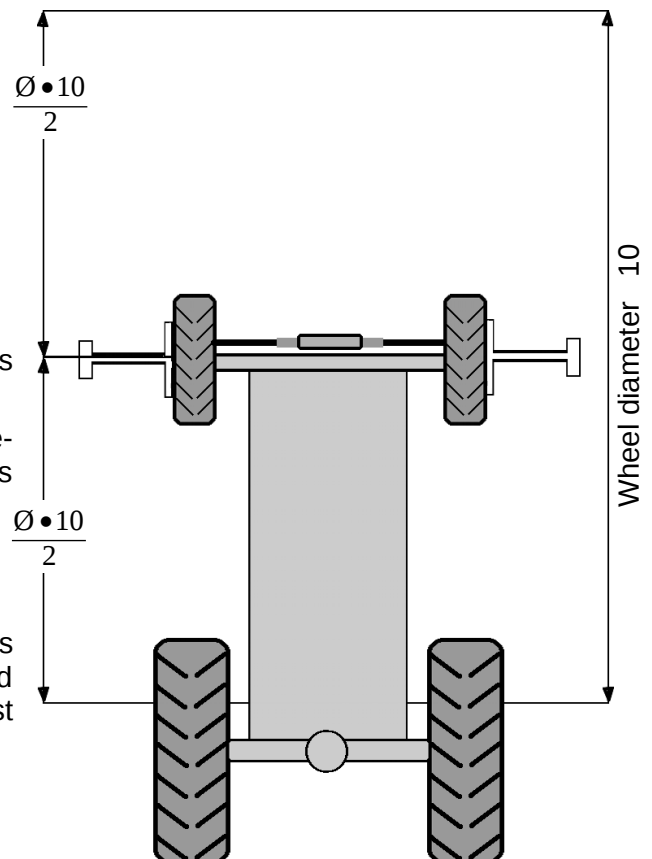
$$\frac{(\text{Wheel diameter } 80\text{ cm}) \bullet 10}{2} = \frac{800}{2} = 400\text{ cm} = 4\text{ m}$$

In this example, a mark is made on the ground 4 metres in front of and behind the laser point.

The total distance from the laser points to the marks behind and in front of the front axle must together always come to a rim diameter of 10 (Figure 7)

I.e., 1 long scale line on the track gauge $\triangleq$ 1 mm.

If this is not possible because there is an obstacle at this position, it is also possible to measure e.g. 3 m forward and 5 m back from the laser points. The total length must always be 8 m for this case!



(Figure 7)

Front Axle Alignment

6.3 Setting Up the Track Gauges (continued)

- Place the first track gauge on the chalk line parallel in front of the front axle.
- Move the track gauge so that the laser beam is pointing to zero on both gauges.



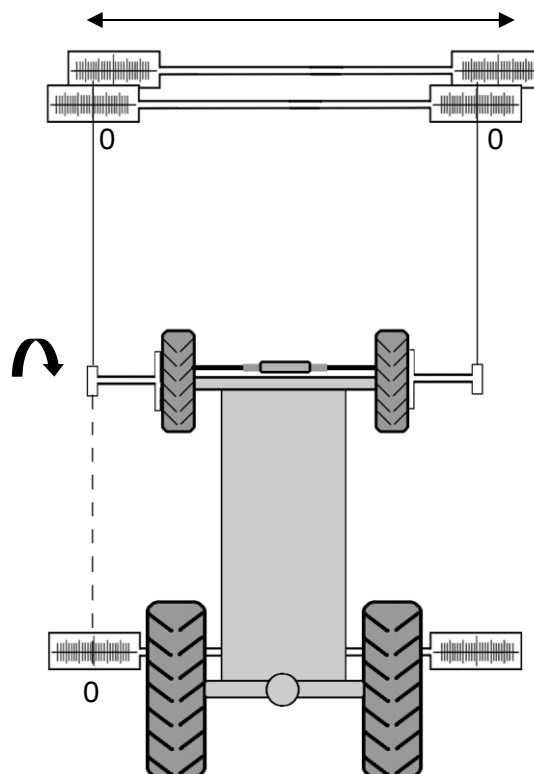
Rotate the laser housing so that the laser beam travels over the ground.

