

# **Opel Astra Opel Kadett**

## **Workshop Manual**

### **Section E**

# **Frame, Front wheel Susp., Wheels & Tyres**

cardiagn.com

Issued by: Service Division  
Delta Motor Corporation  
July 1993

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# FRAME

## General Information

Labour operations concerning replacement of load — carrying body components are described in Section A. Before commencing any major operations, all parts which could obstruct work on the body or could be damaged or set on fire by flying sparks during cutting or welding operations are to be removed. They are to be relocated and/or protected with covers so that they cannot obstruct the work or be damaged.

For professional repair of vehicles damaged in accidents, use checking and straightening bench systems.

### WARNING:

All operations must be carried out at the technician's own responsibility according to the regulations of the local authorities regarding health protection, accident prevention and environmental protection.

The fuel tank and fuel pipes must always be removed if welding operations are performed near these parts. These measures help to prevent the risk of explosion or fire.

The vehicle must be secured on the lifting platform when a change in weight distribution is caused by the removal of parts. The vehicle is to be supported, so that the underbody cannot bend or warp under its own weight.

As all welded parts (primary and secondary frames) — especially in the area of the floor frame — are of great importance to the driving, operating and, above all, accident safety (deformation behaviour) of the vehicle, the given separation points, weld seam formations and welding processes must be observed according to the information in the Service Instructions.

The self-supporting body must be able to withstand the changing loads which occur during extreme driving conditions and must also have additional safety reserves.

Driving safety is guaranteed only when the entire body is in technically perfect condition, so that the forces arising during operation can be absorbed over long periods of time and without ill-effect.

The given operation procedures and methods should enable repair work to be correctly, professionally and economically carried out.

## General Notes for Underbody Repair

Deformations that occur must be returned to the original state by using cold forming and straightening systems.

If there are deformations in the area of the primary and secondary frames, always carry out repair work using checking and straightening bench equipment.

Only when these preconditions are fulfilled can a correct diagnosis be made and the procedure for repair determined on the basis of this

The given separation points, weld seam formations and welding processes must be observed with the utmost care, in order to achieve the original tensile behaviour.

For shielded arc welding (MAG), use active inert gasses, such as CO<sub>2</sub> (carbon dioxide) and mixed gasses with high argon content and percentages of oxygen and carbon dioxide.

The necessary contact pressure of the electrodes for resistance welding with a manual spot — welding tongs is not adequate with welding tongs with a length of over 50 cm.

“Genuine Delta Parts” with the corresponding anti-corrosion agents, damping and sealing compounds are to be used exclusively.

Labour operations dealing with the replacement of frame parts are described in Section “A”.

# Quick Measure Method

Instead of using welding gauges for frame repair, the advancement of technology now prescribes the usage of straightening benches (i.e. Celette Co., Car Bench Co.).

For quick evaluation of damage on the vehicle underbody, instructions are given in this section for the usage of an economical test method with the Telescope Measuring instrument MKM-642-A. Its usage is quite simple. Exchangeable measuring points are used to quickly locate actual values at different measuring locations. Removal of components or trailer hitch (if present) is not necessary.

Checking the axle alignment provides an additional evaluation of the extent of the damage.

At the front, wheel camber, toe-in and toe-out are measured (see operation "Wheel Camber, Toe-in and Toe-out, Check" in this section). When measuring the rear axle alignment, see corresponding operation "Rear Axle Alignment, Check" in section F.

Raising of the outer spring winding in its mounting is a clear way of checking for deformation at outrigger or frame side member.

Fig. 1 shows checking dimension between the rear axle supports — measured with bracket before hole exposed. The measured value is 1025 mm.

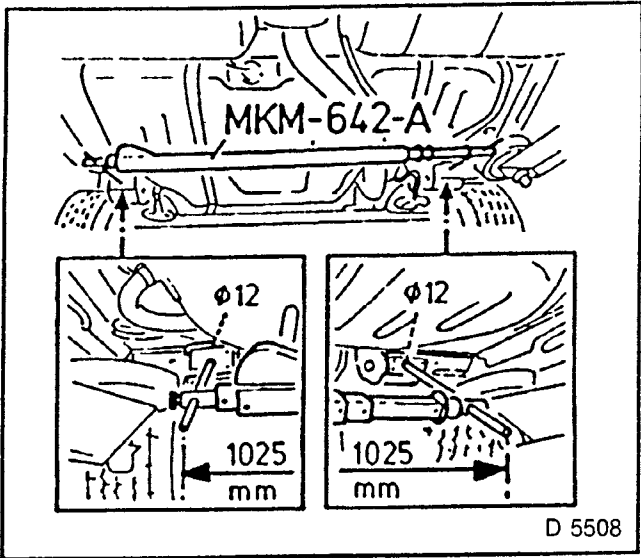


Fig 1

Fig. 2 shows checking dimension of the diagonal front frame to the rear frame.

The measurement is 1948 mm for the illustrated diagonal.

The measurement is 1965 mm for the other diagonal; the measuring cone from MKM-642-A can not be used for the rear right bore hole.

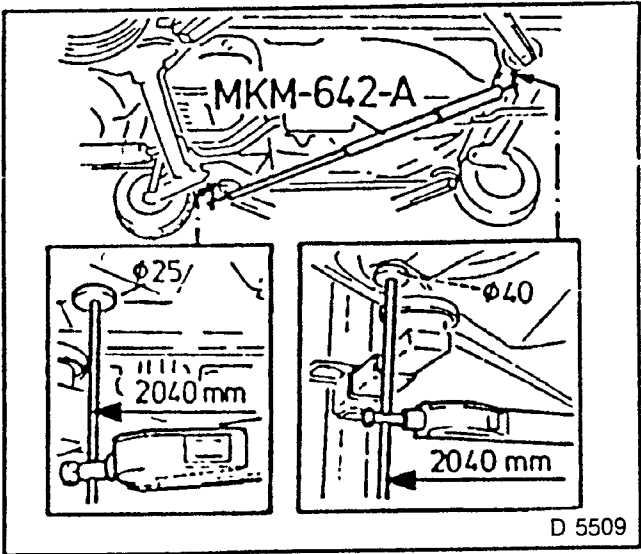


Fig. 2

Fig.3 shows checking dimension at lateral vehicle floor.  
The measurement is 1542 mm at the left side.  
The measurement at the right side is 1557 mm.

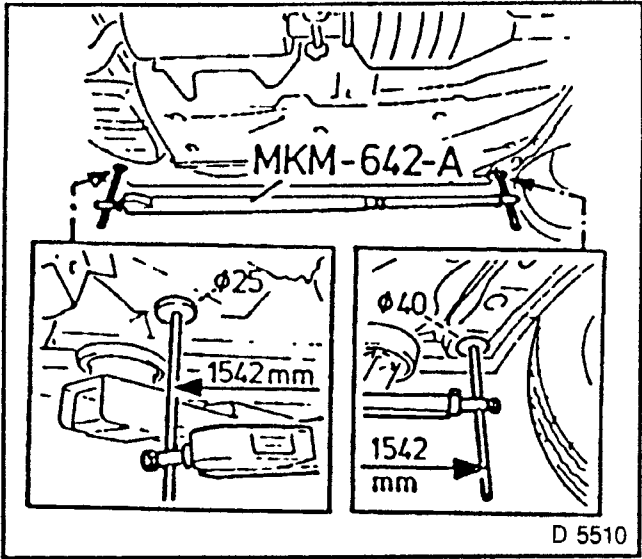


Fig. 3

Fig. 4 shows checking dimension between both front frames. The measurement is 920 mm

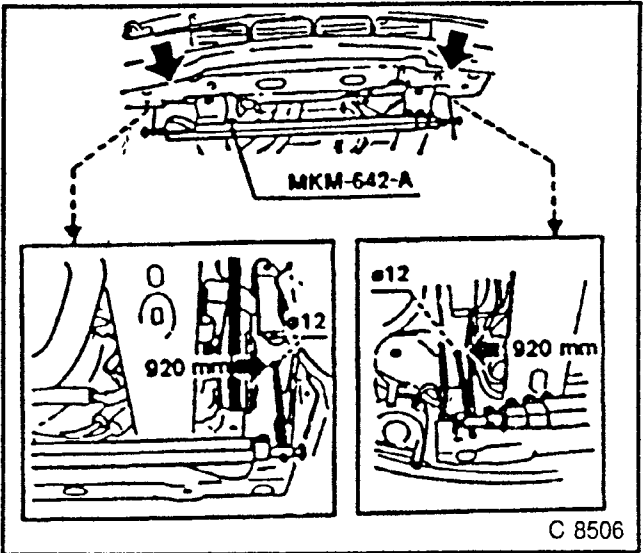


Fig 4

Fig. 5 shows checking dimension between both rear frames.  
The measurement is 1014 mm.  
With trailer hitch installed (bore holes are hidden): Use round heads of press pins as reference marks

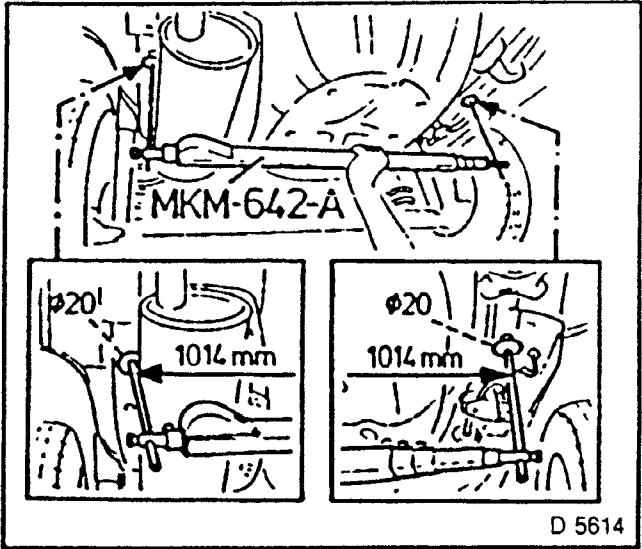


Fig 5

## Instructions for Use of Checking and Straightening Bench Systems

In order to guarantee exact repair of the deformed vehicle body, use checking and straightening bench systems. Using these systems, it is not only possible to check floor frame groups for warp, but also to directly align body components and, if necessary, to position new body components and weld them in exactly. Measurement and checking points on the floor frame groups and vehicle body are represented on the underbody dimension chart and in body dimension plan (see section A).

Observe the user instructions and regulations of the manufacturer of the straightening system.

The following body points are provided in the floor frame for positioning or probing:

- Check bore hole in front side member and front fastening in front axle body.
- Fastening of engine support.
- Upper spring strut mounting (spring strut dome)
- Front fastening for front axle body — not on vehicles with short outrigger.
- Rear fastening for front axle body.
- Central fastening for front axle body.
- Fastening for steering gear — left and right hand drive.
- Check bore hole and fastening for rear wheel suspension longitudinal brace.
- Rear shock absorber mounting.
- Check bore hole for rear side member.

