

Data for Wheel Adjustment of Vehicle Ready for Driving (Curb Condition)

Camber of front wheels	$0^{\circ} \begin{smallmatrix} + 10' \\ - 20' \end{smallmatrix}$
Toe-in (rolled average)	$2 \pm 1 \text{ mm}$ or $0^{\circ} 20' \pm 10'^{(1)}$
Track difference angle at 20° lock of inner wheel	$- 0^{\circ} 15' \pm 40'^{(2)}$
Caster	$3^{\circ} 15' \pm 20'$
KPI ⁽³⁾	6°
Pivot point position (measuring point) = difference in level "a" between lower control arm pivot pin axis and lower edge of pitman arm and intermediate steering arm (pitman arm/intermediate steering arm swivelled to measuring position)	$10.5 \begin{smallmatrix} + 4 \\ - 2 \end{smallmatrix} \text{ mm}$ (8.5 to 14.5 mm)
Perm. difference in level of pivot point position between pitman arm and intermediate steering arm	4mm

1) Try for rated value when making adjustments.

2) Deduct toe-in value contained in measurement from measured track difference angle.

3) KPI is practically not measured; it is included in the design of the steering knuckle.

40.1 Adjustment of Wheels on Front Axle

Camber Adjustment of Front Wheels

Cam adjustment on rear mounting
of lower control arms

Adjusting range of cams	results in camber change on wheel of ¹⁾
approx. + 10 mm — 4 mm	approx. + 2° 15' — 1°

- 1) A change of 0° 10' in camber corresponds to a change in
caster of approx. 0° 15'.
A change of 0° 15' in camber corresponds to a change in
caster of approx. 0° 20'.

Basic adjustment of cams

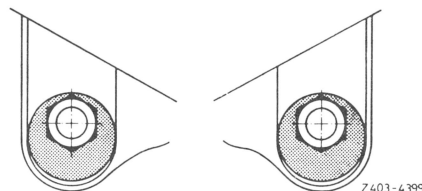


Fig. 1

Rear cams (adjustment of camber)

Caster Adjustment

Cam adjustment on front mounting
of lower control arms

Adjusting range of cams	results in caster change on wheel of ²⁾
approx. + 8 mm — 6 mm	approx. + 3° — 2°

- 2) A change of 0° 40' in caster corresponds to a change in
camber of approx. 0° 05'.
A change of 1° in caster corresponds to a change in
camber of approx. 0° 07'.

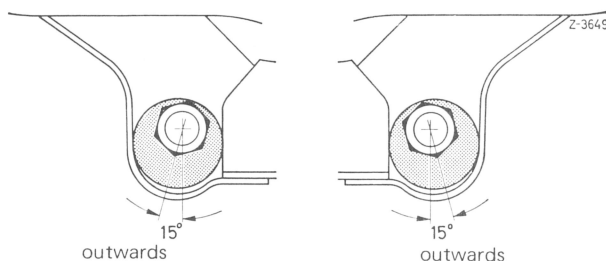


Fig. 2

Front cams (adjustment of caster)

Special Tools

Caster measuring instrument (complete) Beissbarth P 1/92	001 589 33 21 00
Center position control screw for steering	116 589 06 21 00
Measuring instrument for pivot point position	107 589 03 21 00

Notes

The following instructions provide the most significant information for wheel adjustment on front axle when using an optical axle measuring instrument.

For measuring procedure refer to operating instructions of pertinent axle measuring instrument.

Caster

The front axle provides for combined camber and caster adjustment, that is, **both wheel adjustments can be adjusted only together**. Adjustments are made by means of the cam bolts on bearing of lower control arms, the cam bolt of the front bearing is predominantly used to change caster, the cam bolt of the rear bearing predominantly to change camber.

Camber is adjusted by swivelling the lower control arm **on front bearing** (29) above cam (30a) (Fig. 3 to 5).