- Fix the length of the track gauge using the wing screw and repeat the procedure for the second track gauge - both are now the same length. (Figure 8).
- Place one gauge on the chalk line behind the front axle.
- Turn the left-hand laser backward and shift the entire gauge to zero.

Value at back on left = 0

Value at front on left = 0

Value at front on right = 0



(Figure 8)

6.4 Toe Measurement and Adjustment

Reading off the total toe

- Align the right-hand laser backward to the track gauge.

- Read off the measurement 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 following applies to the right-hand rear gauge:

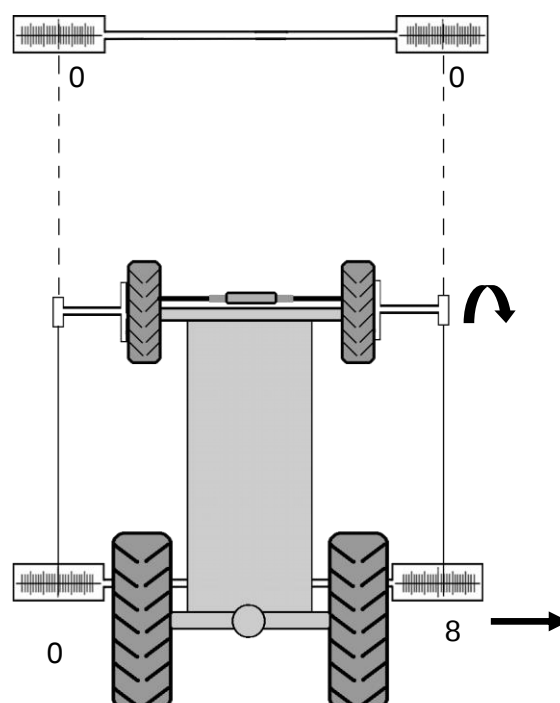
Laser point is pointing to zero = toe is also zero

Laser point is pointing inward from zero = toe-out

Laser point is pointing outward from zero = toe-in

Example:

Laser point behind the right-hand front axle points to 8 long scale lines outward, i.e. the front axle has an 8 mm toe-in (Figure 9)



(Figure 9)



Note

Set up the toe only after measuring the partial toe.

Front Axle Alignment

Reading off the partial toe

- Once the total toe has been recorded, the rear track gauge is measured, i.e. the total toe value (in our example, 8 mm). The rear track gauge is moved sideways until both sides display the same value.

Example:

On the **left side**, the laser point is 4 scale lines outward on the rear gauge.
 On the **right side**, the laser point is 4 scale lines out-ward on the rear gauge.
 (Figure 10)

- Next, centre the differential steering cylinder by turning the steering wheel.

Clearance distance **A** = clearance distance **B**

- After aligning the steering centre position, read off the partial toe values on each side of the vehicle.

Example:

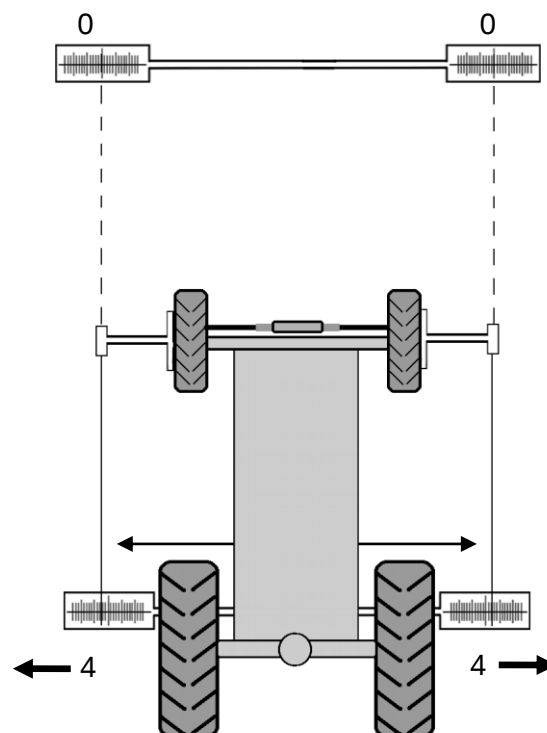
Front left-hand laser point is pointing outward to 4 long scale lines; rear left-hand laser point is pointing to 0