Underbody Dimension Chart — View from below

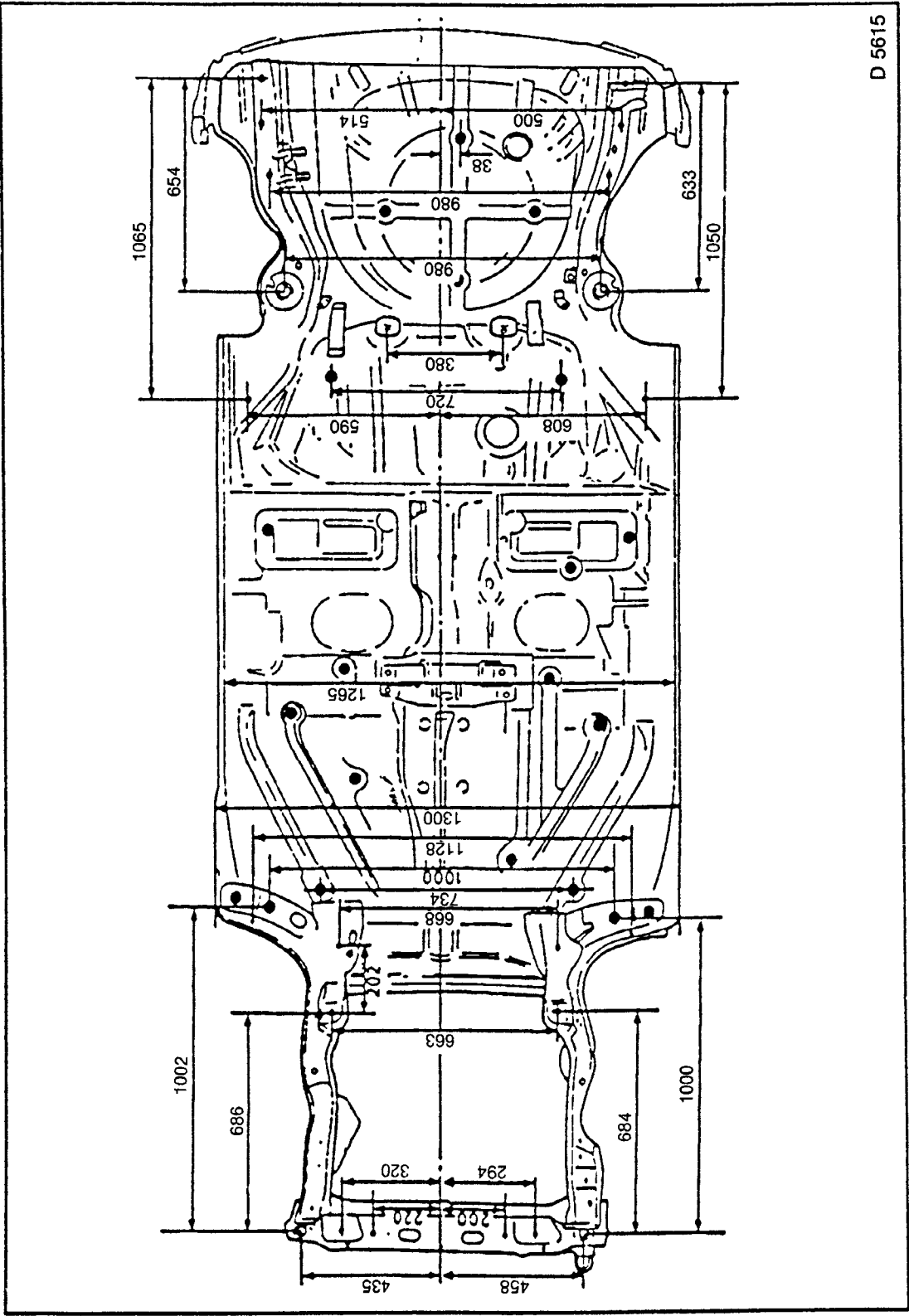


Fig 6

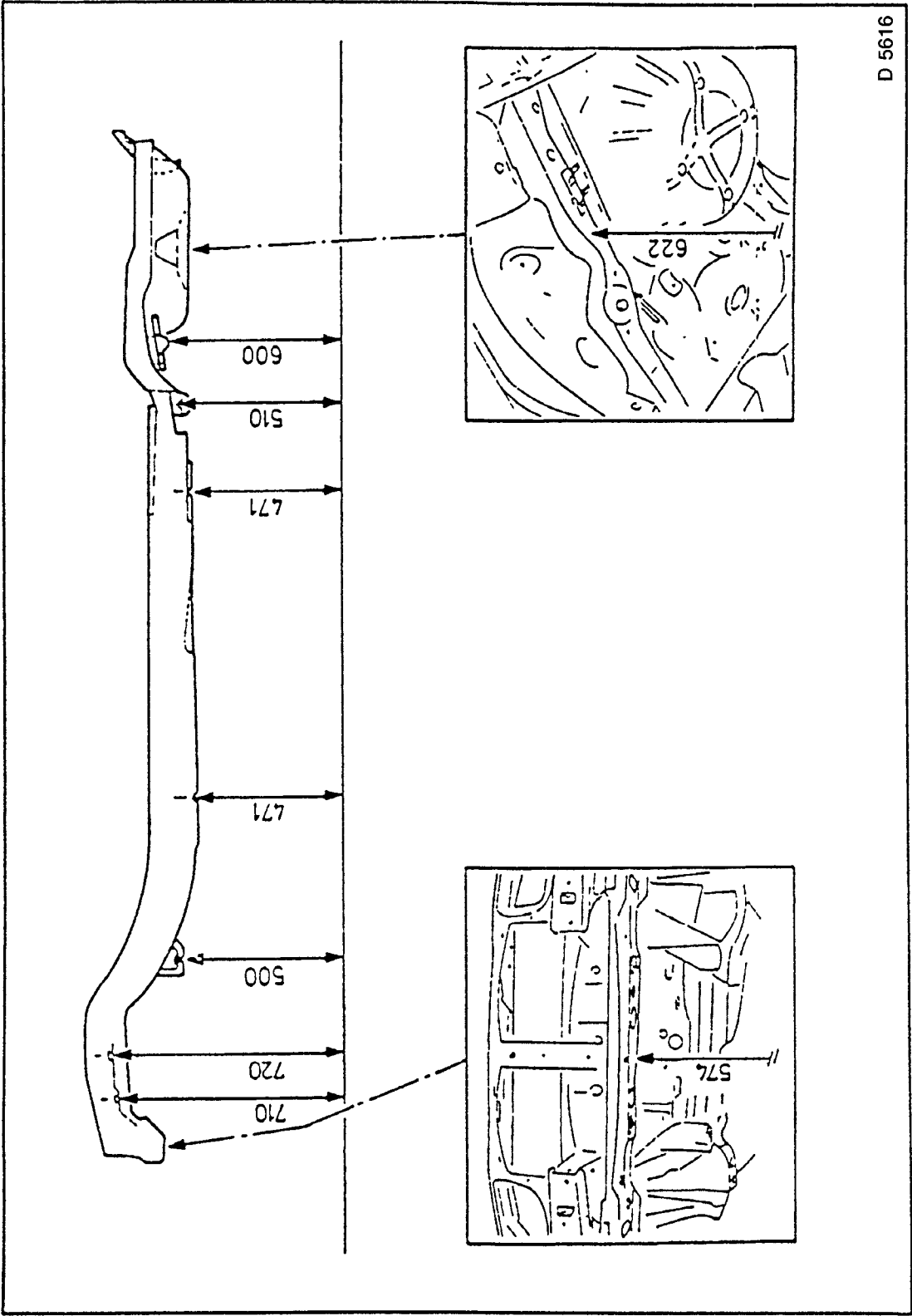


FIG. 7 — LEFT SIDE MEMBER — ON FRONT AXLE BODY WITH SHORT OUTRIGGER



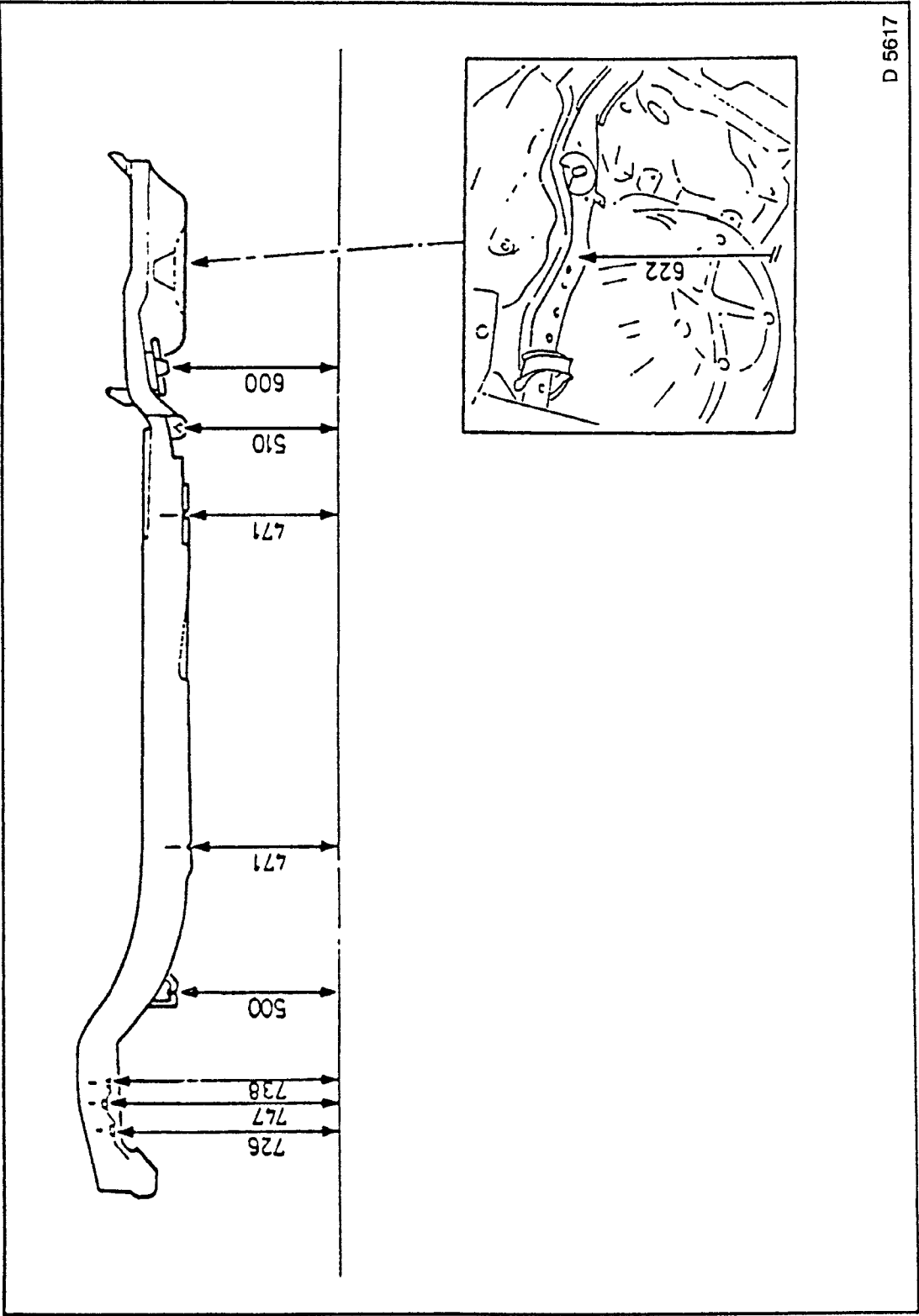


FIG. 8 -- RIGHT SIDE MEMBER -- ON FRONT AXLE BODY WITH SHORT OUTRIGGER

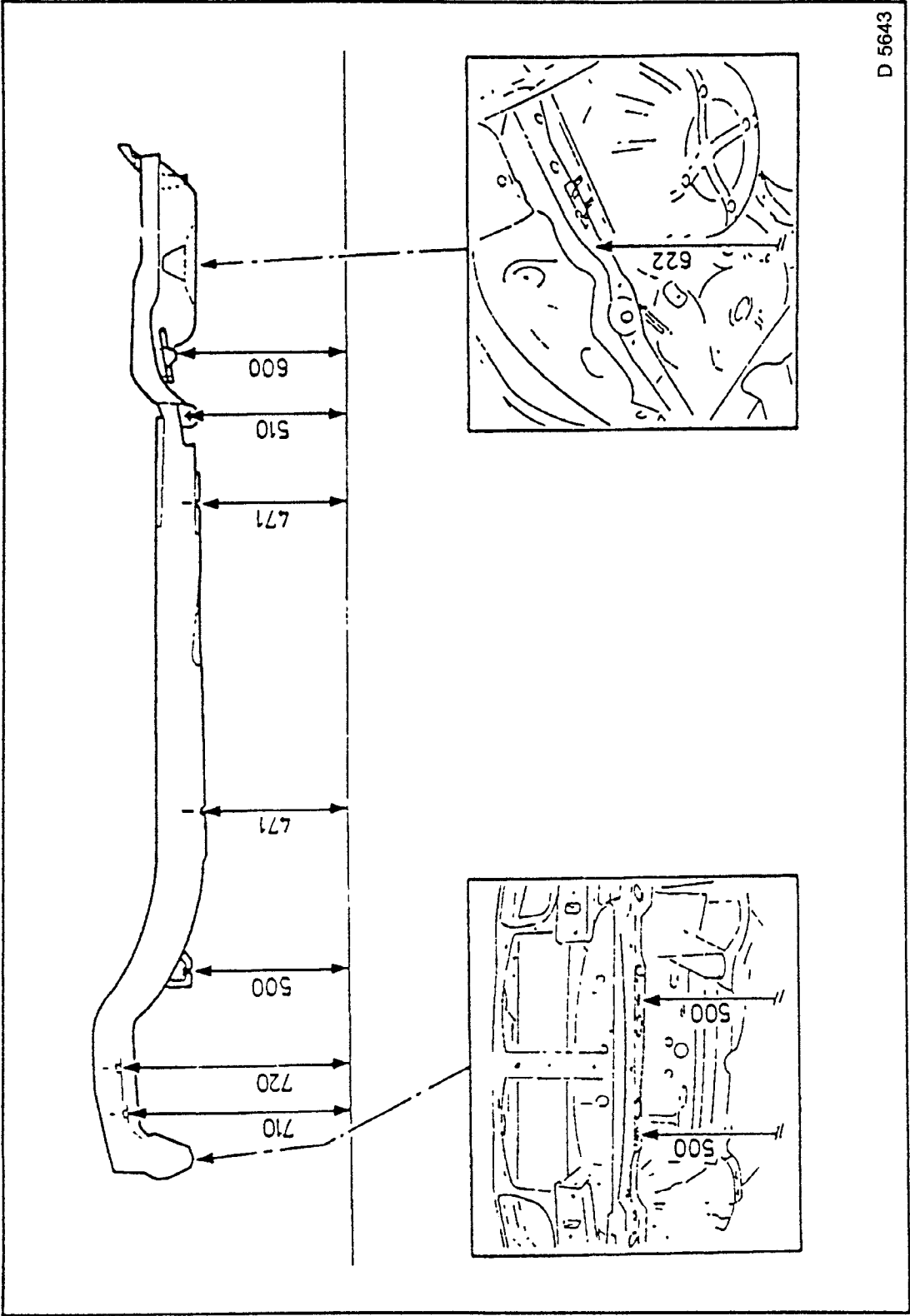


FIG. 9 — LEFT SIDE MEMBER — ON FRONT AXLE BODY WITH LONG OUTRIGGER

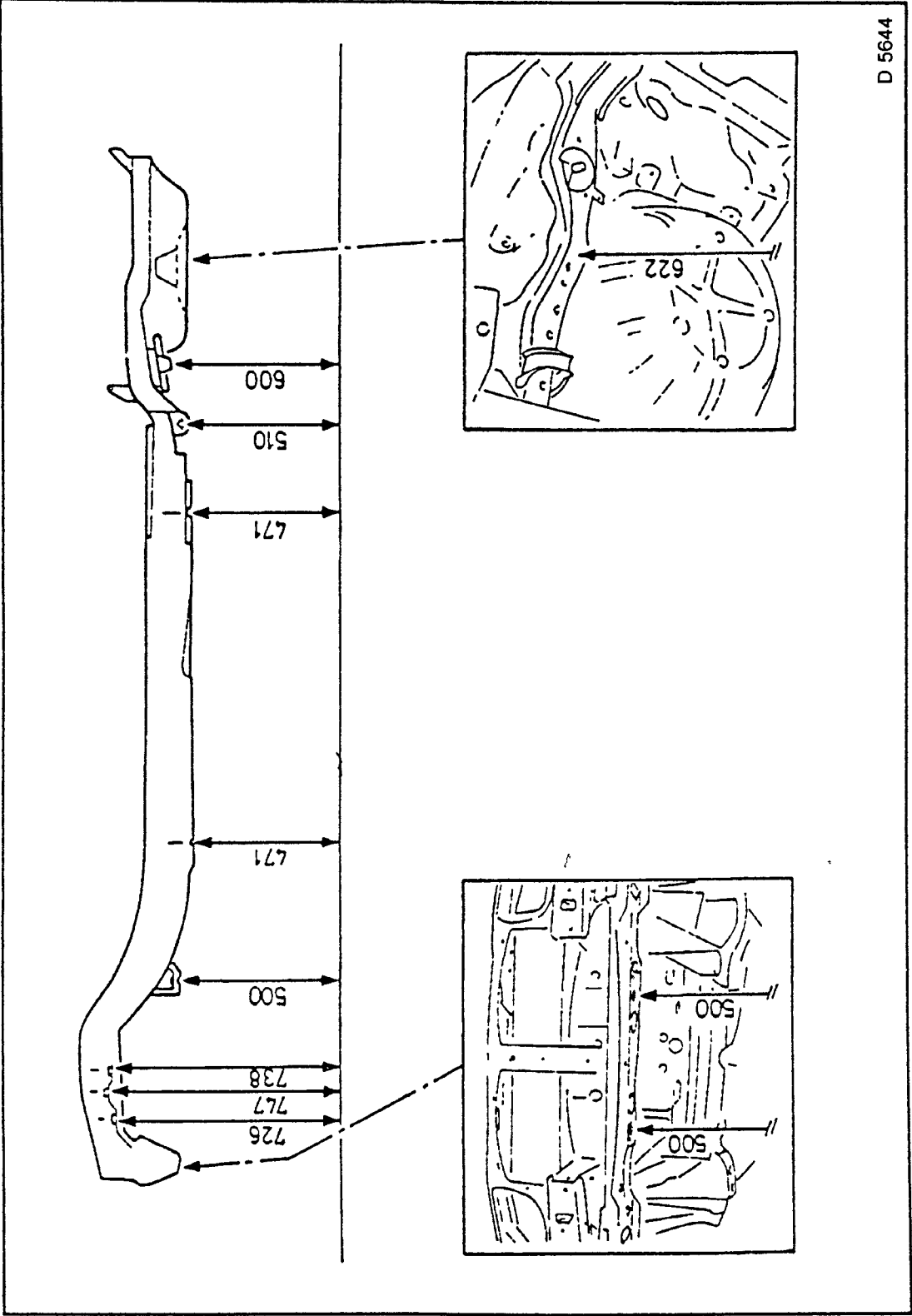


FIG 10 — RIGHT SIDE MEMBER — ON FRONT AXLE BODY WITH LONG OUTRIGGER

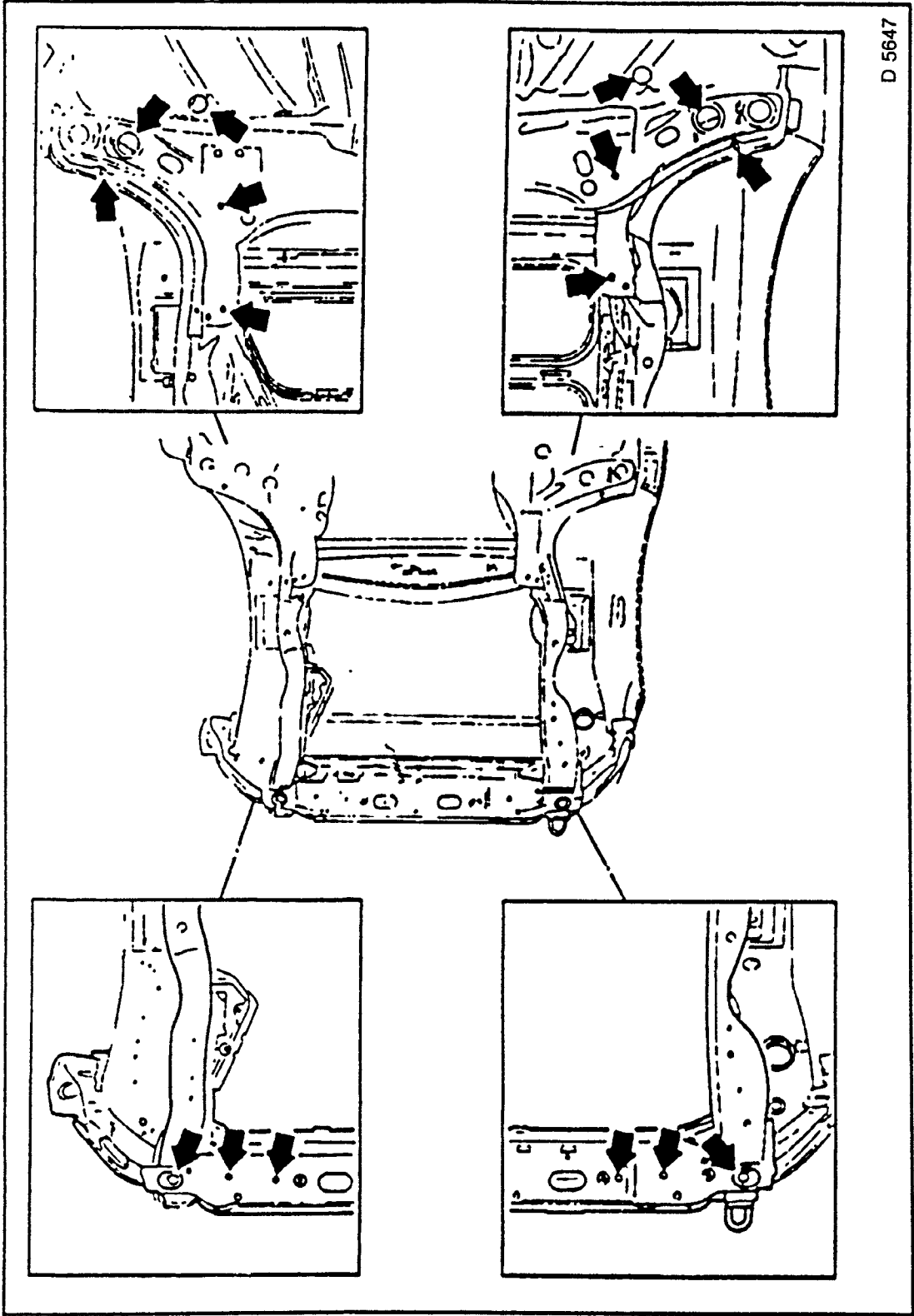
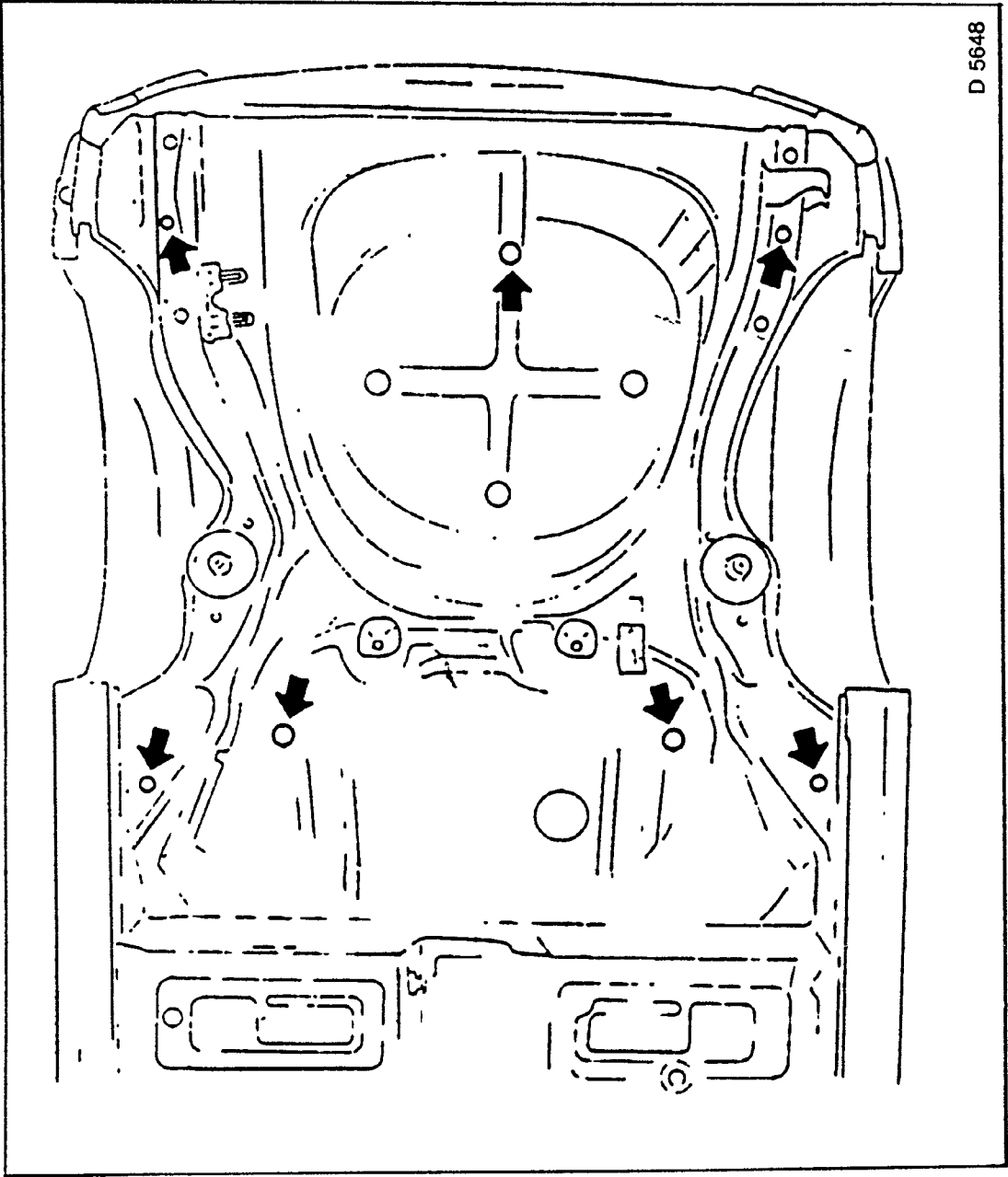
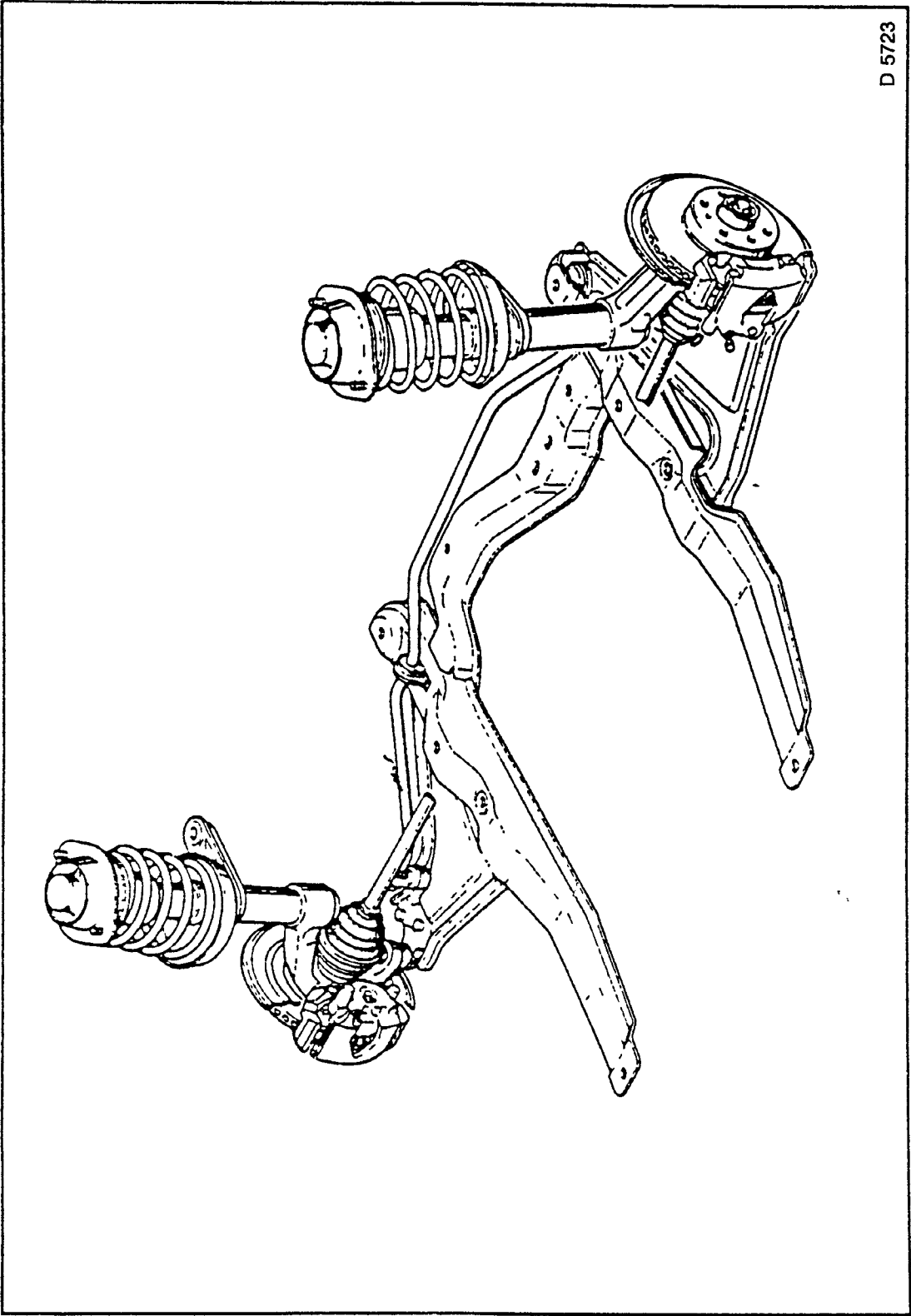


FIG. 11 — VEHICLE FRONT — MOUNTING POINTS



D 5648

FIG. 12 — VEHICLE REAR — MOUNTING POINTS



D 5723

Fig. 13 — FRONT AXLE (WITH LONG OUTRIGGER)

# FRONT WHEEL SUSPENSION

## General Information

When removing the front wheels, mark the position in relation to the hub to assist when installing. Installation must always be carried out with the prescribed torque.

On threaded connections which are inserted with locking compound, the thread must be re-cut. If the new screws are not microencapsulated they must be inserted with Locking Compound.

Operational steps which are not explained can be taken from the corresponding operation.

Ensure that no dirt enters between brake disc and front wheel hub during installation. Contact surfaces must be smooth and free of burrs.

Always replace front springs/spring strut cartridges in pairs.

Use spring strut cartridges from the same manufacturer.

All operations must be carried out at the technician's own responsibility according to the regulations of the local authorities regarding health protection, accident prevention and environmental protection.

## CHECKING AND ADJUSTING OPERATIONS

### Camber, Caster and Toe-out — Check

#### IMPORTANT

1. Uniform and good tyre tread profile.
2. Adjust tyre pressures for full load, same on both sides — see Technical Data for ratings.
3. All wheel rims must be in good condition.
4. There must be no play in the ball joints (tie rod joints and guiding joints).
5. Bring vehicle into checking position.
6. Load each front seat with 70 kg.
7. Half fill fuel tank.
8. Rock vehicle several times.  
If this procedure is omitted, an excessive camber angle will be measured, since the lower control arm **will not** have attained its normal operating position.