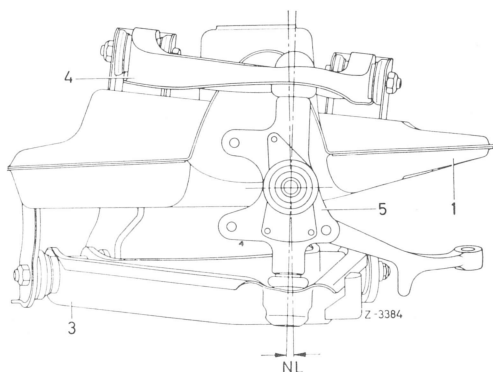


Fig. 3

- | | |
|----------------------|---------------------|
| 1 Front axle carrier | 4 Upper control arm |
| 3 Lower control arm | 5 Steering knuckle |

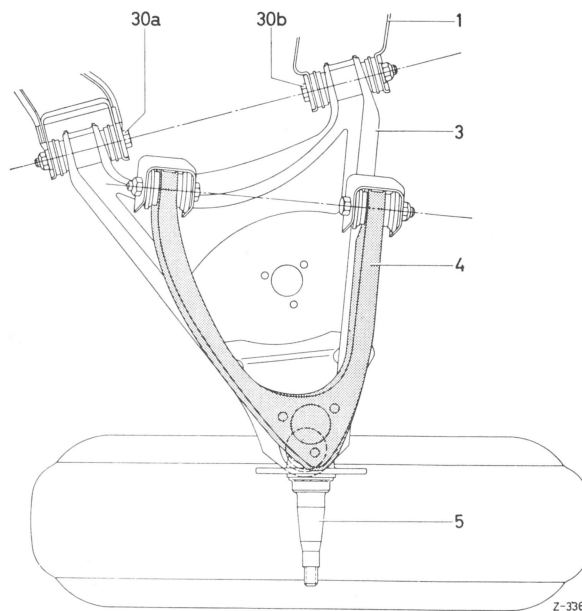


Fig. 5

- | | |
|----------------------|--------------------|
| 1 Front axle carrier | 5 Steering knuckle |
| 3 Lower control arm | 30a Cam bolt front |
| 4 Upper control arm | 30b Cam bolt rear |

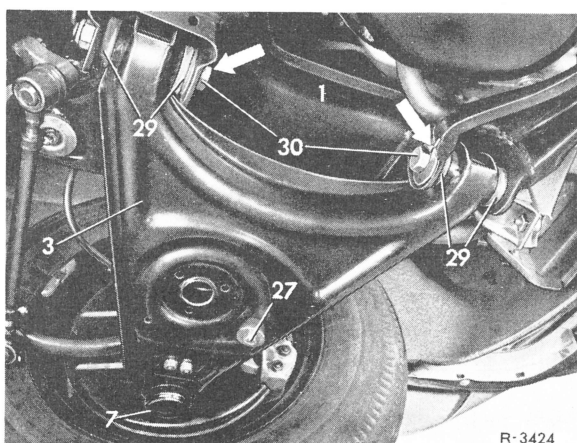


Fig. 4

- | | |
|----------------------|-------------------------------------|
| 1 Front axle carrier | 27 Torsion bar connecting linkage |
| 2 Lower control arm | 29 Rubber bearing (tension bearing) |
| 7 Supporting joint | 30 Cam bolt |

The cam plate is located at thread end of cam bolt by means of a groove (Fig. 6).

For adjusting caster, loosen hex. nut of cam bolt; apply counterhold to cam bolt when tightening hex. nut (Fig. 7).

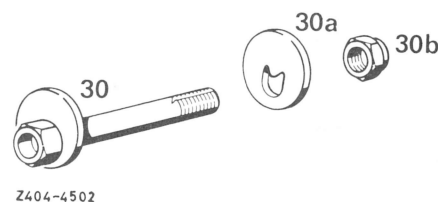


Fig. 6

- | | |
|---------------|---------------------------|
| 30 Cam bolt | 30b Self-locking hex. nut |
| 30a Cam plate | |

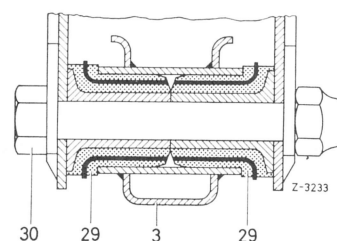


Fig. 7

- | | |
|-------------------------------------|-------------|
| 3 Lower control arm | 30 Cam bolt |
| 29 Rubber bearing (tension bearing) | |

To simplify the combined camber and caster adjustment a special, mechanical caster measuring instrument is available as a supplementary device for the axle measuring instrument.

