



# **Operating Instructions**

## **Upgrade Kit for Trailers and Semi-Trailers**

**922 000 021**

**Wheel Alignment System**

**AXIS500**  
Optical Wheel Alignment | Laser System

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GEB 001 075



## Measuring of trailers and semi-trailers on commercial vehicles

This upgrade kit, when combined with the basic version of the AXIS500 wheel alignment system, enables quick and easy measurement of the chassis on trailers and semi-trailers for commercial vehicles.

The upgrade is meant solely for measuring the **total toe, partial toe left/right and camber, and for determining the axle mismatch and axle inclination.**

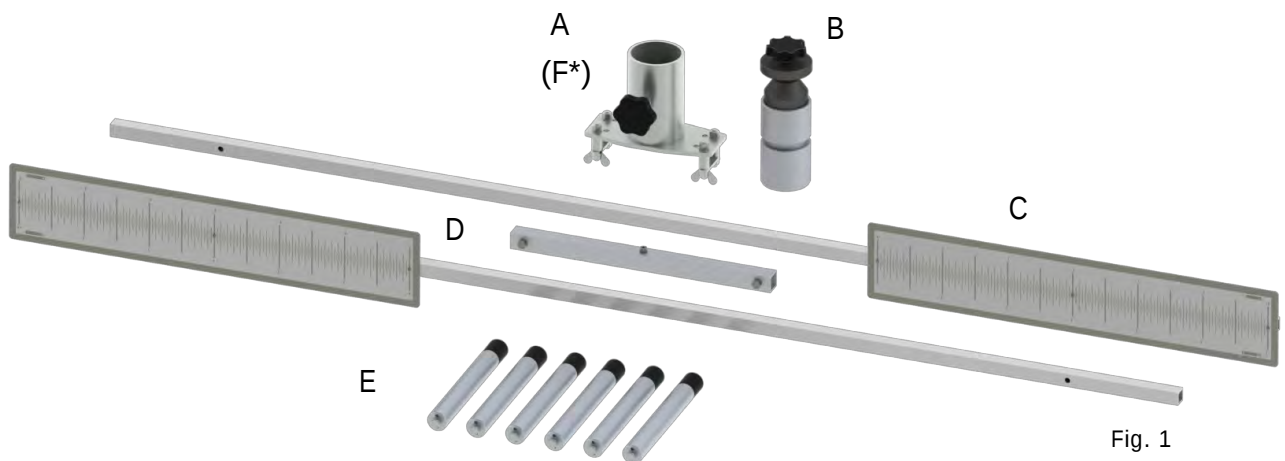
This product is intended for users with technical knowledge of vehicle chassis measurement and with knowledge of how to use the AXIS500 wheel alignment system.

The procedure described herein presupposes that you have the AXIS500 operating instructions to hand and that the AXIS500 wheel alignment system can be operated error-free.

In this regard, please note the description contained in the AXIS500 operating instructions, Point 1 *General Safety Precautions*.



Chassis measurement of trailers and semi-trailers is only possible in conjunction with the basic equipment version of the AXIS500 wheel alignment system.



### The upgrade kit comprises the following:

- |    |                                                  |                              |
|----|--------------------------------------------------|------------------------------|
| A) | 1 x toe scale holder for 2"                      | Item No. 913 052 041         |
| B) | 1 x coupling ring / semi-trailer drawbar adapter | Item No. 913 024 001         |
| C) | 2 x scale holders including scale                | Item No. 913 014 017         |
| D) | 1 x square pipe connector                        | Item No. 913 014 014         |
| E) | 6 x magnetic feet 265 mm                         | Item No. 913 029 015 / 6 pc. |

### \* Optional:

- |     |                               |                      |
|-----|-------------------------------|----------------------|
| F*) | 1 x toe scale holder for 3,5" | Item No. 913 052 042 |
|-----|-------------------------------|----------------------|

Technical modifications reserved.

### Version 7.1

Illustrations HAWEKA GmbH / 30938 Burgwedel

## Preparations for measuring trailers

In order to be able to position the measuring heads against the vehicle wheels of the trailer, the magnetic feet on the 3-arm clamping stars of the wheel alignment clamp may have to be changed, depending on the rim type.