9. When using axle measuring unit with turntables, which record no lateral forces, the vehicle must first be rolled back 1 m and then pushed forward again.
10. Position steering for driving straight ahead (see operation "Toe-out, Adjust").
11. Establish actual values on axle measuring equipment (prescribed values see "Technical Data").  
The user instructions and manufacturer's specifications are to be observed.
12. Fill out axle measuring card

# Toe-out — Adjust

## INSPECT

- 1. Straight ahead position.  
Reference dimension "1" = 325 mm

## MEASURE

- 1. Place Checking Gauge KM-476 between tie rod ends and left steering housing fastening offset.
- 2. Hold steering wheel in this straight ahead driving position.

**NOTE:**  
The clamp bolt for the steering spindle flange must rest on top horizontally, the steering wheel spokes must be centred and slanted downwards. Correct, if necessary.

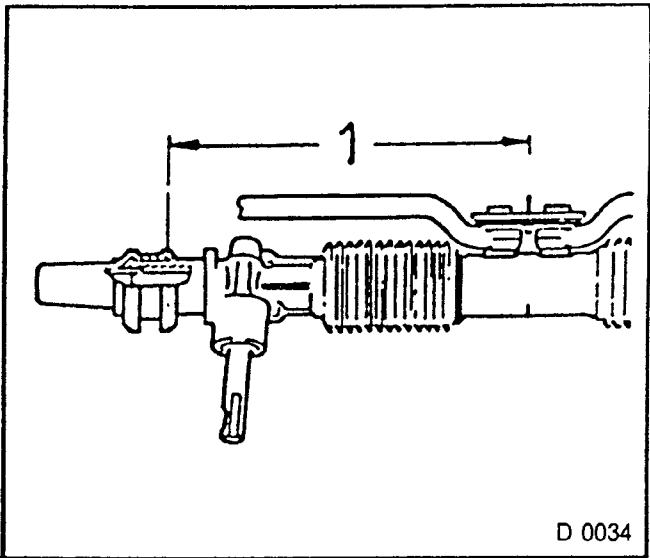


Fig. 14

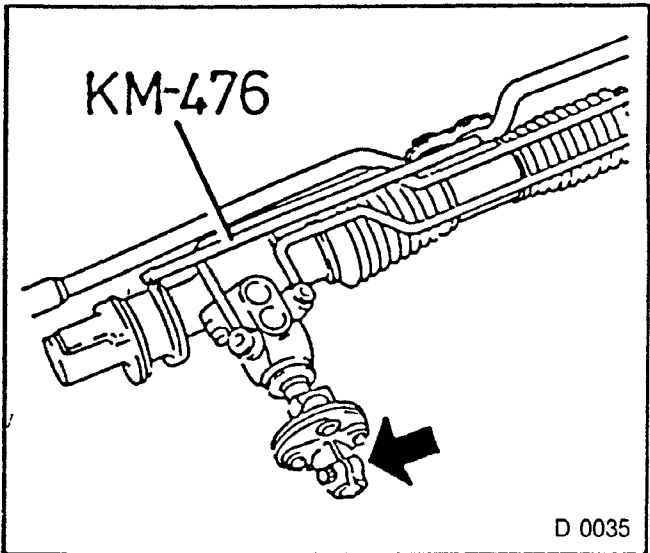


Fig. 15

## ADJUST

- 1. Toe-out on adjusting bolts.  
For recommended values see "Technical Data".  
Always carry out adjustment on both tie rods.  
Permissible difference in length of tie rods = 5 mm.

## TIGHTEN (TORQUE)

- 1. Clamp bolts of both tie rods — 20 Nm.  
Check toe-out adjustment.

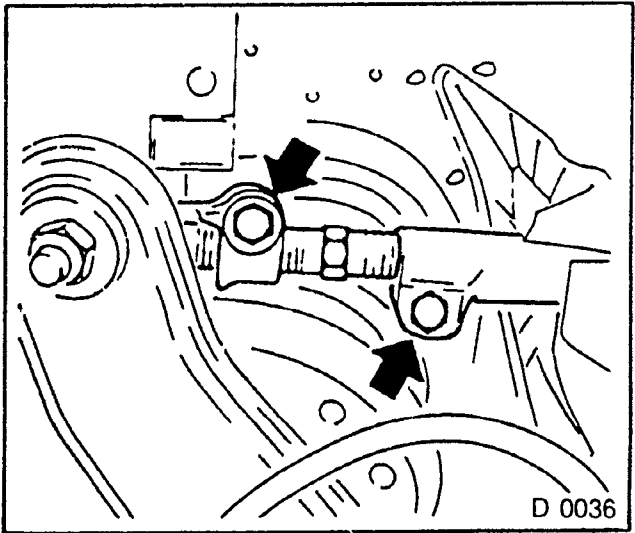


Fig. 16



# **AXLE DRIVING SHAFT, WHEEL BEARING, FRONT WHEEL HUB**

## **Wheel Bearing, Front Wheel Hub — Remove and Install** **REMOVE, DISCONNECT**

1. Spring strut (see page 23)
2. Brake disc — detent screw from front wheel hub.

### **DISASSEMBLE**

1. Press off front wheel hub from wheel bearing.
2. Place two flat or square metal bars under spring strut (arrows).  
F10, F13 manual transmission: KM-466-5.  
F16, F20 manual transmission: KM-500-5.
3. Half of the inner bearing ring remains on the front wheel hub.
4. Cover plate from steering knuckle.

### **DISASSEMBLE**

1. Retaining rings from steering knuckle (pos. 1 and 2)

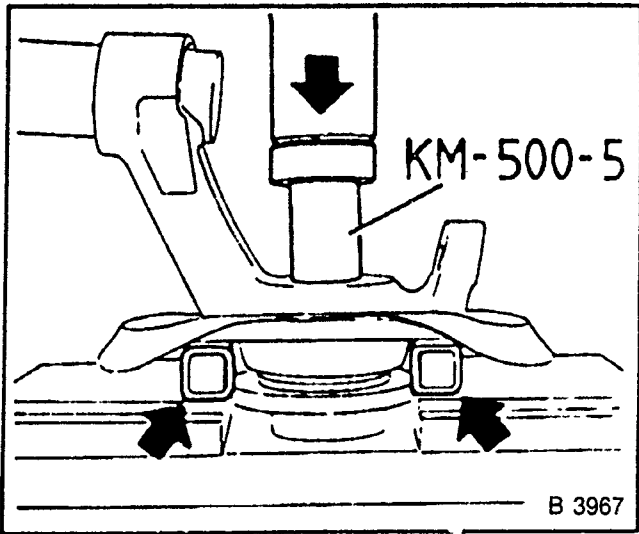


Fig. 17

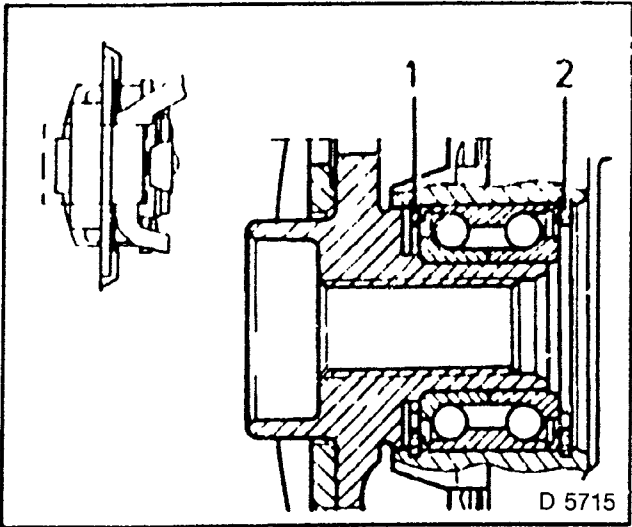


Fig. 18

**DISASSEMBLE**

- 1. Press wheel bearing out of steering knuckle  
F10, F13 manual transmission: KM-466-2, KM-466-4 and KM-466-5.  
F16, F20 manual transmission: KM-500-2, KM-500-4 and KM-500-5.