40.1 Adjustment of Wheels on Front Axle

This permits measuring the caster in straight ahead position of front wheels, so that the change in caster can be directly read while adjusting camber and caster. **As a result, the entire adjusting procedure is considerably facilitated and shortened.**

The caster measuring instrument consists of the holder (61a) and the carrier for the spirit level (61b) (Fig. 8).

Insert holder of instrument at hex. nuts of supporting joint (7) and guide joint (6). Insert carrier for spirit level each time from the front into holder and locate by means of adjusting screw (61c). During the measuring process the stop pin (61d) should be in touch with the brake caliper.

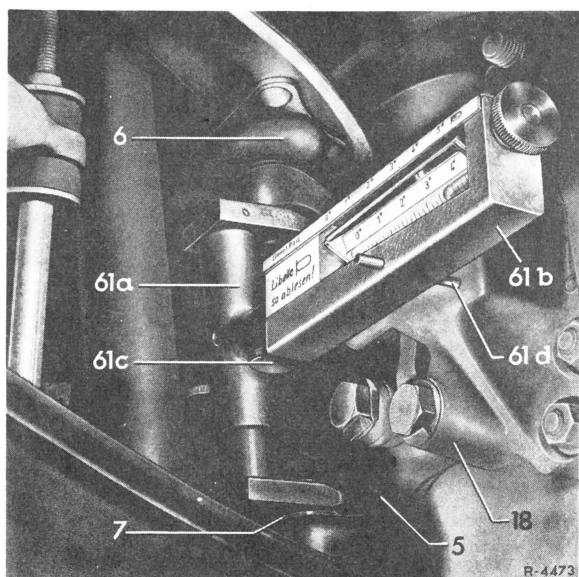


Fig. 8

- | | |
|--------------------------------|------------------------------|
| 5 Steering knuckle | 61a Holder |
| 6 Guide joint | 61b Carrier for spirit level |
| 7 Supporting joint | 001 589 34 21 00 |
| 18 Brake caliper | 61c Fastening screw |
| 61 Caster measuring instrument | 61d Stop pin |
| 001 589 33 21 00 | |

For additional information on camber and caster adjustment refer to "Adjusting Instructions for Camber and Caster".

Camber

The front wheel camber is adjusted by swivelling the lower control arm at rear bearing (29) by means of cams (30) (Fig. 4 to 6). Note that the caster will be changed accordingly.

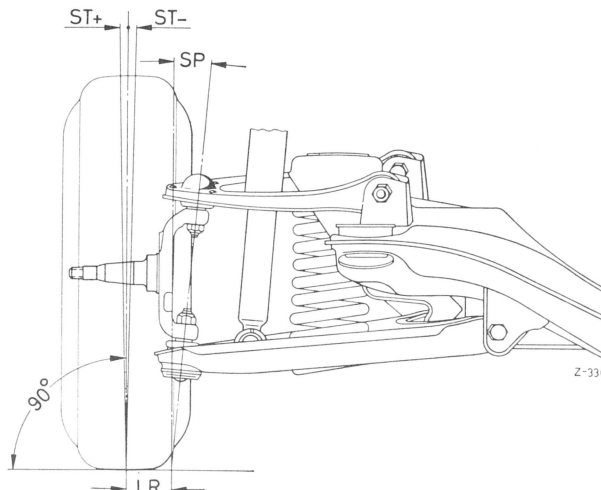


Fig. 9

- ST Front wheel camber
SP KPI
LR Radius of tire contact

Adjusting Instructions for Camber and Caster

When adjusting the camber (on rear cam) in the direction of plus, the caster will change in the direction of minus; when adjusting in the direction of minus, the caster will change in the direction of plus.

When increasing the caster (on front cam) the camber will change in the direction of plus; when reducing the caster, the camber will change in the direction of minus.