- To do this, loosen the clamping star grip screws and replace the 100 mm long magnetic feet with the new 265 mm or 315 mm long (standard AXIS500) magnetic feet which are included with the delivery. (Fig. 2)
- Then attach the measuring heads with the wheel alignment clamp as you would usually do to the wheel of the trailer.

See AXIS500 operating instructions, Point 5.1, Page 18

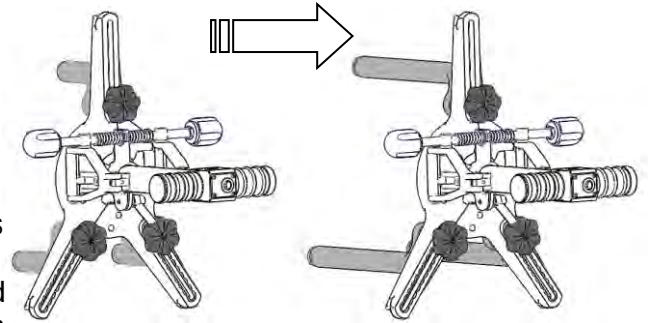


Fig. 2

## Measuring the camber

- Place the inclinometer onto the measuring column of the measuring head and lock with the knurled-head screws. (Fig. 3)
- Turn the inclinometer on using the ON/OFF button (Fig. 4)

First the welcome screen will appear with the software version, then the current camber will immediately be displayed as an absolute angle. (Fig. 5)



Fig. 3

- Read off the measured value from the display and enter it into the test record.

**Positive camber** = a + (plus sign) appears on the display.

**Negative camber** = a - (minus sign) appears on the display.

This measurement is necessary for each individual vehicle axle.

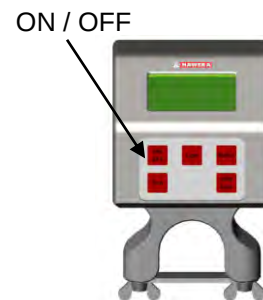


Fig. 4



Once all these measured values are recorded, the process must be repeated on the other side of the vehicle.

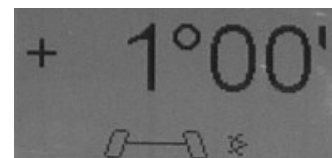


Fig. 5

## Design of the scales

- Put together the scale holder and bolt it using the square connection pipe.

The king pin adapter is already prefitted centrally on the connection pipe. (Fig.6)

- Now push the toe scale holder onto the trailer's king pin using the king pin adapter and secure it using the star grip screw. (Fig.7)

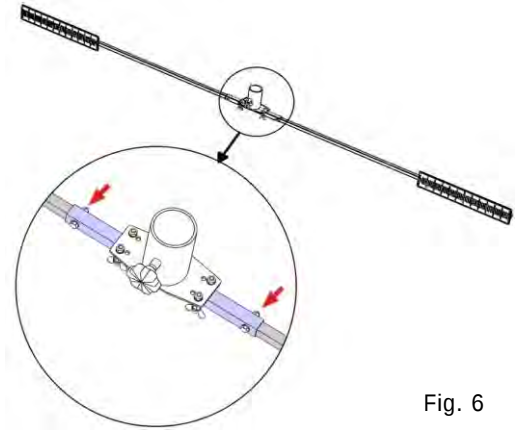


Fig. 6

## Setting up the toe scales / floor scales

- To set up the toe scales and toe measurement, proceed exactly as described in the AXIS500 operating instructions, from Point 5.3 onwards.



Fig. 7

**Please note:** The following formula must be applied in order to read the value in mm off the toe scale:

$$\frac{\text{Rim diameter} \bullet 10}{2} = \text{Distance of the scale in front of the axle being measured or behind the axle being measured}$$

- Set both toe scales to »0« at the same position on both sides, one after the other. Both scale holders are now the same length.
- Next place a scale on the other marking of the axle being measured (Fig. 8).
- Both scale holders must be optically aligned in such a way that they stand at rectangles to the long axle of the vehicle.
- Turn the left-hand laser to the back and shift the entire scale to zero.