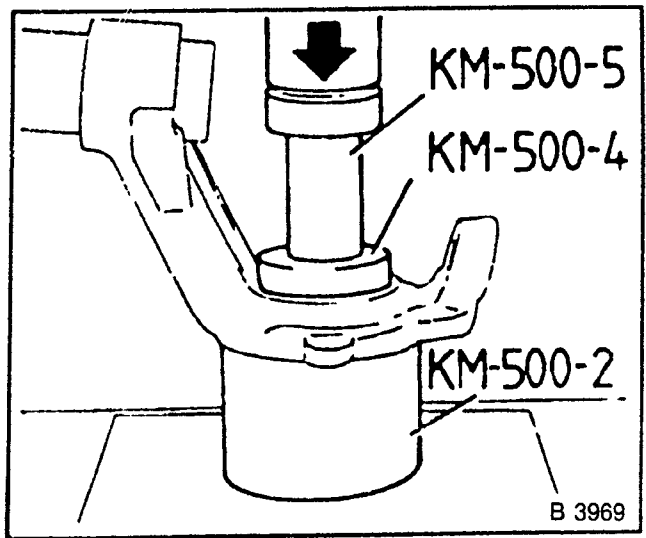


Fig. 19

**IMPORTANT**

Using Remover Tools KM-466-4 and KM-500-4, shorten through surface grinding on the heel on bearing side by 1 mm.  
New tools have been modified accordingly.

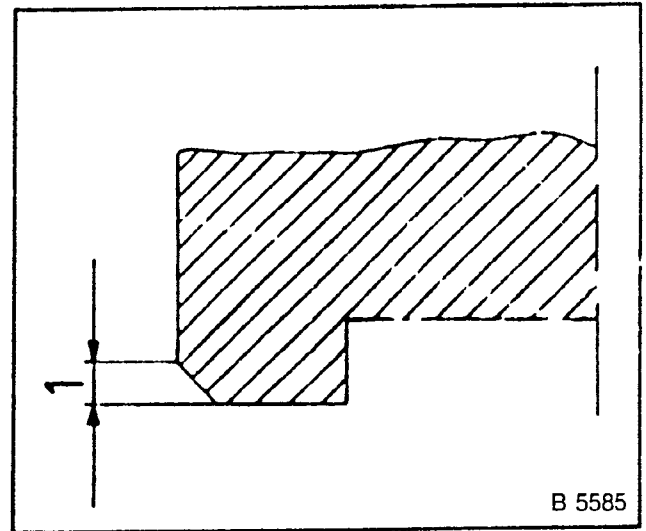


Fig. 20

**DISASSEMBLE**

- 1. Inner bearing ring from front wheel hub  
F10, F13 manual transmission: KM-466-1-A.  
F16, F20 manual transmission: KM-500-1-A.

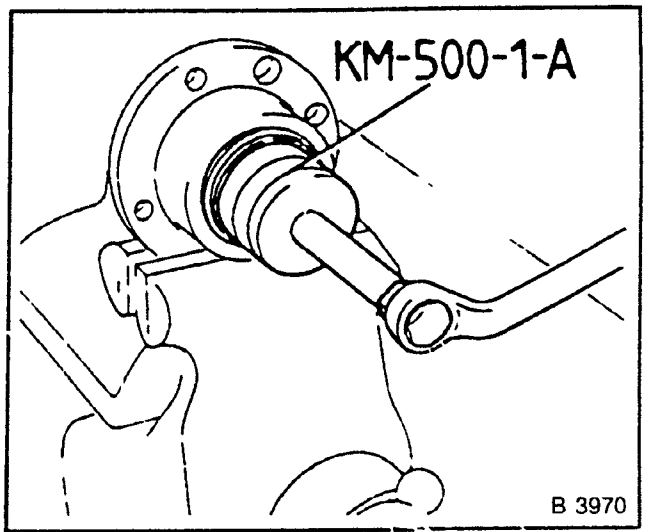


Fig. 21

**ASSEMBLE**

- 1. Outer retaining ring in steering knuckle.  
The locking tabs of the ring must face downwards to prevent moisture accumulating.
- 2. Press new wheel bearing up to stop in retaining ring in steering knuckle.  
F10, F13 manual transmission: KM-466-4 and KM-466-5.  
F16, F20 manual transmission: KM-500-4 and KM-500-5.

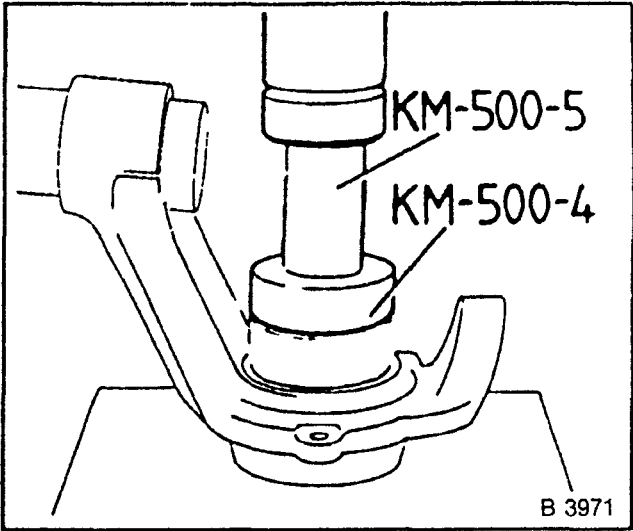


Fig. 22

**TIGHTEN (Torque)**

- 1. Cover plate to steering knuckle — 4 Nm.

**ASSEMBLE**

- 1. Inner retaining ring in steering knuckle  
The locking tabs of the ring must face downwards.
- 2. Front wheel hub in wheel bearing  
F10, F13 manual transmission: KM-466-3 and KM-466-5.  
F16, F20 manual transmission. KM-500-3 and KM-500-5.

**TIGHTEN (Torque)**

- 1 Brake disc to front wheel hub — 4 Nm.

**INSTALL, CONNECT**

- 1. Spring strut.  
See operation “Spring Strut, Remove and Install” Page 23.

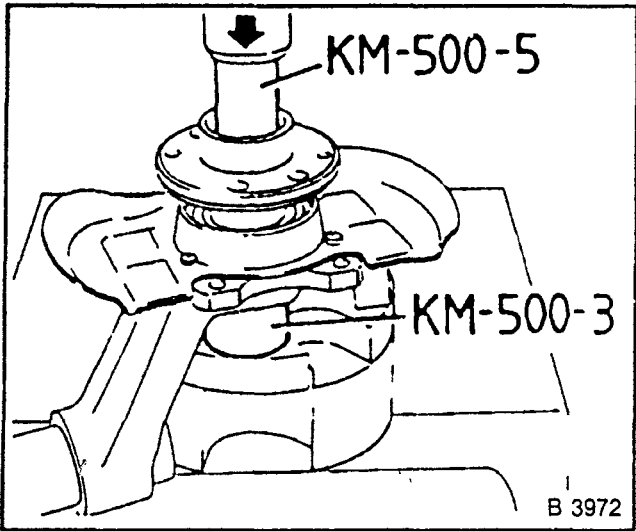


Fig. 23

# Axle Driving Shaft, Remove and Install Completely

## WARNING

- 1. After an accumulation of approximately 80 000 km the axle driving shaft may only be replaced as an assembly. With collapsed folding cover, do not remove axle driving shaft.
- 2. Remove small clamp, inflate folding cover and secure again with new clamp. On the right axle driving shaft there is a two-part axle shaft weight (not on all vehicles).  
When installing, maintain distance (1) = 268 to 270 mm from offset of folding cover fastening for outer joint (2).

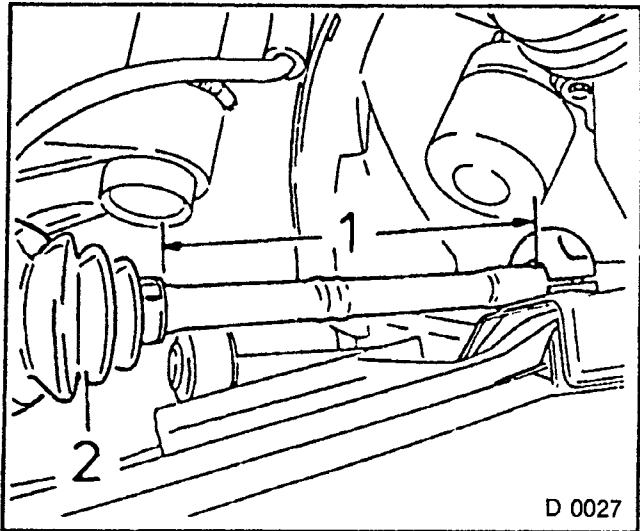


Fig. 24

## REMOVE, DISCONNECT

- 1. Front wheel.
- 2. Castellated nut from axle driving shaft. To counterhold, screw KM-468 to front wheel hub.
- 3. Ball joint from steering knuckle: KM-507-C.
- 4. Disconnect ABS sensor lead connection in wheel well.
- 5. "Check Control" sensor from brake lining.

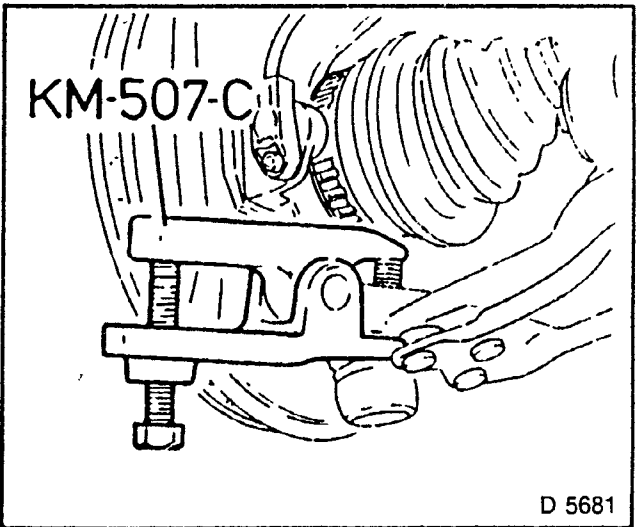


Fig. 25

## REMOVE, DISCONNECT

- 1. Axle driving shaft from transmission F10, F13 manual transmission: left and right KM-460-2-A

**WARNING:**  
FLUID ESCAPES. CLOSE OPENING.  
TIE UP AXLE DRIVING SHAFT.

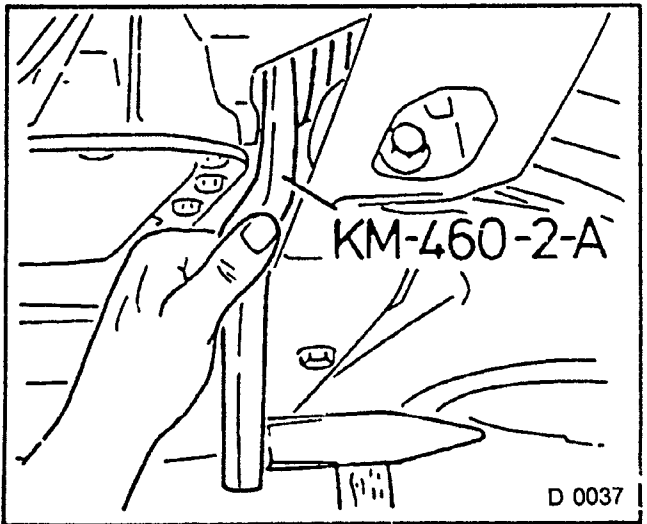


Fig. 26

REMOVE, DISCONNECT

1. Axle driving shaft from transmission.
- |     |          |                  |
|-----|----------|------------------|
|     | Left:    | Right:           |
| F16 | KM-503-A | KM-460-2-A       |
| F20 | KM-503-A | KM-460-2-A       |
| AT  | KM-503-A | Soft metal drift |

**WARNING:**  
FLUID ESCAPES. CLOSE OPENING.

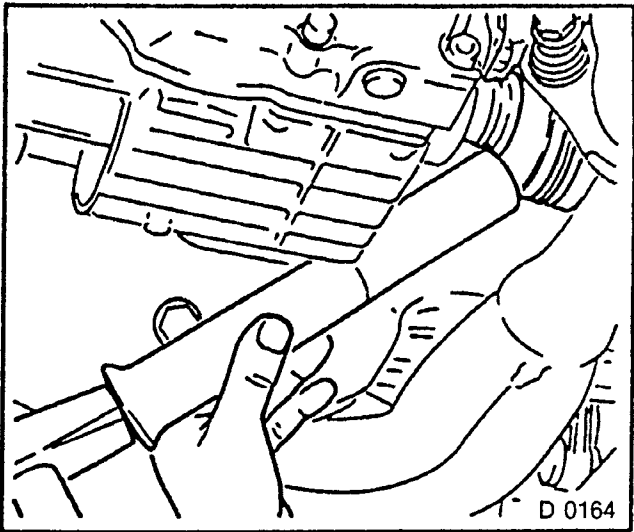


Fig. 27

**KM-503-A(1) at differential cover (2), must not be supported at the tapered roller bearing nut (3).**

**CAUTION:**  
On F-20 — left side.

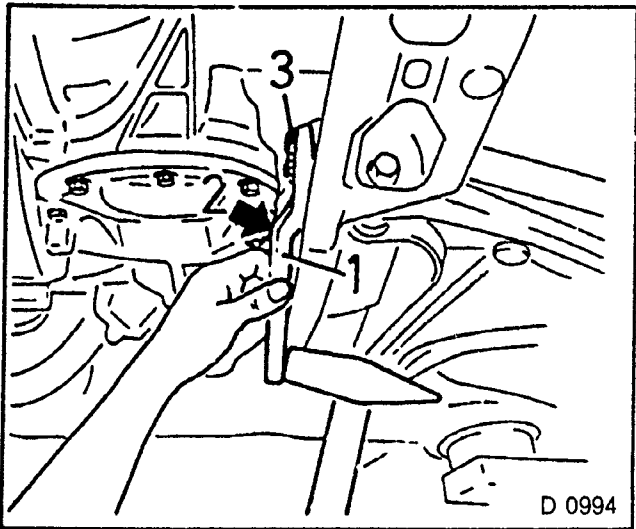


Fig. 28

REMOVE DISCONNECT

1. Axle driving shaft from front wheel hub.
- By hand or with Kukko Wheel Hub Remover No. 38-A.

**CAUTION:**  
After removal, do not put weight on wheel bearing or move vehicle any more.  
If moving the vehicle is unavoidable, insert replacement axle stub shaft in hub and tighten.

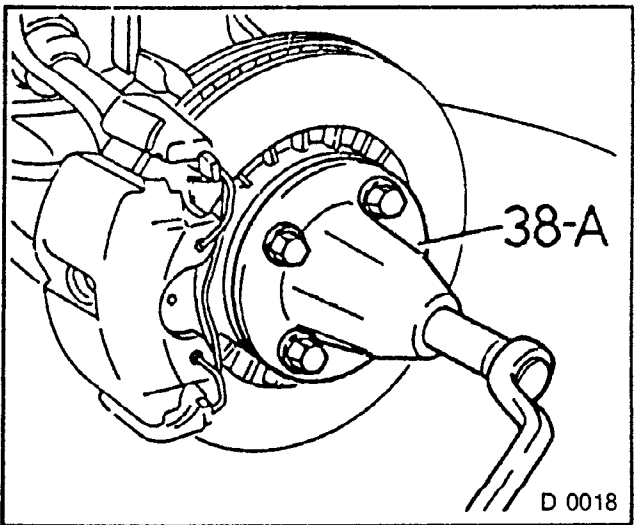


Fig 29

**CAUTION:**  
Treat new axle driving shaft carefully.  
Do not lay shaft on folding cover for a long period.  
Coat toothing and bearing points with transmission fluid.  
When re-using the axle shaft:  
Replace retaining ring (1).  
When driving in the axle shaft,  
position the screwdriver at the friction welding seam (2).