I.e., the left front wheel has 4 mm toe-out

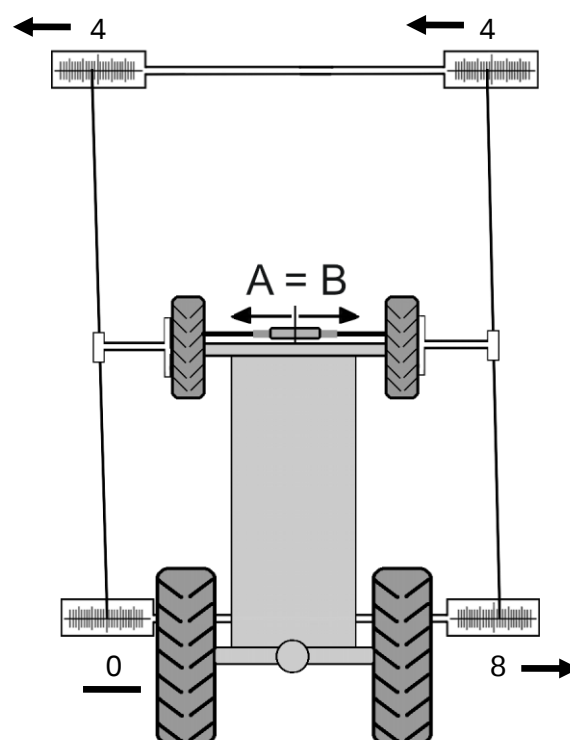
Front right-hand laser point is pointing inward to 4 long scale lines;
 rear right-hand laser point is pointing out-ward to 8 long scale lines

I.e., the right front wheel has + 12 mm toe-in

(Figure 11)



(Figure 10)



(Figure 11)



Front Axle Alignment

Setting the toe



Note

Please note:

The "Travel Straight Ahead" alignment must not be changed on the track rod during adjustment work!

EXAMPLE: ***The desired toe value should be zero.***

- Lock the differential cylinder.
- Loosen the left track rod.
- Turn the left track rod until the laser point displays the same value (in our example: 2 long scale lines outward) on the front left-hand gauge and the rear left-hand gauge.
- Loosen the right track rod.
- Rotate the right track rod until the laser point displays the same value (in our example: 2 long scale lines outward) on the front right-hand gauge and the rear right-hand gauge.
- The total toe is now zero.
- Re-tension the track rods.