Value at back on left = 0  
 Value at front on left = 0  
 Value at front on right = 0

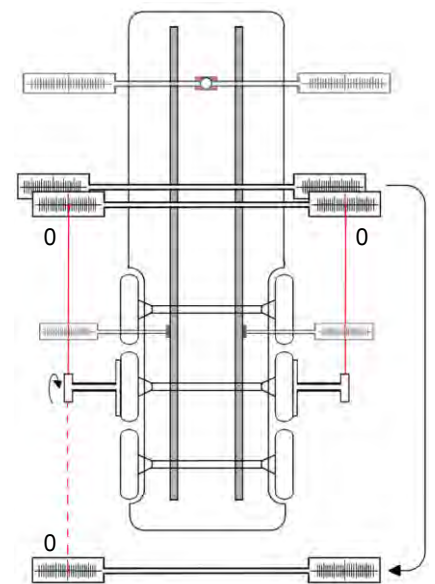


Fig. 8

## Total toe measurement

Reading off the total toe

- Point the right-hand laser to the back at the toe scale.
- Read off the measurement result:

|                      |         |
|----------------------|---------|
| 1 long scale line    | 1.00 mm |
| 1 half scale line    | 0.50 mm |
| 1 quarter scale line | 0.25 mm |

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

- If the toe corresponds to the specified values:
- Enter the measured value in the test record

### Example:

Laser point on the rear scale of the right-hand axle being measured is pointing outward to 5 long scale lines, i.e. this axle has a toe-in of 5 mm (*Fig. 9*)

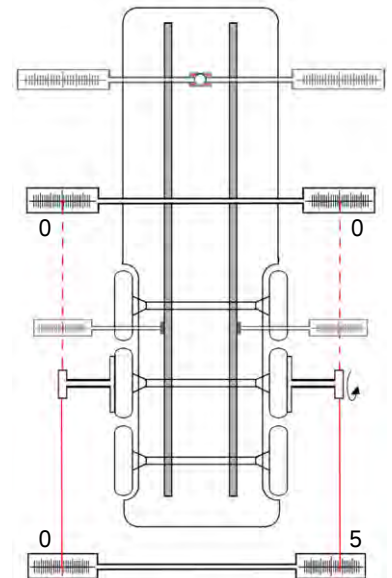


Fig. 9

This measurement process must be repeated at a later stage to record all measured values for the other vehicle axles.

## Axle mismatch - measuring in relation to the frame

- Place the measuring heads against the vehicle axles being measured on both sides of the vehicle.
- Attach a magnetic scale onto one side above the wheel on the vehicle frame.
- Switch on the laser on the measuring head.



**Pay attention to the laser beam exit opening when switching it on!**

- Direct the laser point at the scale and set the scale to zero.
- Secure this magnetic scale to the other side of the vehicle frame in the same position and direct the laser point at the scale. Half of the displayed value is the axle mismatch.

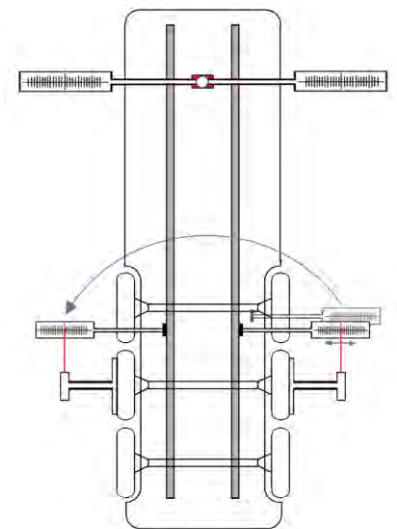


Fig. 10

### Example:

Drive direction left:

Magnetic scale = 0

Drive direction right:

Magnetic scale = 1 long scale line outward.

This means an axle mismatch in relation to the frame = 5 mm to the right.

## Axle inclination in relation to the long axle of the vehicle

- Direct both laser points at the scale holder on the king pin.



**Pay attention to the laser beam exit opening when switching it on!**

- Read off the value for both the left-hand and right-hand sides and halve the difference.
- Determine the inclination value using the diagram and the wheel base.
- Repeat this measuring procedure on all other vehicle axles.