When the front axle is newly adjusted prior to measuring, move cam on bearing of lower control arm into basic position (Fig. 1).

When measuring the caster, make sure that the front wheels are always in straight ahead position.

When the straight ahead position of the wheels while completing measurements and adjustments for camber and caster is not indicated on the available axle measuring instrument, align pertinent front wheel in relation to rear wheel. The straight ahead position is attained when both wheels are fully aligned.

Do not turn front wheels to more than 25° lock

when the caster measuring instrument is installed. At a full lock (approx. 43° or 35°) there is the risk that the spirit level carrier of the measuring instrument is pushed against the torsion bar attachment and damaged.

Examples

Fig. 10

Example 1
Type 107

Measured values (X)
 Camber $-0^{\circ} 20'$
 Caster 3°

Rated values (B2)
 Camber 0°
 Caster $3^{\circ} 15'$

Corrections: Adjust **rear** cam until the caster is $2^{\circ} 40'$ (correction value B1). Then adjust to caster value B 2 with **front** cam. The specified camber will be automatically attained when adjustments are correctly made.

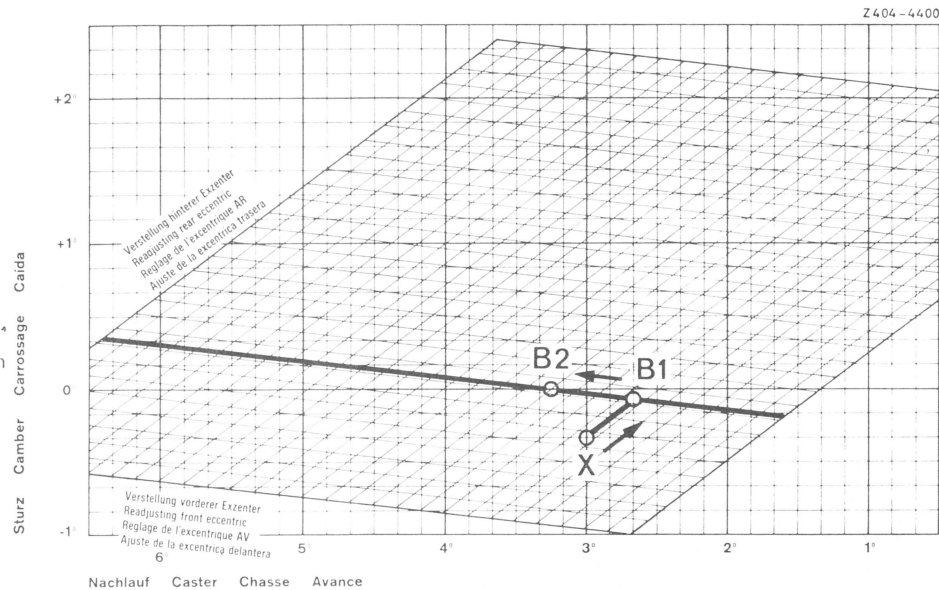


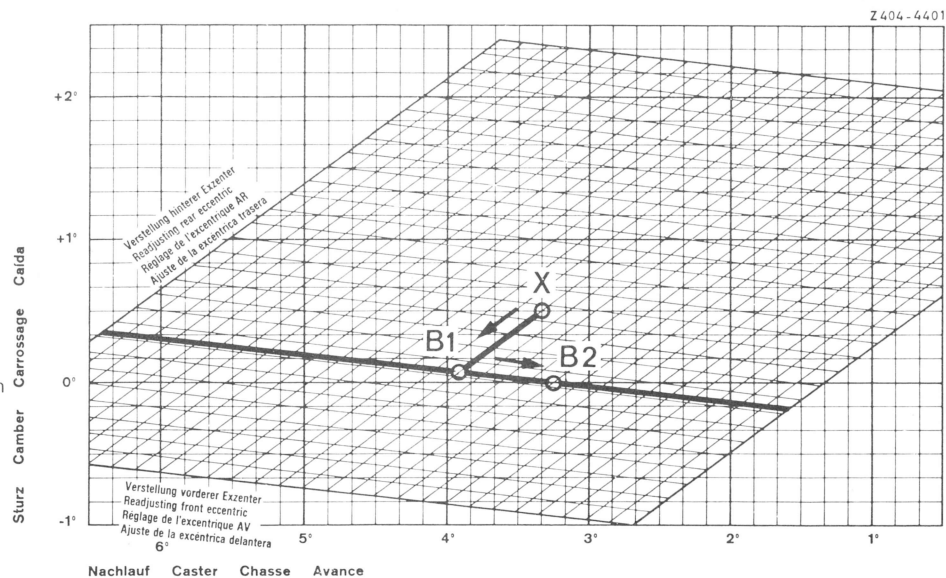
Fig. 11

Example 2
Type 107

Measured values (X)
 Camber $+0^{\circ} 30'$
 Caster $3^{\circ} 20'$

Rated values (B2)
 Camber 0°
 Caster $3^{\circ} 15'$

Corrections: Adjust **rear** cam until the caster is $3^{\circ} 55'$ (correction value B1). Then adjust to caster value B2 with **front** cam. The specified camber will be automatically attained when adjustments are correctly made.

**KPI**

The KPI is included in the design of the steering knuckle and is actually never measured.

Toe-in