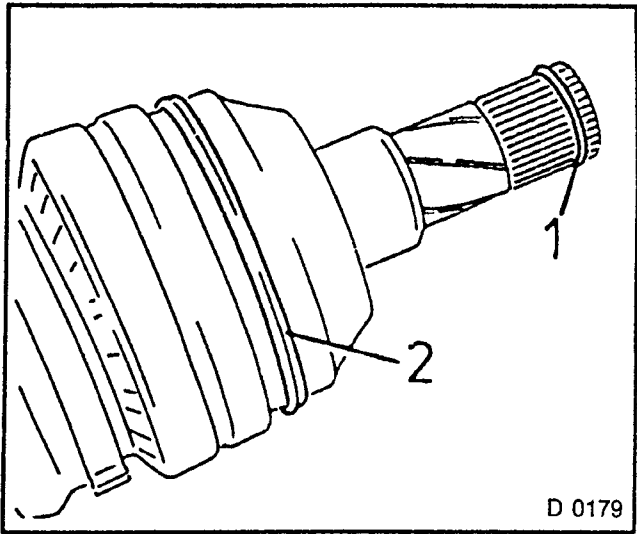


Fig 30

**INSTALL, CONNECT**

- 1. Axle shaft in front wheel hub.
- 2. New castellated nut and new washer loosely on shaft.
- 3. Thoroughly clean contact surfaces of joint to bearing inner ring and axle nut with washer to hub (arrows), to maintain prescribed torque.

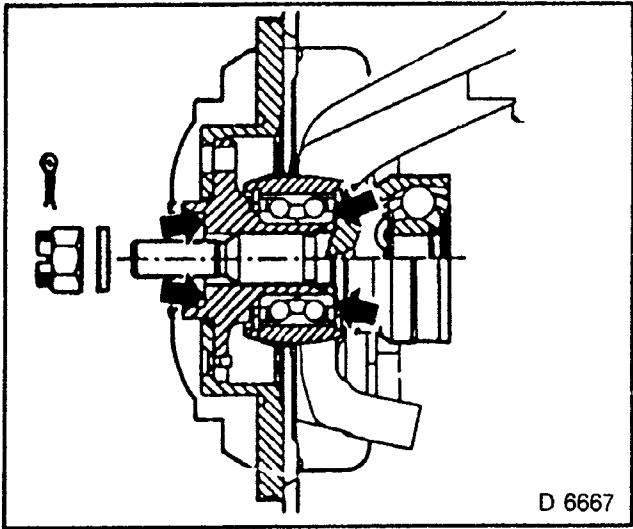


Fig 31

**INSTALL, CONNECT**

- 1. Axle shaft in transmission.
- 2. New retaining ring.
- 3. Drive in with suitable drift until retaining ring engages.
- 4. Check that joint is firmly seated by pulling on outer diameter of joint by hand.

**TIGHTEN (Torque)**

- 1. Ball joint to steering knuckle — 70 Nm.
- 2. Use new retaining clamp and new nut.

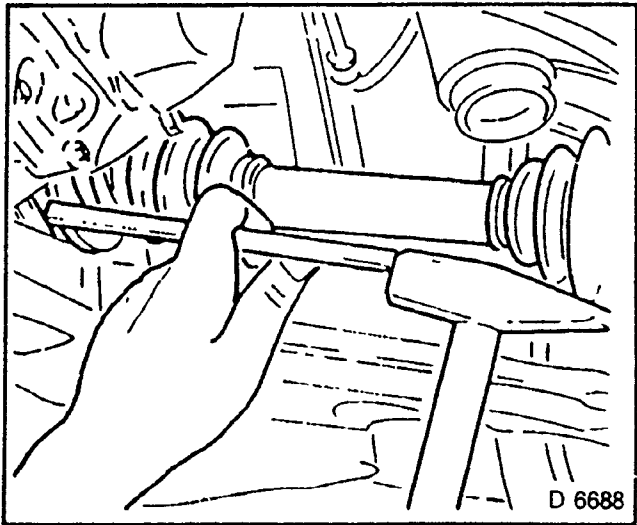


Fig 32

**TORQUE — ANGLE METHOD**

1. Push axle shaft wheel journal through hub.
2. Install washer with nut.
3. Tighten nut to 100 Nm and loosen again.
4. Tighten again to 20 Nm, then turn nut a further 80°.  
If in this position no castellated nut groove aligns with a cotter pin hole, turn nut up to 9° further and secure with pin. Counterhold with KM-468.

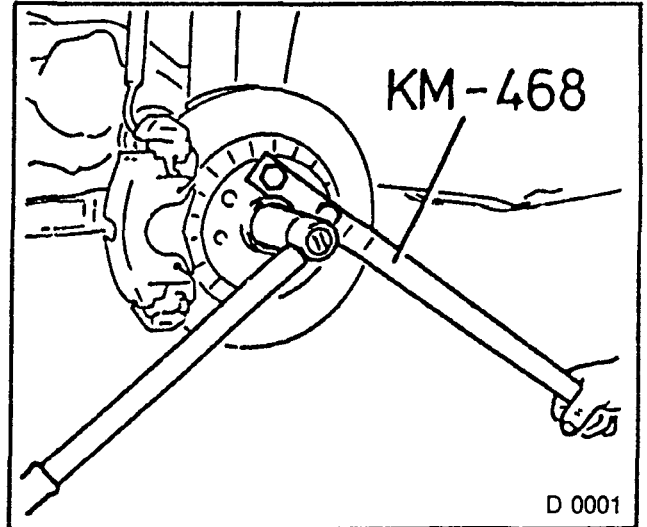


Fig. 33

**TIGHTEN (Torque)**

1. Recut threaded bore hole — M12 x 1,5.
2. Brake caliper to steering knuckle.

**CAUTION:**

1. Ensure that brake hose is routed without twisting.
2. Insert new bolts with Locking Compound and tighten to 95 Nm.
3. Wheel bolts — 110 Nm
4. “Check Control” sensor in brake lining.
5. Connect “Check Control” lead connection in wheel well.
6. ABS sensor lead connection.

**INSPECT**

1. Transmission fluid level (see Section K).

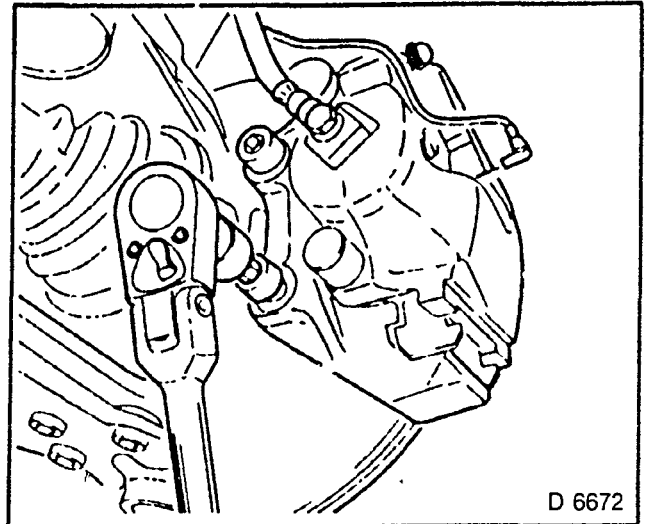


Fig. 34

# Joint of Axle Driving Shaft — Remove and Install Individually

## REMOVE, DISCONNECT

- 1. Axle driving shaft  
See operation “Axle Driving Shaft, Remove and Install Completely”.  
Page 18.
- 2. Remove folding cover retaining band from joint and turn up.
- 3. Pull apart retaining ring in joint with pliers.

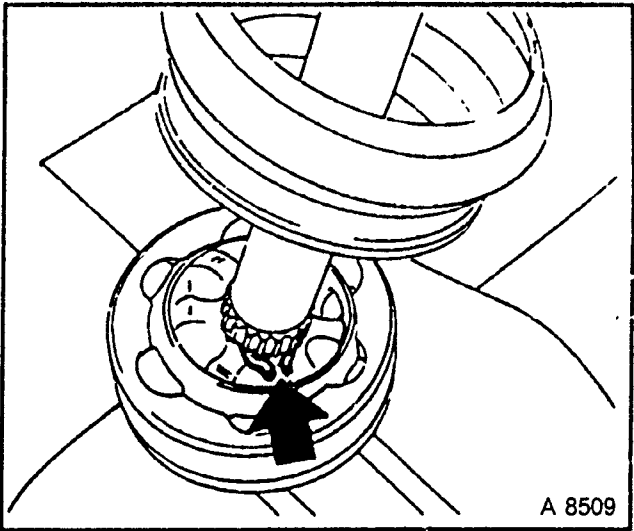


Fig. 35

## REMOVE, DISCONNECT

- 1. Joint from shaft teeth with plastic hammer.
- 2. Joint is replaced as an assembly only.  
Wash out cavities of joint and fill with Special Grease.

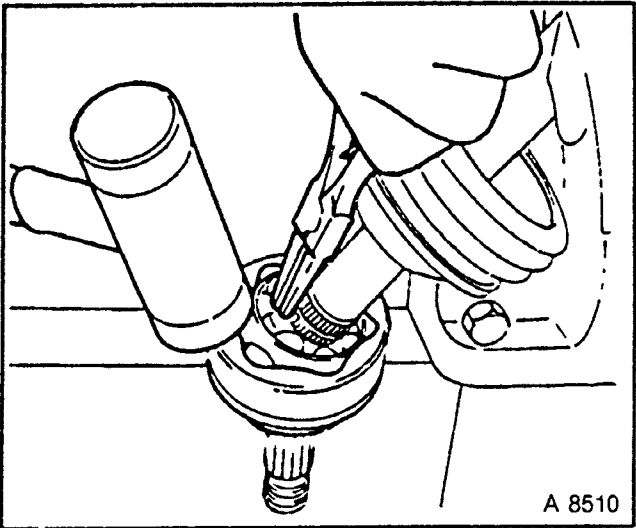


Fig. 36

## INSTALL, CONNECT

- 1. New joint on shaft teeth.
- 2. Use new retaining ring.
- 3. With plastic hammer until retaining ring locks.
- 4. Inner joint on long shaft side for folding cover fastening (dimension “1” = 135 mm).
- 5. Folding cover  
Deflate folding cover — must not be twisted.  
Tension retaining band with Special Clamping Pliers KM-J-22610.
- 6. Axle driving shaft.

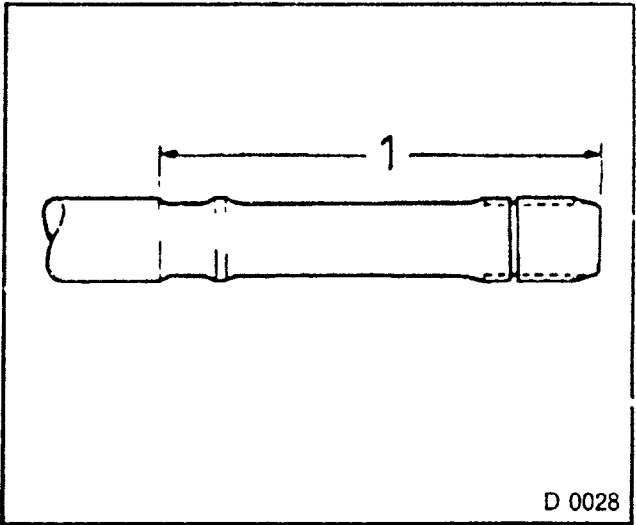


Fig. 37



# Folding Covers of One Axle Driving Shaft — Remove and Install

## REMOVE, DISCONNECT

- 1. Joint .  
See operation “Joint of Axle Driving Shaft, Remove and Install” page 22.
- 2. Folding cover.  
When replacing both folding covers remove only one joint.

## INSTALL, CONNECT

- 1. Folding cover.
- 2. Joint.

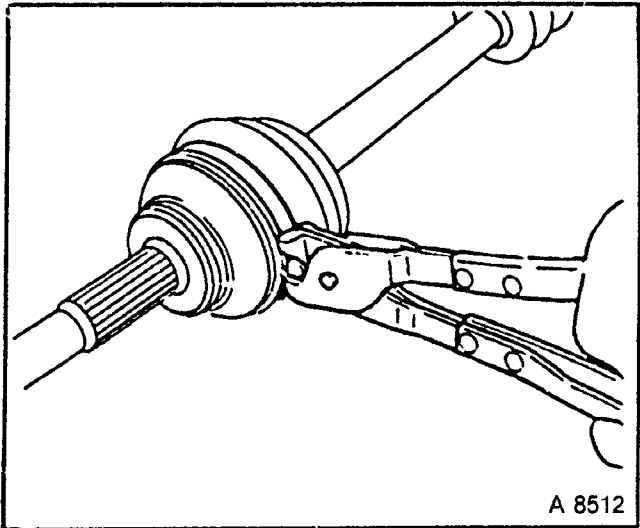


Fig. 38

# SPRING STRUT, CONTROL ARM, STABILIZER, FRONT AXLE BODY

## Spring Strut, Remove and Install

### REMOVE, DISCONNECT

- 1. Front wheel.
- 2. ABS sensor with bracket
- 3. Brake caliper from steering knuckle.
- 4. Suspend brake caliper.
- 5. Castellated nut from axle driving shaft.  
To counterhold screw KM-468 to front wheel hub.

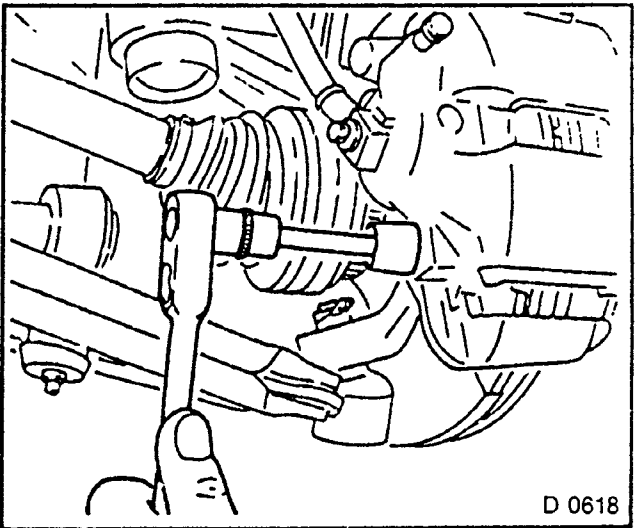


Fig. 39

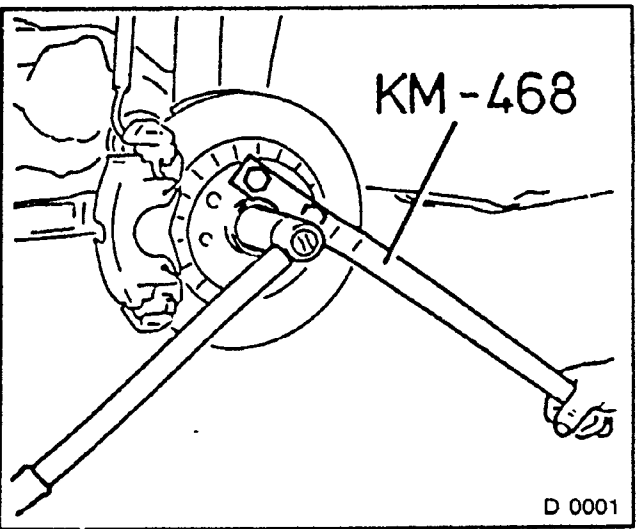


Fig. 40

**REMOVE, DISCONNECT**

1. Tie rod joint from tie rod lever — KM-507-C.
2. Ball joint from steering knuckle using KM-507-C.
3. Axle driving shaft from front wheel hub, by hand or with Kukko Wheel Hub Remover No. 38-A.
4. Tie up axle driving shaft.

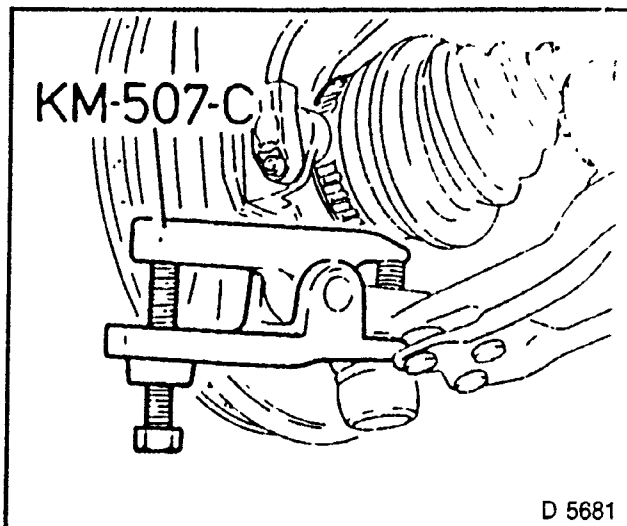


Fig. 41

5. Spring strut from wheel well; loosen two nuts (arrows).

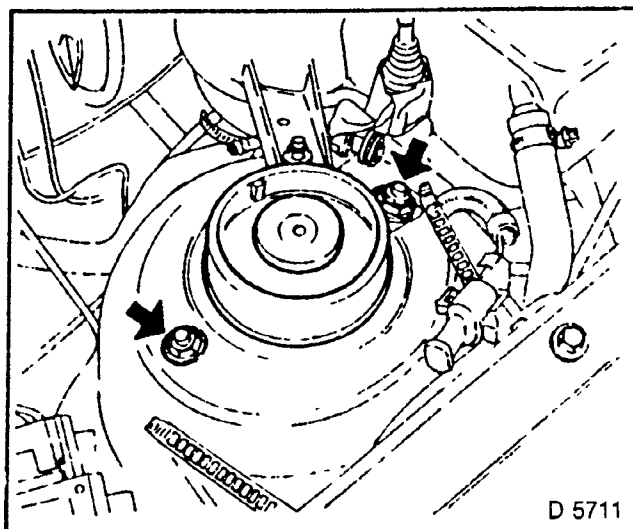


Fig. 42

**Spring Strut, Disassemble****DISASSEMBLE**

1. Tension spring strut in Spring Compressor KM-329-A in conjunction with KM-465-A and Hooks KM-550-31.
2. Tension front spring.  
Note correct seating of hooks.