### Example:

Right-hand scale value points to 40

Left-hand scale value points to 44

1/2 difference = 2.0

Wheel base (distance from laser to scale) in example = 6 m (see inclination table Pages 10,11)

Inclination determined for this axle = 11'

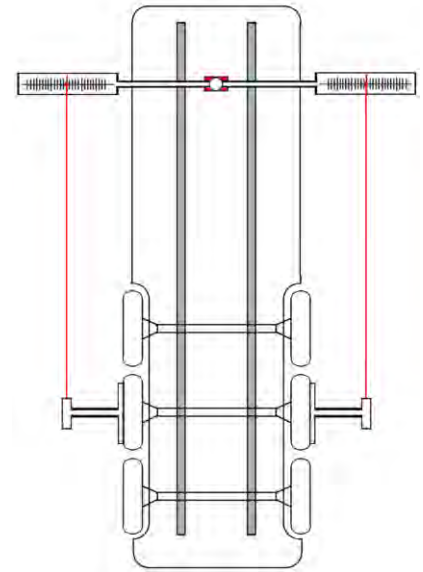


Fig. 11

## Preparations for measuring semi-trailers

Similarly to the trailer measurement, the measuring heads may have to be changed over to the 265 mm long or 325 mm long magnetic feet, depending on the rim type.

### Aligning the vehicle axle on the drawbar

For measuring, make sure that the vehicle axle to be steered is aligned at right angles to the long vehicle axle of the semi-trailer.

- Check the drawbar for visual defects.
- Fit the measuring heads to the vehicle wheels of the rotating axle.  
*See AXIS500 operating instructions, Point 5.1, Page 18*
- Attach a magnetic scale to one side on the vehicle frame. (Fig. 13)
- Switch on the laser.



**Pay attention to the laser beam exit opening when switching it on!**

- Direct the laser point at the scale and set the scale to zero.
- Repeat the process to adjust the second magnetic scale at the same position.
- Secure this magnetic scale to the other side of the vehicle frame at the same position and likewise direct the laser point at the scale.
- The vehicle axle on the drawbar must be aligned so that the laser beam points to the same value on the scale on both sides. (Fig. 14)
- Use the parking brake to lock the vehicle wheels on the axle.
- Remove the magnetic scales from the vehicle frame.

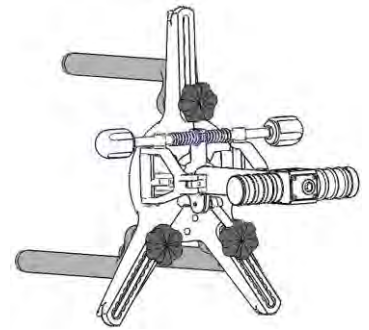


Fig. 12

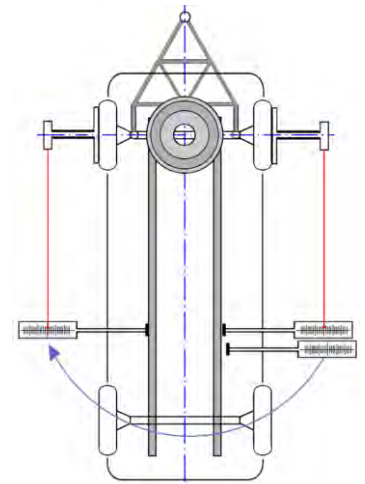


Fig. 13

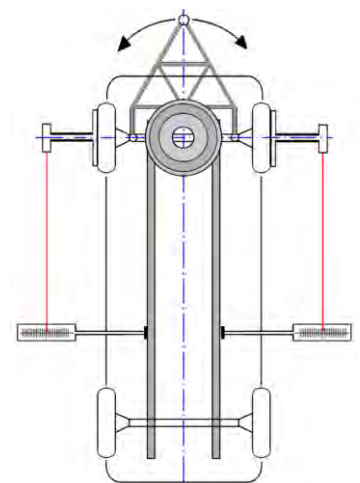


Fig. 14

## Measuring the camber

- Place the inclinometer onto the measuring column of the measuring head and lock with the knurled-head screws. (Fig. 15)
- Turn the inclinometer on using the ON/OFF button (Fig. 16)

First the welcome screen will appear with the software version, then the current camber will immediately be displayed as an absolute angle. (Fig. 17)

- Read off the measured value from the display and enter it into the test record.