The toe-in is the difference between the distance of the front wheels at their front end in relation to the rear wheels measured at the rim flanges of the disc wheels at the level of the wheel center.

The elastic support of the control arms requires a pertinently higher toe-in value, which is reduced to the correct size when driving. Too much toe-in results in increased tire wear starting from the outside of the treads to approx. the center of the tire, while insufficient toe-in results in increased tire wear starting from the inner side of the treads. In both cases the treads are slightly roughened.

40.1 Adjustment of Wheels on Front Axle

For measuring the toe-in, the steering should be in center position. For this purpose, remove closing plug (2) and locate piston by inserting the center position control screw (65) (Fig. 12 and 13).

Caution! Do not turn steering wheel when the center position control screw is inserted!

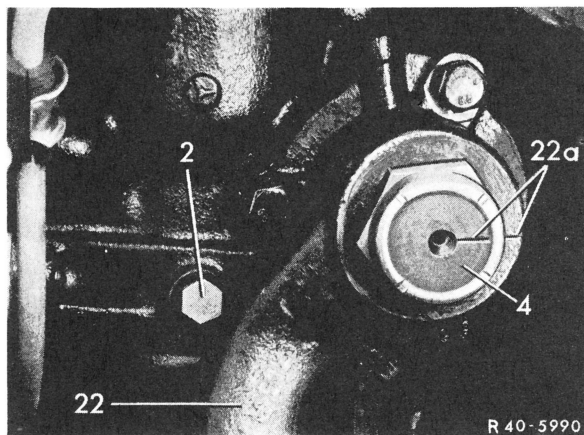


Fig. 12

- | | |
|---|----------------------------------|
| 2 Closing plug in steering gear housing | 22 Pitman arm |
| 4 Steering shaft | 22a Assembly mark for pitman arm |

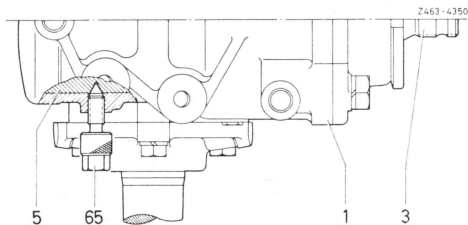


Fig. 13

- | | |
|-------------------------|---|
| 1 Steering gear housing | 65 Center position control screw 116 589 00 21 00 |
| 3 Steering worm | |
| 5 Piston | |

Make sure that the steering is already approximately in center position prior to loosening the closing plug.

In center position of the steering the two surfaces on the steering coupling (12) for receiving the steering spindle are horizontal, if the steering coupling has been mounted correctly in relation to steering worm (Fig. 14).

The toe-in is adjusted by changing the length of the two track rods.