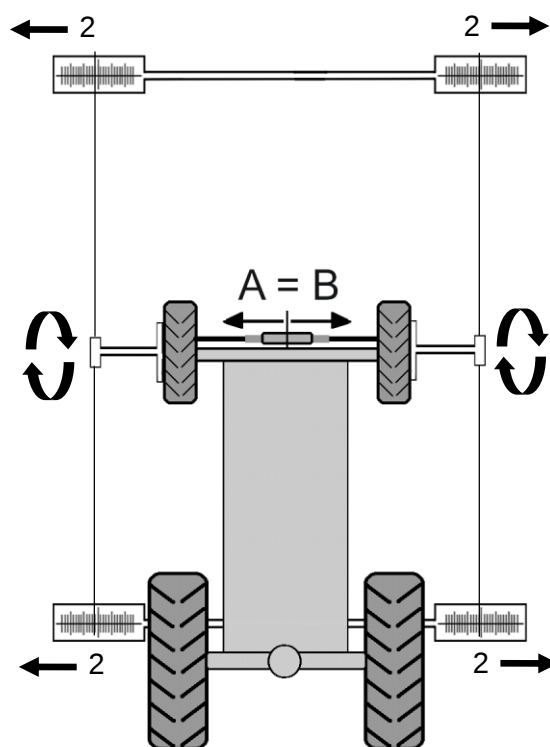


Note

When the toe value is "0", the gauge value at the front and rear is always the same.

Please note:

Once you have completed the work, you must re-establish "Travel Straight Ahead" status.



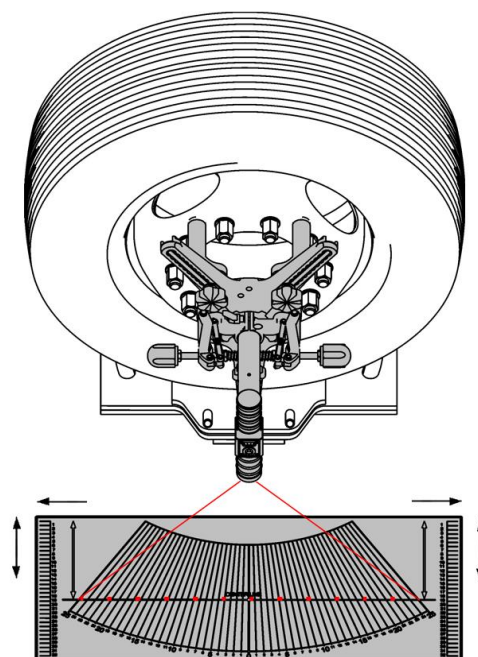
(Figure 12)

Front Axle Alignment

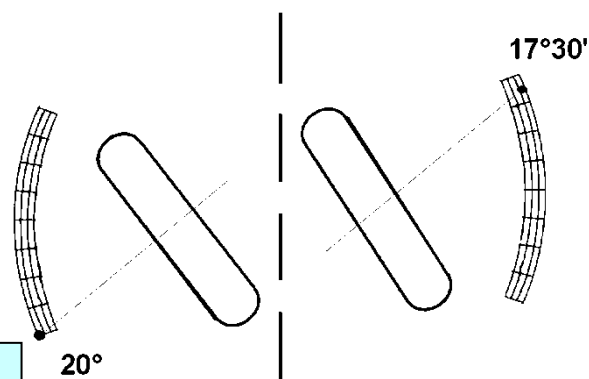
6.5 Toe difference angle measurement

The 20° floor gauge accessories are required for this measurement

- Set the front wheels to "Travel Straight Ahead" at the steering wheel. Both lasers must point to the same value on the magnetic gauges.
- Turn the laser housing until the level shows vertical.
Place the floor gauges on the ground to the side of the front wheel to set up the 20° wheel angle so that the laser point is pointing at the zero mark on the gauge. The zero mark is the intersection of the 0° line and the "Centre Line" adjustment line.
- Turn the laser forward and backward in the area of the floor gauge.
- Align the gauge until the laser point swivels along the centre line parallel to the wheel. Check the level! The laser point must be pointing perpendicular to the zero line (Centre Line) (Figure 13).
- Repeat the procedure on the other wheel.
- Turn the left wheel to the left until the laser point is pointing to 20°. Check the level on the laser housing: If the laser point is pointing to 20°, the laser beam must be aligned perpendicular.
- Similarly, rotate the laser on the right wheel until the level indicates that the laser beam is vertical.
- Read off the toe difference angle of the right wheel and enter it on the test record.