**Positive camber** = a + (plus sign) appears on the display.

**Negative camber** = a - (minus sign) appears on the display.

This measurement is necessary for each individual vehicle axle.



Once all these measured values are recorded, the process must be repeated on the other side of the vehicle.

## Design of the scale holder

- Put together the scale holder and bolt it using the square connection pipe.
- The coupling adapter is unscrewed and pulled up from below into the trailer coupling of the drawbar. (Fig.19)
- Now push the star grip screw with fitting plate from above through the trailer coupling and screw the coupling adapter securely to the drawbar. (Fig. 20)
- Now push the toe scale holder onto the semi-trailer's coupling adapter using the king pin adapter and secure it with the star grip screw. (Fig. 21)



Fig. 15

ON / OFF

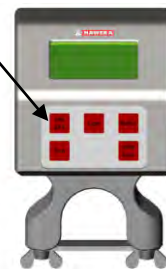


Fig. 16



Fig. 17

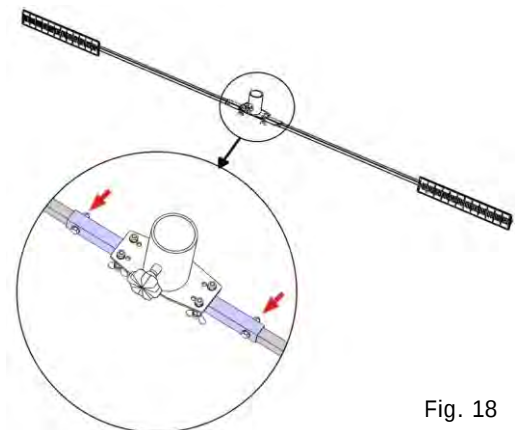


Fig. 18



Fig. 19



Fig. 20



Fig. 21

## Setting up the toe scales / floor scales

- To set up the toe scales and toe measurement, proceed exactly as described in the AXIS500 operating instructions, from Point 5.3 onwards.

**Please note:** The following formula must be applied in order to read the value in mm off the toe scale:

$$\frac{\text{Rim Diameter} \bullet 10}{2} = \text{Distance of the scale in front of the axle being measured or behind the axle being measured}$$

- Set both toe scales to »0« at the same position on both sides, one after the other. Both scale holders are now the same length.
- Now place a scale on the other marking of the axle being measured (Fig. 22)
- Both scale holders must be optically aligned in such a way that they stand at rectangles to the long axle of the vehicle.
- Turn the left-hand laser to the back and shift the entire scale to zero.
 

|                         |     |
|-------------------------|-----|
| Value at back on left   | = 0 |
| Value at front on left  | = 0 |
| Value at front on right | = 0 |

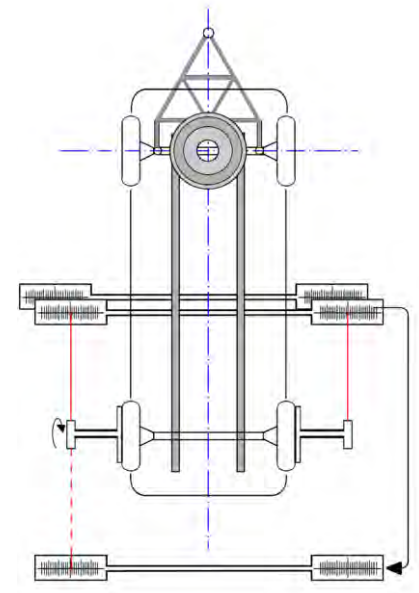


Fig. 22

## Total toe measurement

Reading off the total toe

- Point the right-hand laser to the back at the toe scale.
- Read off the measurement result:

|                      |         |
|----------------------|---------|
| 1 long scale line    | 1.00 mm |
| 1 half scale line    | 0.50 mm |
| 1 quarter scale line | 0.25 mm |

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

- If the toe corresponds to the specified values:
- Enter the measured value in the test record

Laser point behind the right-hand axle being measured is pointing outward to 5 long scale lines, i.e. this axle has a toe-in of 5 mm (Fig. 23)