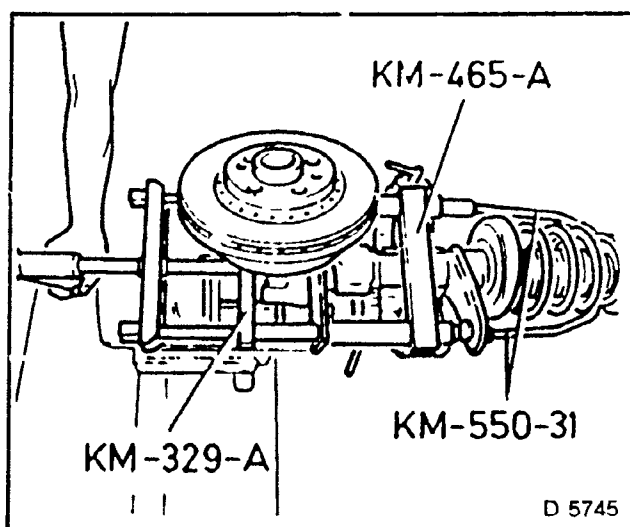


Fig. 43

- 3. Remove closure plug.
- 4. Loosen nut from piston rod and while doing so, counterhold piston rod.

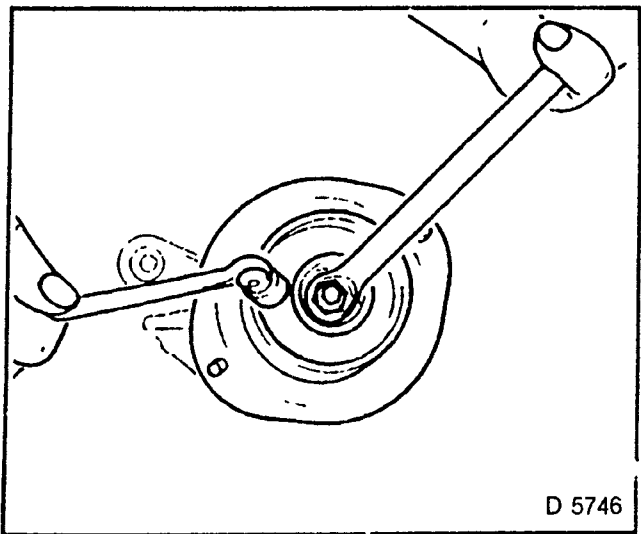


Fig. 44

**DISASSEMBLE**

- 1. Remove support bearing.
- 2. Thrust bearing.
- 3. Dust cap.
- 4. Damping ring.
- 5. Stop buffer.  
Check whether they can be re-used.
- 6. Release tension on front springs and remove.

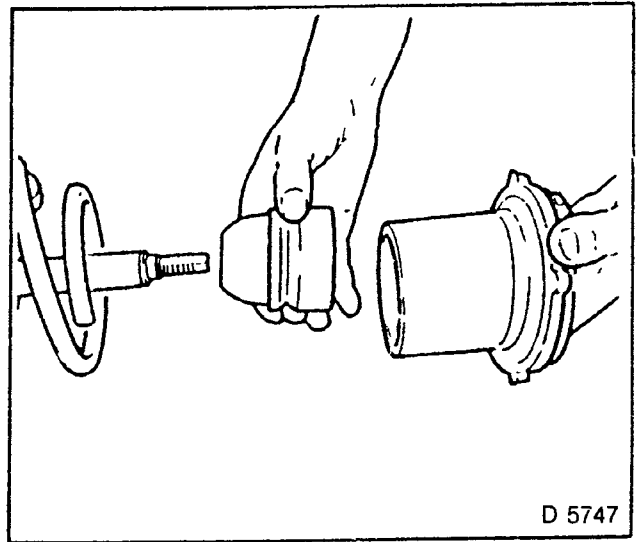


Fig. 45

- 7. Remove threaded ring (plate nut) from carrier tube with KM-563.

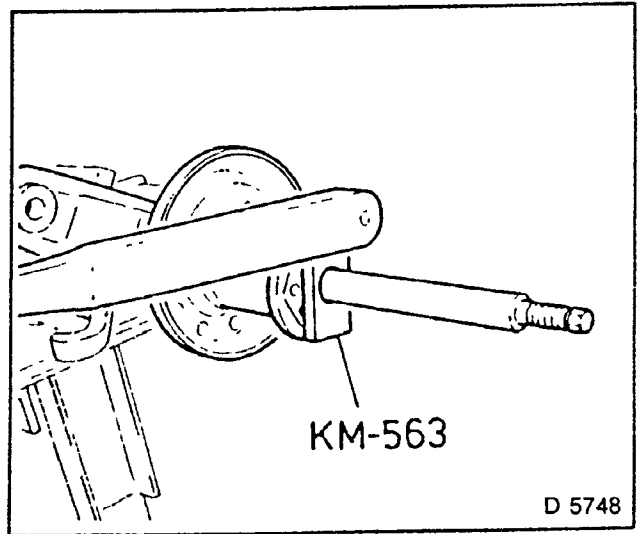


Fig. 46

**NOTE:**  
**A HIGH LOOSENING TORQUE IS**  
**NECESSARY.**

# **Support Bearing — Remove and Install Front Spring and/or Damper Rings — Remove and Install**

1. Remove spring strut and disassemble (see page 24).

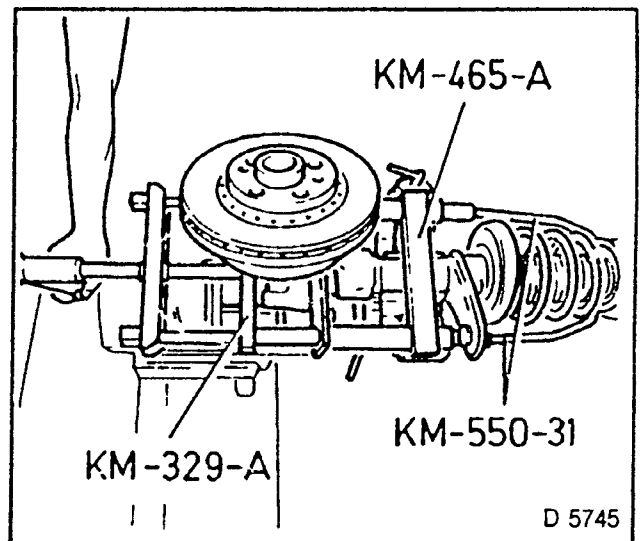


Fig. 47

## **DISASSEMBLE**

Spring strut — see Fig. 48

- 1 — Support bearing
- 2 — axial bearing
- 3 — dust cap with upper damper ring
- 4 — stop buffer
- 5 — spring
- 6 — lower damper ring

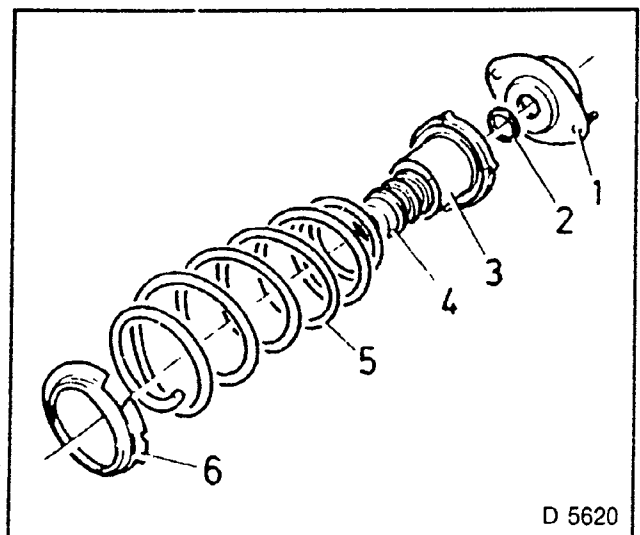


Fig. 48

## **INSPECT**

Removed parts to see if they can be re-used.

## **ASSEMBLE**

Single parts of spring strut — in reverse order 6 to 1.

## **NOTE:**

1. Mount stop buffer (4) with the even side towards spring.
2. Mount axial bearing (2) with smaller circumference side towards spring.

## **INSTALL, CONNECT**

1. Spring strut to control arm and wheel housing.
2. Brake caliper to steering knuckle.

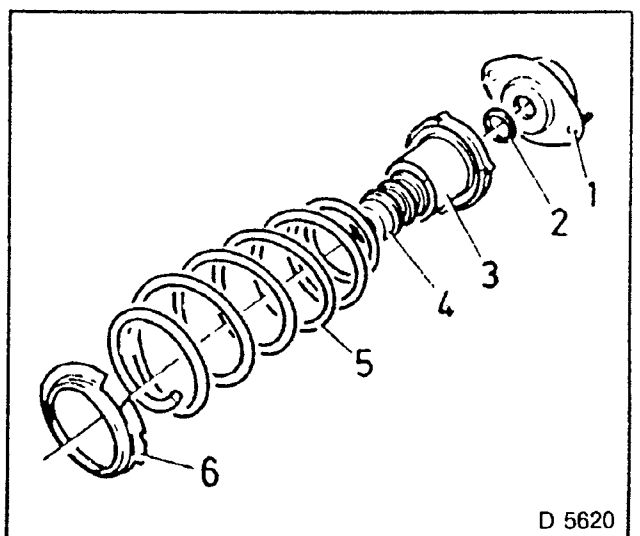


Fig. 49

# Spring Strut Cartridge — Remove and Install

## DISASSEMBLE

- 1. Remove spring strut from spring compressor.  
When replacing the spring strut:  
Front wheel hub from steering knuckle.  
Damper ring from lower spring plate.  
See operation “Front Wheel Hub, Remove and Install”. Page 15.

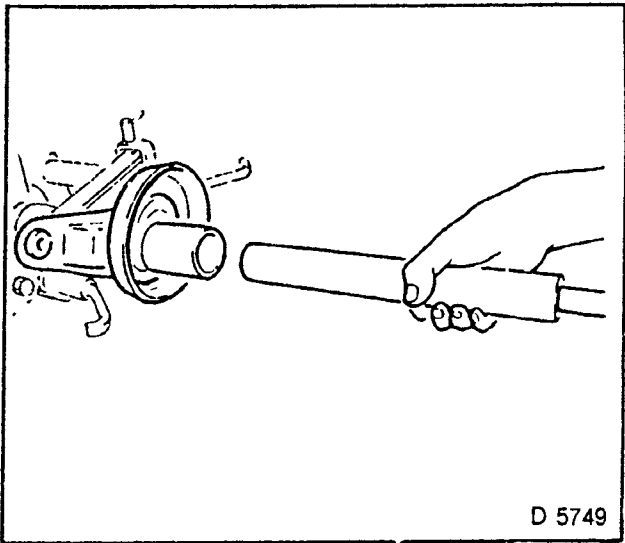


Fig. 50

## ASSEMBLE

- 1. New wheel bearing and front wheel hub in spring strut. See operation “Wheel Bearing, Remove and Install”. Page 15.
- 2. Spring strut cartridge.
- 3. Tension spring strut in spring compressor.

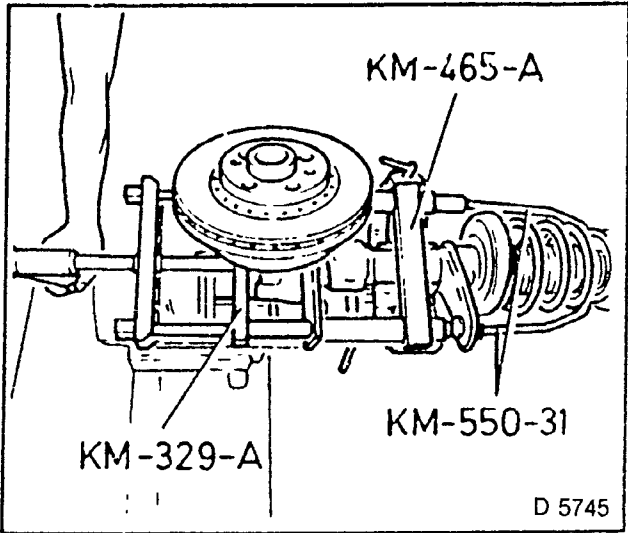


Fig. 51

## TIGHTEN (Torque)

- 1. Threaded ring to carrier tube — 200 Nm.  
DO NOT remove wax coating. Maintain shown 90° position of torque wrench relative to KM-563.

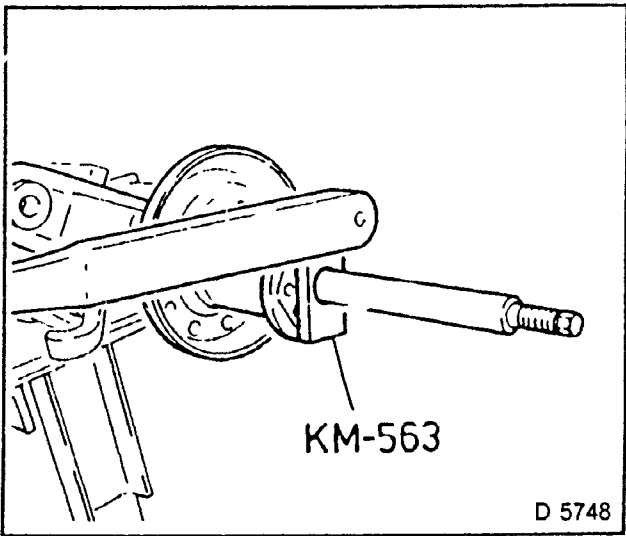


Fig. 52

**ASSEMBLE**

1. Front spring from spring strut.
2. Place spring end with damper ring in stop of spring collar.
3. Tension spring.
4. Stop buffer on piston rod.

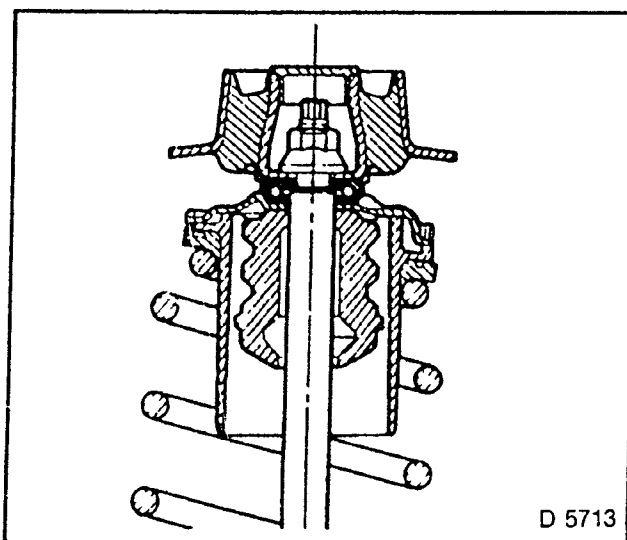


Fig. 53

**ASSEMBLE**

1. Dust cap with damper ring on piston rod.

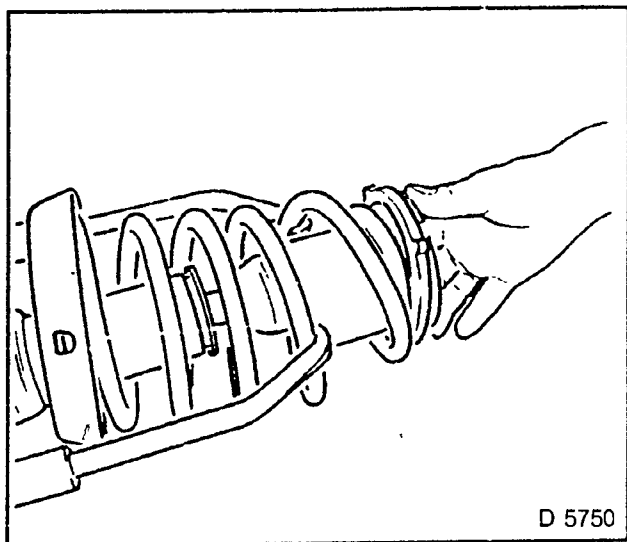


Fig. 54

**TIGHTEN (Torque)**

1. Piston rod to support bearing — 55 Nm.
2. Crosshold at piston rod of spring strut cartridge.
3. Release spring

**NOTE:**  
**CHECK FOR PERFECT POSITION-**  
**ING OF DAMPER RING.**  
**REMOVE SPRING STRUT FROM**  
**SPRING COMPRESSOR.**

**TIGHTEN (Torque)**

1. Spring strut to wheel housing — 30 Nm.

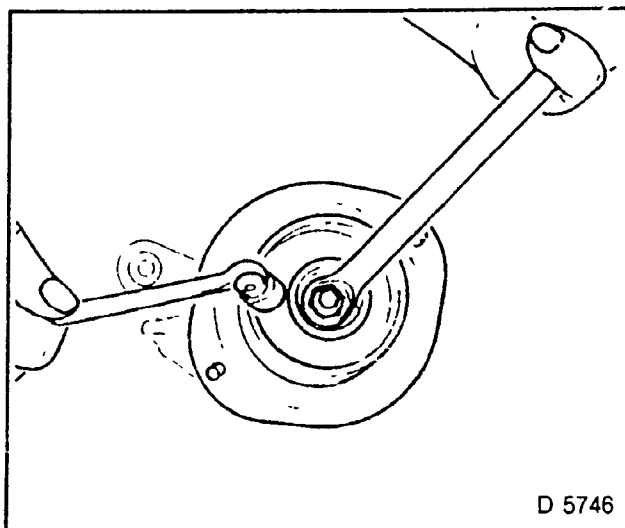


Fig. 55

**INSTALL, CONNECT**

- 1. Axle shaft to front wheel hub.  
See operation "Axle Shaft, Remove and Install Completely". Page 18.