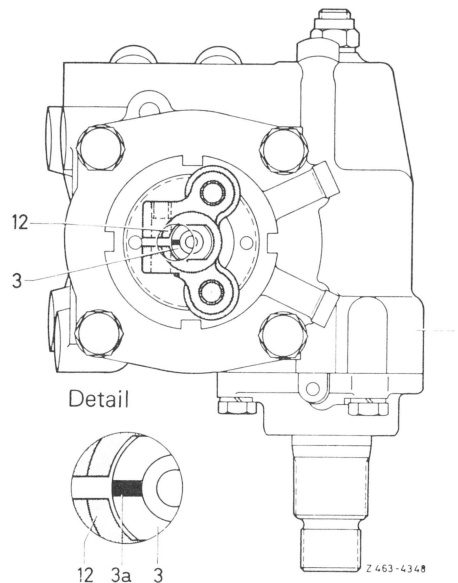


Fig. 14

- | | |
|--|----------------------|
| 3 Steering worm | 12 Steering coupling |
| 3a Assembly mark for steering coupling and steering worm | |

Prior to tightening hex. bolts for clamps, swivel both track rod ends each time in the same direction against lock (Fig. 15).

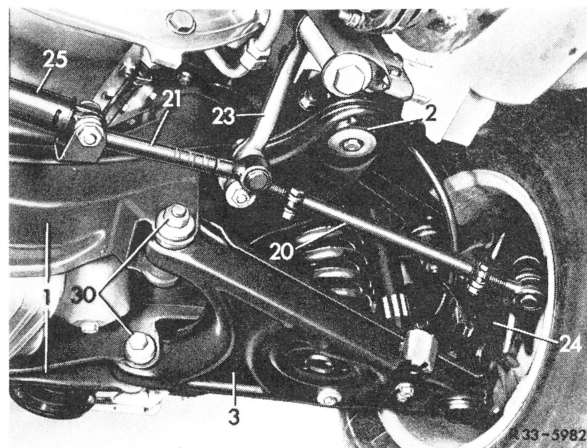


Fig. 15

- | | |
|----------------------|--------------------------------|
| 1 Front axle carrier | 23 Intermediate steering lever |
| 2 Rubber mounting | 24 Steering knuckle arm |
| 3 Lower control arm | 25 Steering damper |
| 20 Track rod | 30 Cam bolt |
| 21 Drag link | |

The hex. bolts of the clamps are provided with fine threads M 8 x 1 metric; do not use standard bolts and nuts.

These nuts are secured only by the specified high-tension rings, never use normal snap rings.

Track Difference Angle (Track Angularity)

To check the geometric layout of the steering system, the track difference angle is measured at a 20° lock of the inner wheel.

The **basic assumption** for these measurements is that both wheels have the same toe-in in the straight ahead position.

When the track difference angle is measured by optical means, the toe-in must be deducted from the measuring results.

Example:

Toe-in adjusted to:
3 mm or $0^{\circ} 30'$

Measured track difference angle:

Lefthand lock	$- 0^{\circ} 10'$
Righthand lock	$+ 0^{\circ} 20'$

Actual track difference angle:

Lefthand lock	$- 0^{\circ} 40'$
Righthand lock	$- 0^{\circ} 10'$

When the track difference angle is mechanically measured by means of the rotating supports, the actual track difference angle is directly shown, since the graduated scales of the rotating supports were each first set to straight ahead position, that is, to 0° .

Slight deviations from the nominal value have no influence on the driving performance and on tire wear. The effect produced on the tire wear pattern in the event of major deviations is similar to using the wrong toe-in.

Major deviations may be the result of the following causes, always assuming that the caster and the camber are correctly adjusted:

1. Toe-in not adjusted in straight ahead position of steering, resulting in non-uniform track rod lengths.
2. Wrong pitman arm, intermediate steering lever or steering knuckle arm installed.
3. Pitman arm wrongly mounted on pitman shaft.
4. Steering knuckle arm distorted.

Pivot Point Position

Correct location of the ball joints in the steering linkage is decisive for almost constant toe-in when the wheels deflect.

The pivot point position should always be checked on vehicles involved in an accident. If in spite of a correct ball point position and good condition of the ball joints of the steering linkage there is still too much of a change in toe-in, the fault must be the result of a distorted steering knuckle arm on steering knuckle (also refer to 46.1—550).