(Figure 13)



(Figure 14)

Example:

The laser is pointing to 20° on the left wheel (inside wheel). The laser is pointing to 17°30' on the right wheel (outside wheel). The toe difference angle on the rights is 2°30'.

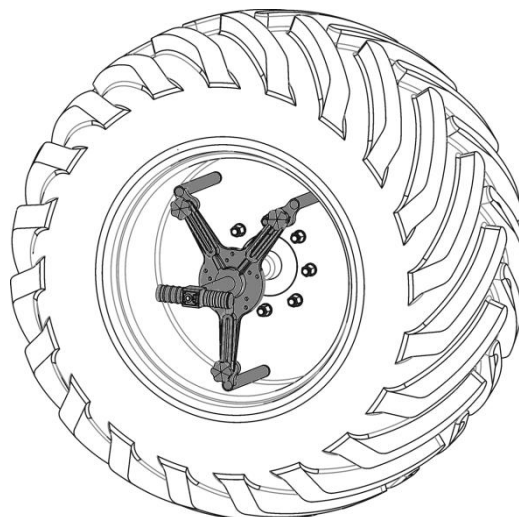
Front Axle Alignment

6.6 Run out Control

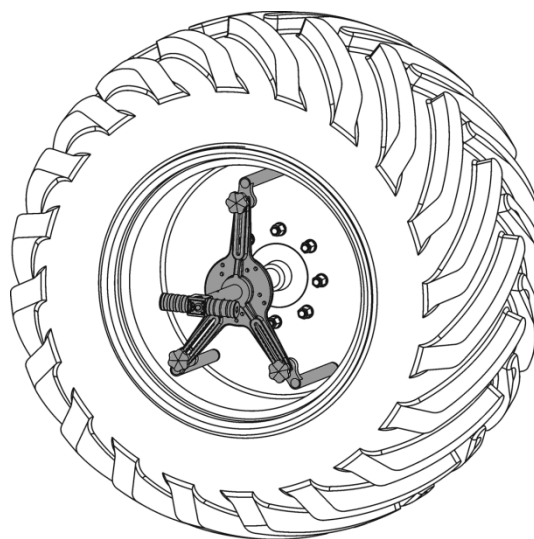
If you suspect that the rim has been damaged by an accident, corrosion or other external influences, run out control should be carried out before measurement.

The measuring head laser beam must display the same value on the track gauges and/or the magnetic gauges at each attachment position on the rim.

To check, the measuring head is first attached to the rim normally (*Figure 15*) and then rotated 180° (*Figure 16*). During run out control, the laser beam must point to the same gauge value.



(Figure 15)



(Figure 16)

7 Servicing

7.1 Maintenance and Care

Please note that the laser measuring heads and their accessories are precision components. These components must be used and maintained with great care at all times.



The contact surfaces of the magnetic feet must be kept free of dirt at all times. This ensures full contact and therefore firm positioning on the rim.

The laser's lens is generally maintenance-free. If dirty, the components can be cleaned with a dry, soft cloth.
Do not use solvent or other liquids for cleaning!

7.2 Replacing the Batteries in the Laser Housing

To open the battery compartment in the laser housing (*Figure 17*), unscrew the black covering cap. (*Figure 18*)



(Figure 17)

Type of battery: AA 1.5 V



(Figure 18)



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

8 Error description



Operators may only correct errors that are clearly the result of errors during operation or maintenance!

8.1 Description and causes of errors

Description	Possible causes	Correction of error
The laser beam becomes weaker shortly after switching on the system.	There is insufficient battery power in the laser head	Turn off the system! Replace the batteries
Wheel alignment system does not sit securely on the rim	• Dirty rim surface • Dirty magnetic feet • Magnets on the rim are not fully in contact	Turn off the system! • Clean the rim surface • Clean the magnet surface • Realign the magnetic feet
The measurement result cannot be repeated	• Measuring head adjustment is damaged • Incorrect calibration	Adjust the measuring head. Contact your HAWEKA sales partner