**TIGHTEN (Torque)**

- 1. Ball joint to steering knuckle — 70 Nm.
- 2. Use new retaining clamp (arrow) and new nut.
- 3. Tie rod joint to tie rod lever — 60 Nm.

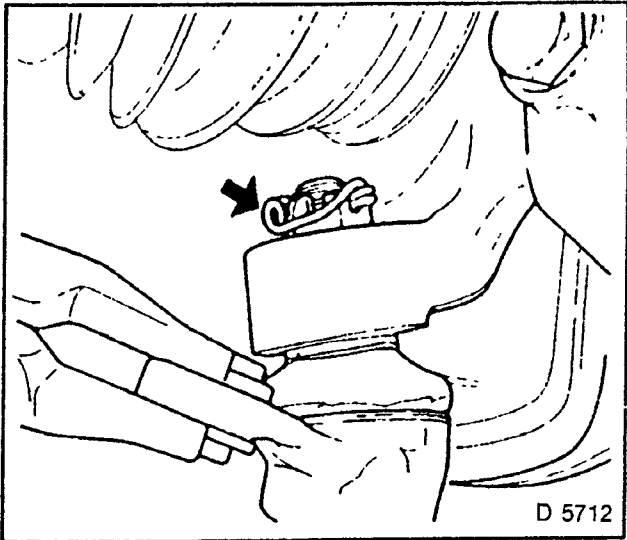


Fig 56

- 4. Brake caliper to steering knuckle — 95 Nm.
- 5. Wheel bolts — 110 Nm.

**ADJUST**

- 1. Air play — brake lining.  
By fully depressing the brake pedal several times.

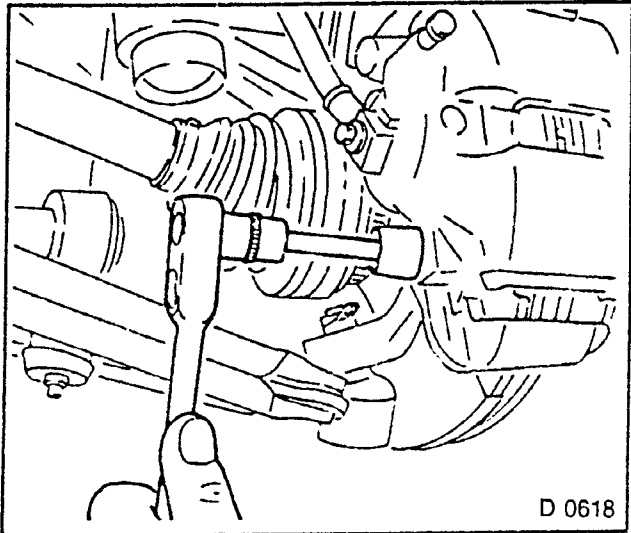


Fig 57

**Control Arm —  
Remove and Install**

**REMOVE, DISCONNECT**

- 1. Stabilizer from control arm.
- 2. Ball joint from steering knuckle  
KM-507-C

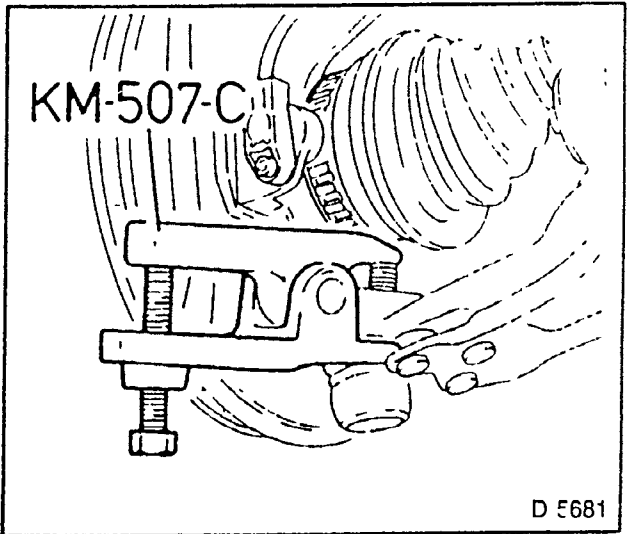


Fig. 58

- 3. Control arm from front axle body front and rear.
- 4. Press out control arm from mounting lever.  
Existing mounting sleeves (arrows) in rear damping bush are not applicable when installing.

**CAUTION:**  
**WHEN REPLACING THE RIGHT CONTROL ARM CONVERT COMPENSATING WEIGHT.**

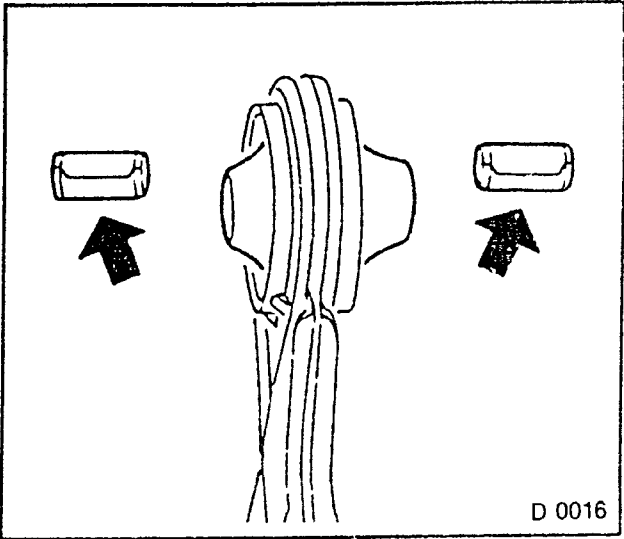


Fig. 59

**TIGHTEN (Torque)**

- 1. Control arm to front of front axle body — 100 Nm + 60° to 70°.
- 2. Control arm with front axle body to support — 170 Nm.
- 3. Control arm in horizontal position.

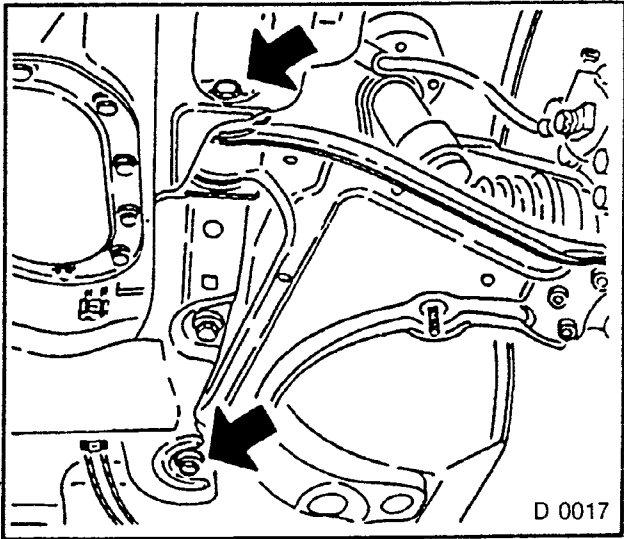


Fig 60

**TIGHTEN (Torque)**

- 1. Ball joint to steering knuckle — 70 Nm.  
Use new retaining clamp and new nuts.

**INSTALL, CONNECT**

- 1. Stabilizer on control arm.
- 2. Maintain pre-tension dimension  
"1" = 38 — 39 mm.  
If necessary, replace rubber buffer.
- 3. Use new Nuts, counterhold with Self-locking Nuts — 20 Nm.
- 4. Front wheel — 110 Nm.

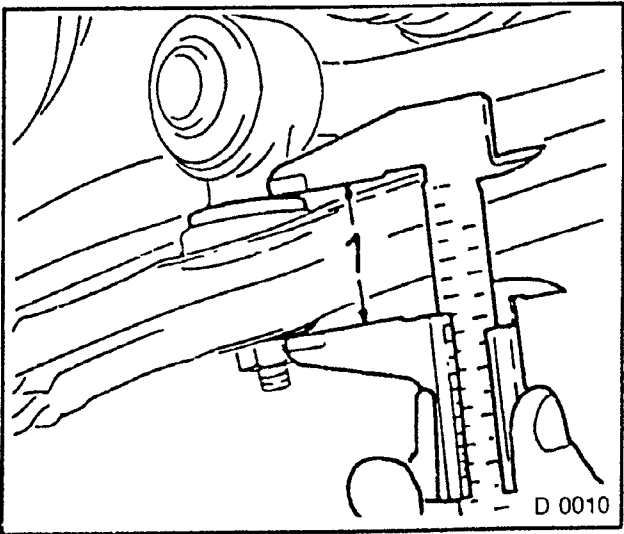


Fig 61



# Damping Bushings in Control Arm — Remove and Install

## REMOVE, DISCONNECT

Control arm — see corresponding page 29.

## DISASSEMBLE

- 1. Rear damping bushing.
- 2. Press out with KM-613-1 and KM-613-3 from below upwards, control arm in installation position.

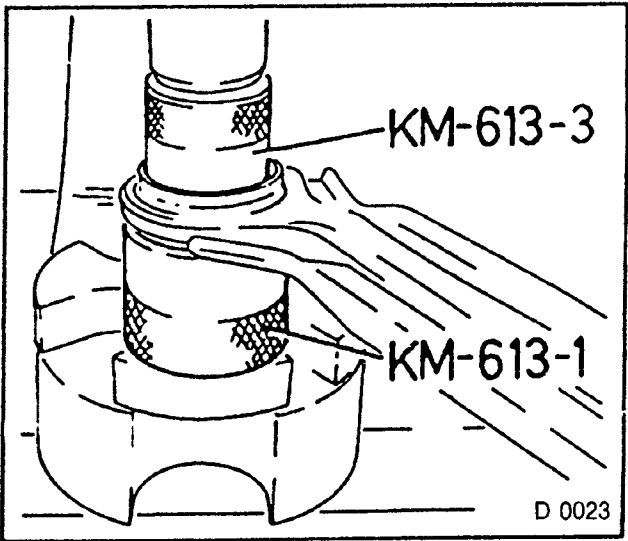


Fig 62

## DISASSEMBLE

- 1. Front damping bushing  
Press out with KM-508-1 and KM-508-3 from rear to front, control arm in installation position.

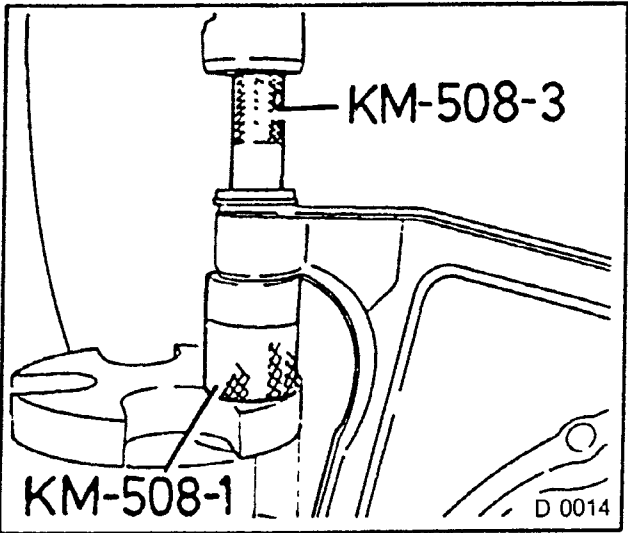


Fig 63

## ASSEMBLE

- 1. New front damping bushings.  
Press in with KM-508-1, KM-508-2 and KM-508-3 from front to rear, control arm in installation position
- 2. Soak outer bushing in soapy water  
Same projection of rubber bead on both sides

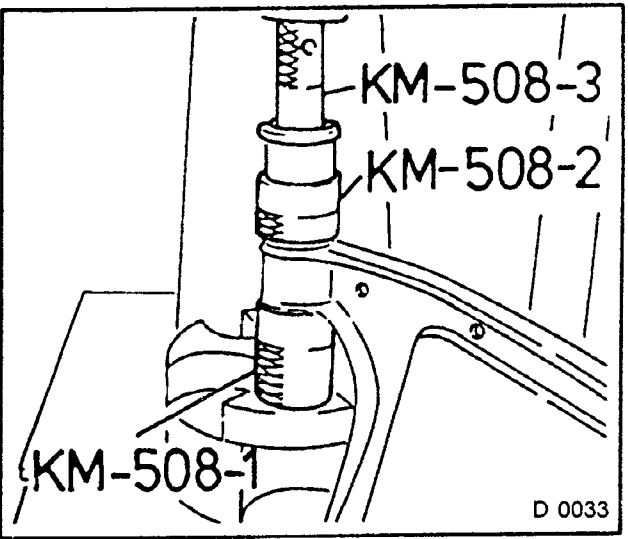


Fig 64

**ASSEMBLE**

1. New rear damping bushings.  
Press in with KM-613-1 and KM-613-2 from below, control arm in installation position.

**INSTALL, CONNECT**

1. Control arm — (see page 29).

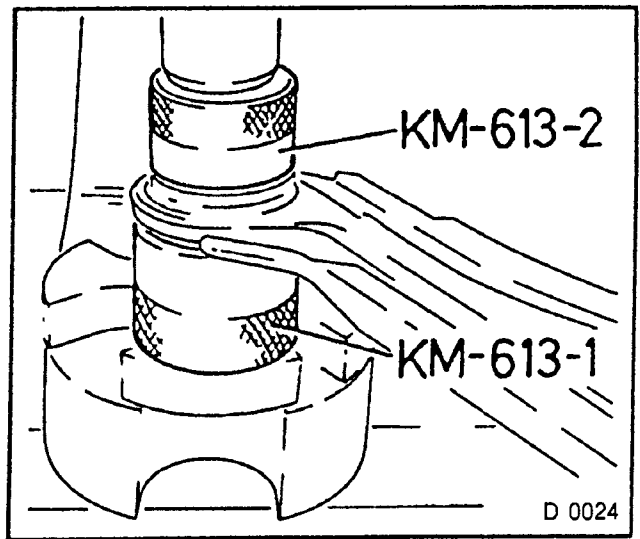


Fig. 65

## Ball Joint on Control Arm — Remove and Install

**REMOVE, DISCONNECT**

1. Control arm (see page 29).

**DISASSEMBLE**

1. Ball joint rivet heads.  
Drill off with 12 mm drill.  
Place drill on side of rivet head with centre mark

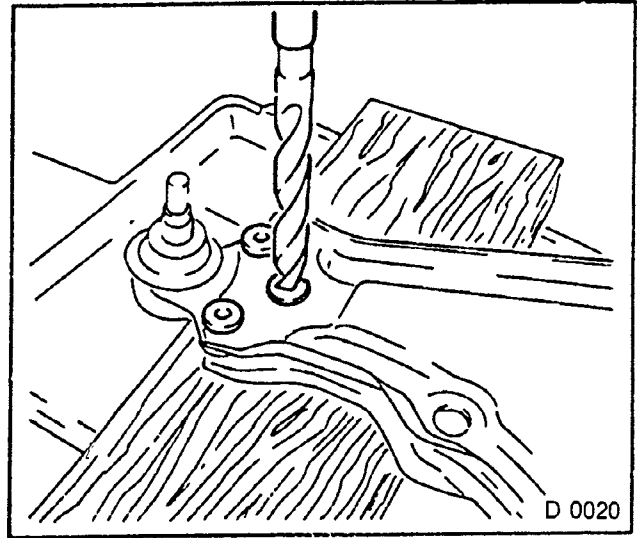


Fig. 66

**TIGHTEN (Torque)**

1. Ball joint to control arm — 60 Nm.  
Ball joint is replaced as assembly only  
Special bolts and nuts see Parts Catalogue.  
Screw on nuts of control arm underside.