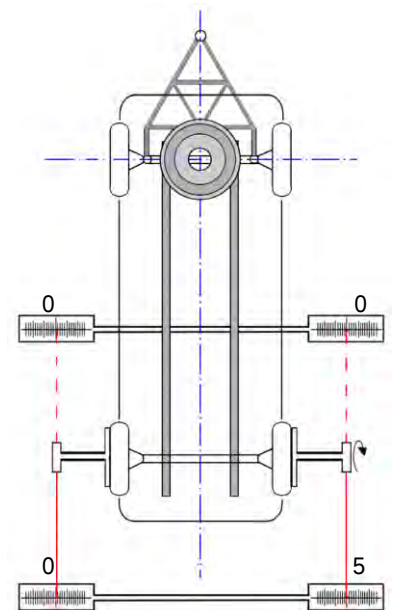


Fig. 23

This measurement process must be repeated at a later point to record all measured values for the other vehicle axles.

## Axle mismatch - measuring in relation to the frame

- Place the measuring heads against the vehicle axles being measured on both sides of the vehicle.
- Attach a magnetic scale onto one side above the wheel on the vehicle frame.
- Switch on the laser.



**Pay attention to the laser beam exit opening when switching it on!**

- Direct the laser point at the scale and set the scale to zero.
- Now secure this magnetic scale to precisely the other side of the vehicle frame and direct the laser point at the scale. Half of the displayed value is the axle mismatch.

### Example:

Drive direction left:

Magnetic scale = 0

Drive direction right:

Magnetic scale = 1 long scale line outward.

This means an axle mismatch in relation to the frame = 5 mm to the right.

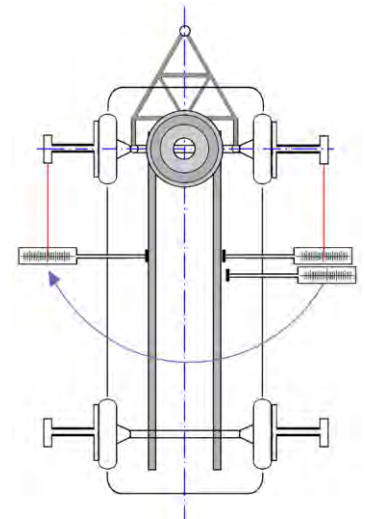


Fig. 24

## Axle inclination in relation to the long axle of the vehicle

- Direct each of the laser measuring heads on the left and right at the toe scales on the drawbar. (Fig. 25)
- Read off the value for both the left-hand and right-hand sides and halve the difference.
- Determine the inclination value using the diagram and the wheel base.
- Repeat this measuring procedure for all other vehicle axles (Fig. 26).

### Example:

Right-hand scale value points to 40

Left-hand scale value points to 44

1/2 difference = 2.0

Wheel base in example = 6 m

(see inclination table Pages 10,11)

Inclination determined for this axle = 11'