9 Appendix

9.1 Measurement report for wheel alignment

Company / Address		
ZIP and town		
Telephone		

Manufacturer:	Operating hours:	
Model:	Driven km / miles:	
chassis number:	Tyre pressure: (psi) left:	right:
Licence plate no.:	Vehicle owner:	

Measurement report for wheel alignment

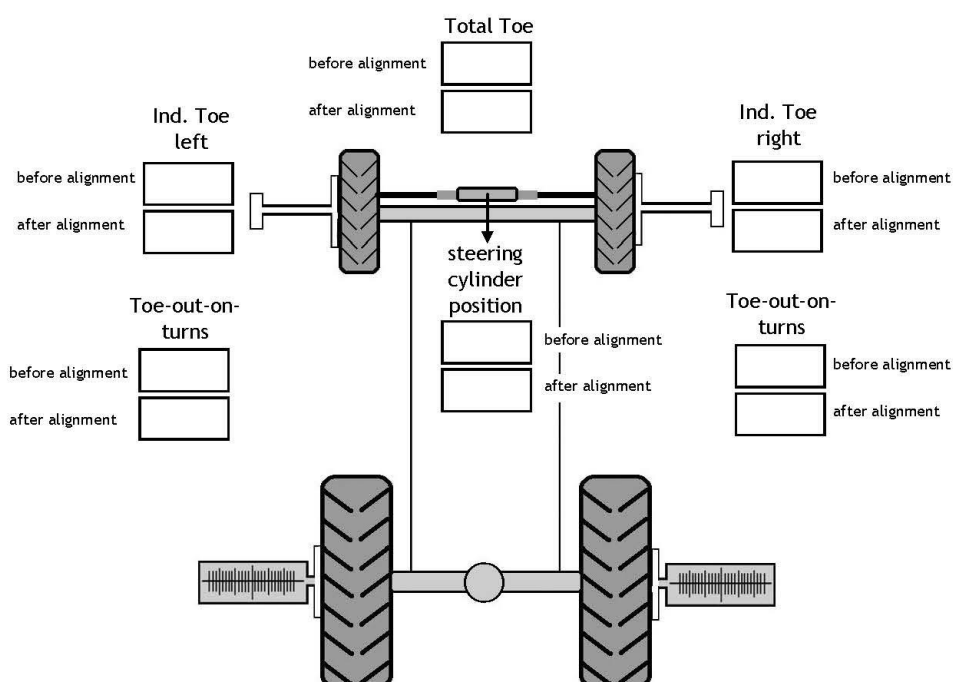


Diagram illustrating the measurement points for wheel alignment on a vehicle chassis. The diagram shows the front and rear wheels, steering knuckles, and tie rods. The measurement points are labeled as follows:

- Total Toe:** before alignment, after alignment
- Ind. Toe left:** before alignment, after alignment
- Ind. Toe right:** before alignment, after alignment
- Toe-out-on-turns:** before alignment, after alignment
- steering cylinder position:** before alignment, after alignment

Mechanic:	Date:
Notes for Vehicle:	

10 EC Declaration of Conformity

The manufacturer:

HAWEKA GmbH
Kokenhorststr. 4
D-30938 Burgwedel
Germany

herewith declares that the following described system

AXIS50LM wheel alignment system

fulfils the safety and health requirements of the following EC directives:

EMC Directive 89/336/EEC

Applicable harmonised standards:

Immunity	EN 61000-4-2 EN 61000-4-4 EN 61000-4-8
Safety of laser products	DIN EN 60825 - Part 1 7/1994

National standards and technical specifications applied:

Laser radiation	VBG 93
Technical documentation	VDI 4500 Sheet 1

Design modifications which affect the Technical Data provided in the Operating Instructions and the authorised intended purpose invalidate this Declaration of Conformity!

Burgwedel, 29/11/2022



CEO
Dirk Warkotsch



(Signature)



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