An incorrect pivot point position may show up in the tire wear pattern as too much or insufficient toe-in (refer to section "toe-in" and "track difference angle").

The difference in height "A" between the bearing of the lower control arm on front axle carrier and the center of the ball pin on inner joint of track rod serves for checking the pivot point position. In practice, however, the pivot point is not measured directly, but as dimension "a" (Fig. 16).

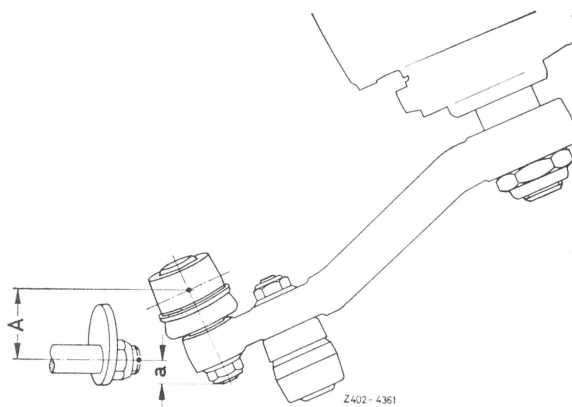


Fig. 16

A Pivot point position (not measurable in practice)
a Pivot point position (measuring point)

For this purpose, swivel pitman arm or intermediate steering lever into the position resulting from measuring device.

Simultaneously, turn ball head of track rod toward the rear against lock (Fig. 17).

40.1 Adjustment of Wheels on Front Axle

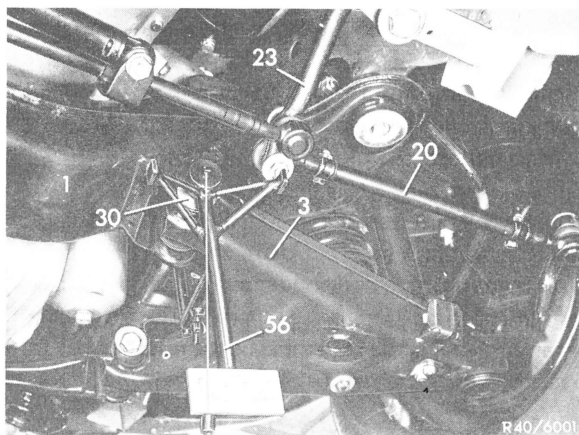


Fig. 17

- | | |
|----------------------|--------------------------------|
| 1 Front axle carrier | 23 Intermediate steering lever |
| 3 Lower control arm | 30 Cam bolt |
| 20 Track rod | 56 Measuring instrument |
| | 107 589 33 21 00 |

Deviations of pivot point position can be balanced within certain limits on intermediate steering lever by means of washers (3) (Fig. 18).

For details also refer to 46.1—520.

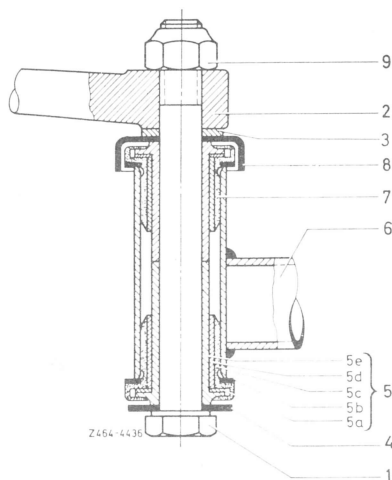


Fig. 18

- | | |
|-------------------------------|------------------------------|
| 1 Hex. bolt | 6 Bearing |
| 2 Intermediate steering lever | 7 Upper rubber slide bearing |
| 3 Washer | 8 Dust cap |
| 4 Sealing washer | 9 Self-locking hex. nut |
| 5 Lower rubber slide bearing | |

Normally, a steel washer 3.5 mm thick is fitted to the bearing of the intermediate steering lever. To correct the pivot point position, that is, to fit the intermediate steering arm to the position of the pitman arm either remove washer or add additional washer.