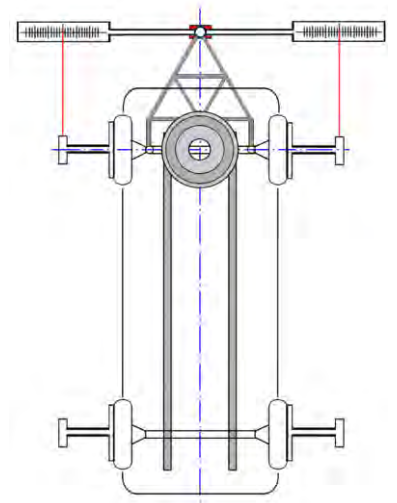


Fig. 25

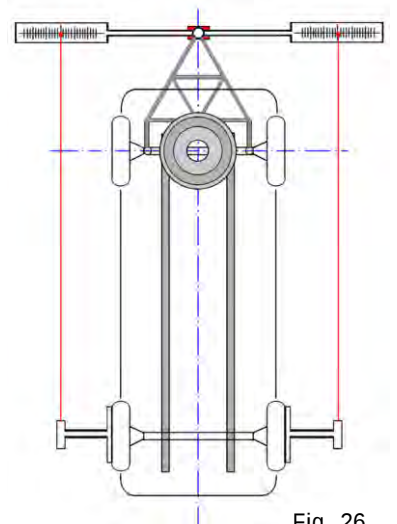
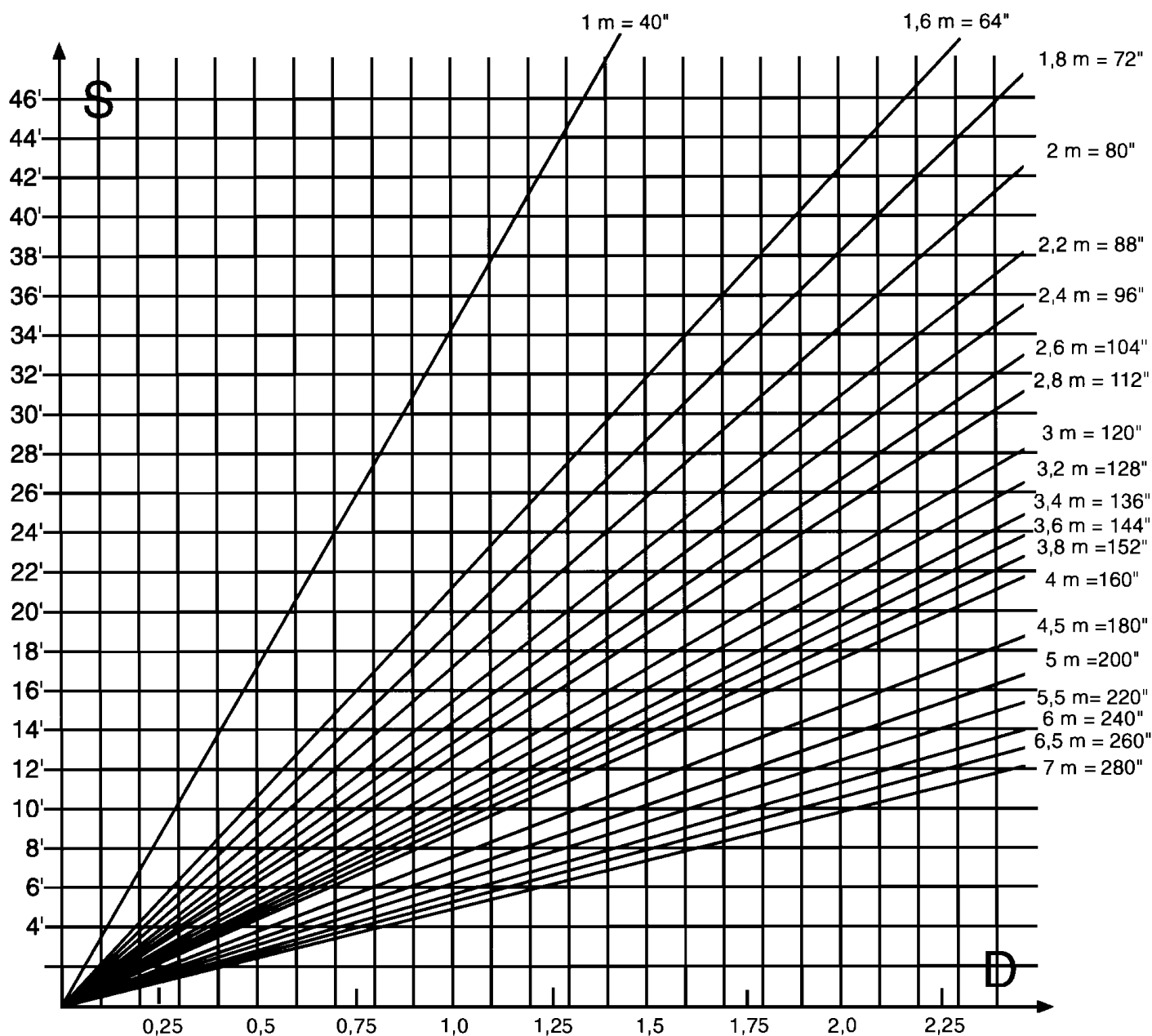


Fig. 26



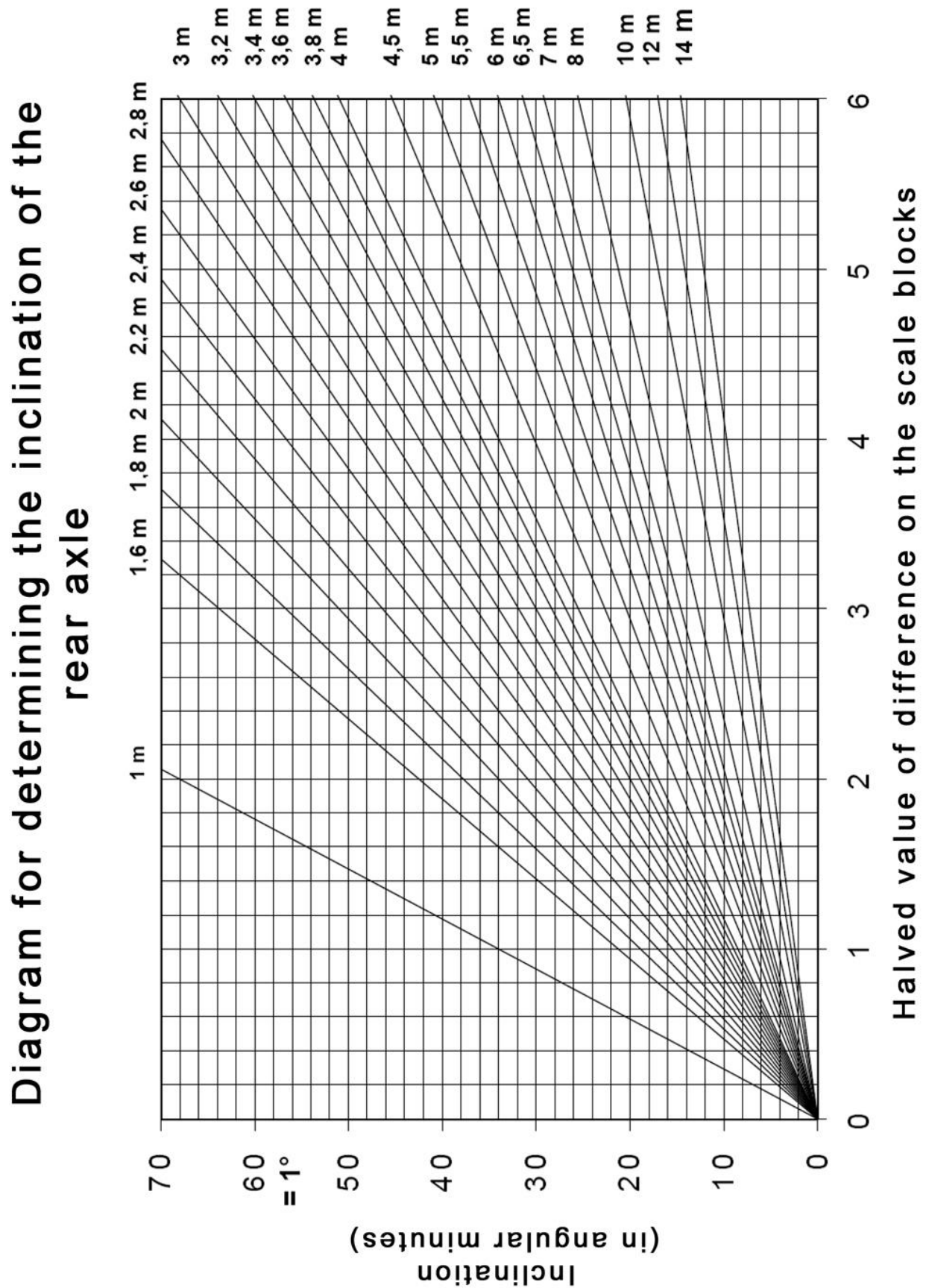
## Appendix

### Diagram for determining the inclination of the rear axles – (Diag.1) (optical measurement)



- I** = Inclination (in angular minutes)  
**D** = Halved value of difference on the scale blocks  
**W** = Wheel base (in metres)

**Diagram for determining the inclination of the rear axles – (Diag.2)**







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