**INSTALL, CONNECT**

1. Control arm (see page 29).

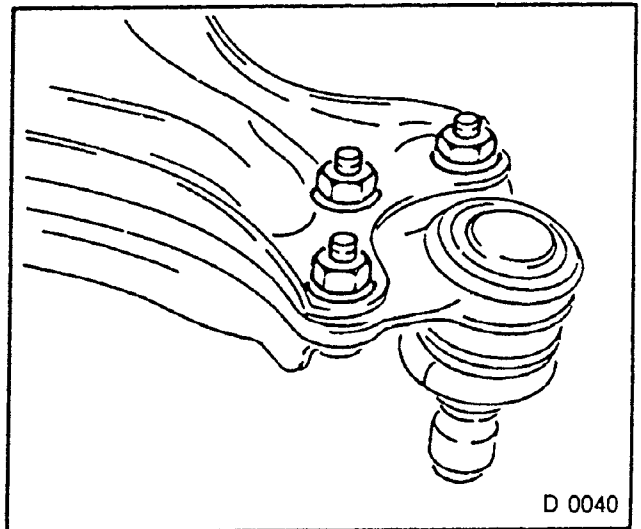


Fig. 67

# Front Axle Body — Remove and Install

## REMOVE, DISCONNECT

- 1. Disconnect battery.
- 2. Oxygen sensor wiring harness plug (DOHC engines only)
- 3. Jack up engine with Engine Lifter KM-263-A and two guiding hooks.
- 4. Both front wheels, engine compartment covering.
- 5. Front exhaust pipe.
- 6. On DOHC engine separate at joint only.

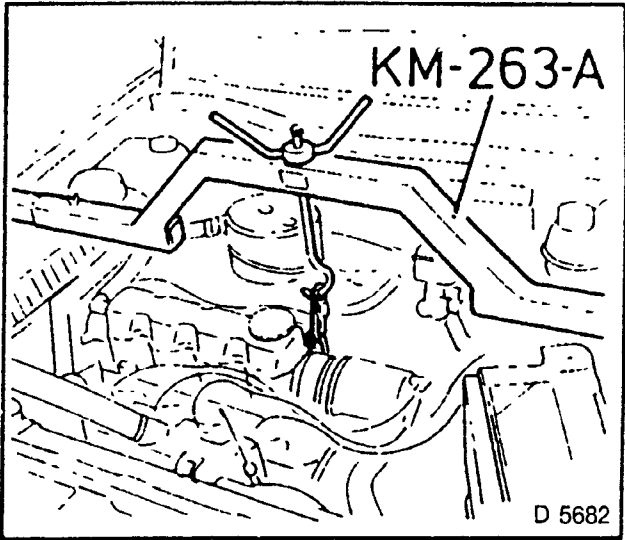


Fig 68

## REMOVE, DISCONNECT

- 1. Both ball joints from steering knuckle. KM-507-C.
- 2. Rear transmission bracket.
- 3. Front axle body.
- 4. Support with hydraulic jack and unscrew fastening bolts — high torque.
- 5. Lower front axle body and remove. (Fig. 69 shows front axle body with long outrigger)

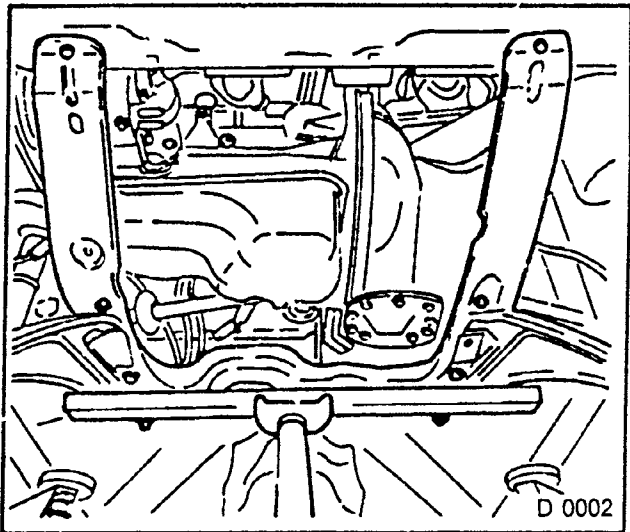


Fig. 69

# Front Axle Body — Transfer

- 1. If front axle body is replaced, tension it in vice.
- 2. Remove stabilizer and both traverse control arms.
- 3. Mounting sleeves in rear damping bushing are not applicable when installing. (Fig. 70 shows front axle body with long outrigger).

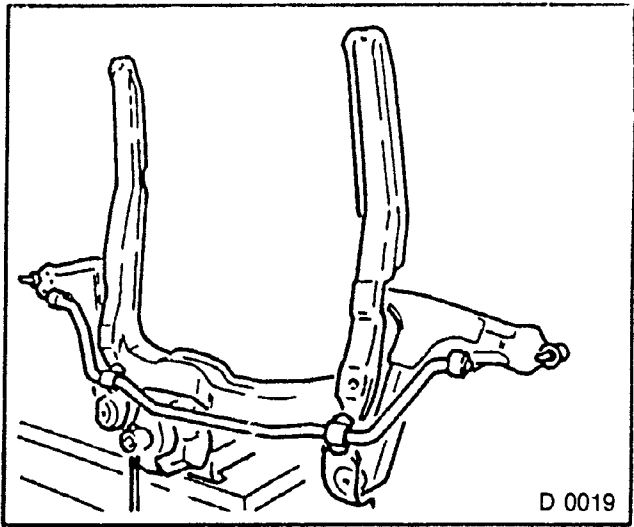


Fig 70

**TIGHTEN (Torque)**

- 1. Control arm to front axle body — 110 Nm + 60° to 75°.
- 2. Control arm in horizontal position.
- 3. Stabilizer to front axle body — 20 Nm.

**INSTALL, CONNECT**

- 1. Stabilizer to control arm.
- 2. Maintain pre-tension dimension "1" = 38 — 39 mm.  
If necessary, replace rubber buffer.
- 3. Use new Nuts, counterhold with Self-locking Nuts — 20 Nm.

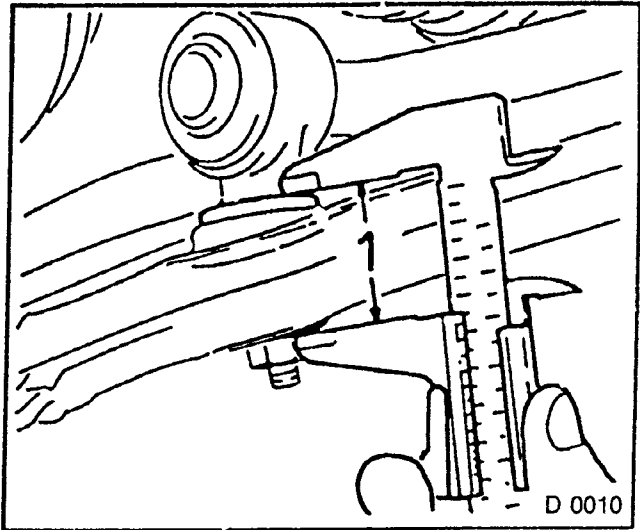


Fig. 71

**INSTALL, CONNECT**

- 1. Cut thread for front axle bolts.  
M12 x 1,5  
M14 x 1,5
- 2. Front axle body.
- 3. Raise with hydraulic jack.
- 4. Insert ball joints in steering knuckle and transmission bracket in front axle body.

**TIGHTEN (Torque)**

- Front axle body to underbody.
- 1. Bolts (1) — 115 Nm.
  - 2. Bolts (2) — 170 Nm.

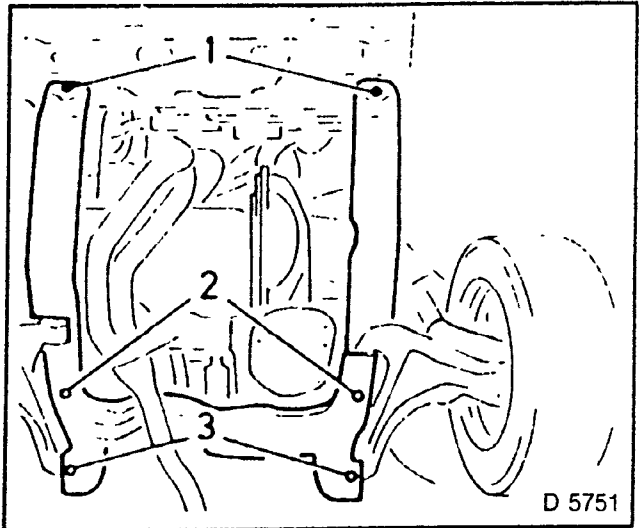


Fig. 72

**TORQUE — ANGLE METHOD**

Bolts (3 in Fig. 72) — 100 Nm + 75° to 90°.

**TIGHTEN (Torque)**

- 1. Transmission bracket on front axle body (arrows) — 40 Nm.
- 2. Ball joint to steering knuckle — 70 Nm.
- 3. Use new retaining clamp and new nuts.

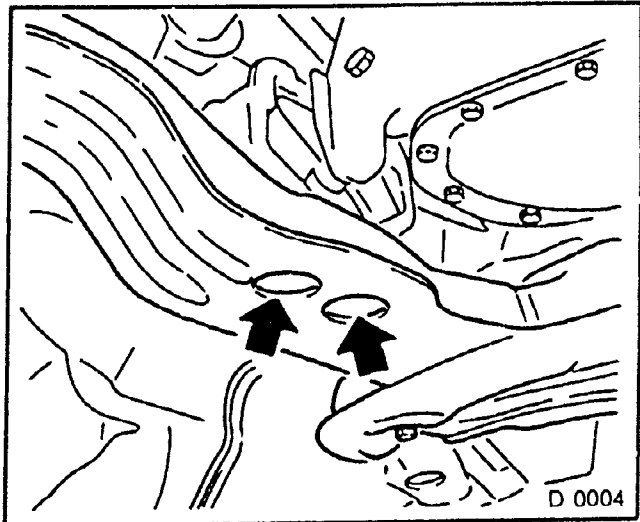


Fig. 73

# **INSTALL, CONNECT**

1. Front exhaust pipe or joint piece.
2. Engine compartment cover.
3. Front wheels.
4. Oxygen sensor wiring harness plug (arrow) (DOHC engines only).

# **REMOVE, DISCONNECT**

1. Engine Lifter — KM-263-A.

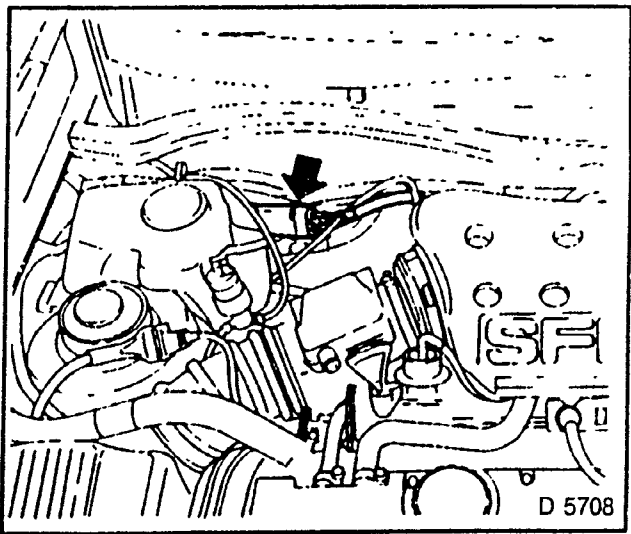


Fig. 74

## Stabilizer — Remove and Install

### INSTALL, CONNECT

1. Engine Lifter — KM-263-A.

### REMOVE, DISCONNECT

1. Stabilizer fastening from control arm.
2. Bracket for transmission from front axle body.

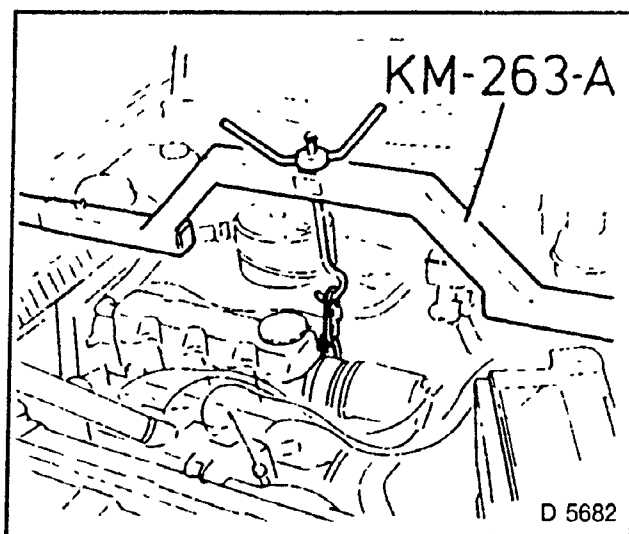


Fig 75

### REMOVE, DISCONNECT

1. Lower front axle body.
2. Support with hydraulic jack.
3. Unscrew rear fastening bolts, only loosen front bolts.
4. Lower front axle body, until fastening bolts for stabilizer (arrows) are accessible.
5. Stabilizer.  
If stabilizer is replaced, transfer damping weight —  
Note installation position.  
If necessary, replace pendulum —  
(see "Pendulum, Remove and Install", page 37).

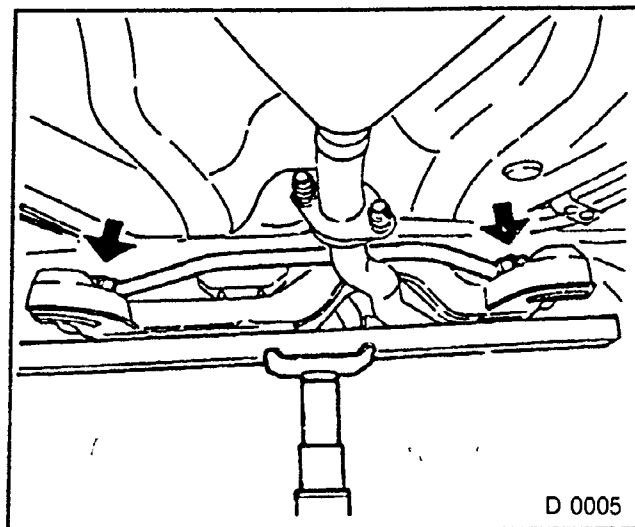


Fig 76

### INSTALL, CONNECT

1. Stabilizer to front axle body — 20 Nm.
2. Secure stabilizer with lock nut M8 — 20 Nm.
3. Front axle body to underbody (see Front Axle Body, Remove and Install, page 33).
4. Pendulum to control arm — (see Pendulum, Remove and Install, page 37).

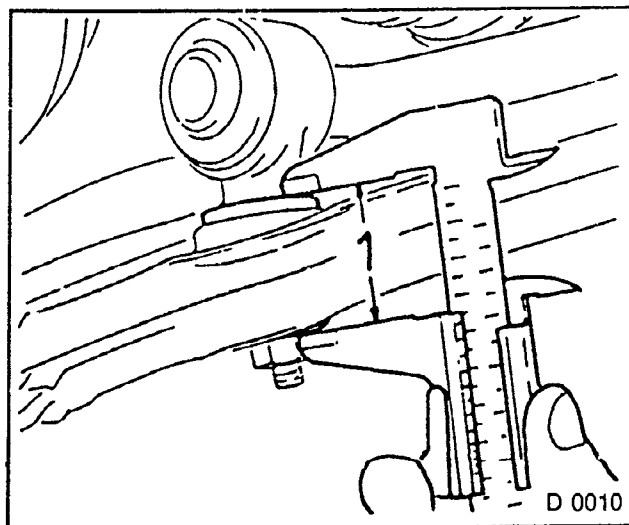


Fig 77

## Pendulum — Remove and Install

### REMOVE, DISCONNECT

1. Front wheel.
2. Stabilizer fastening from control arm.
3. Ball joint from steering knuckle, KM-507-C.
4. Spray oil between pendulum and stabilizer.
5. Pendulum from stabilizer — KM-507-C.
6. If necessary, in repeated operations, suitable spacers between KM-507-C and stabilizer (arrow).

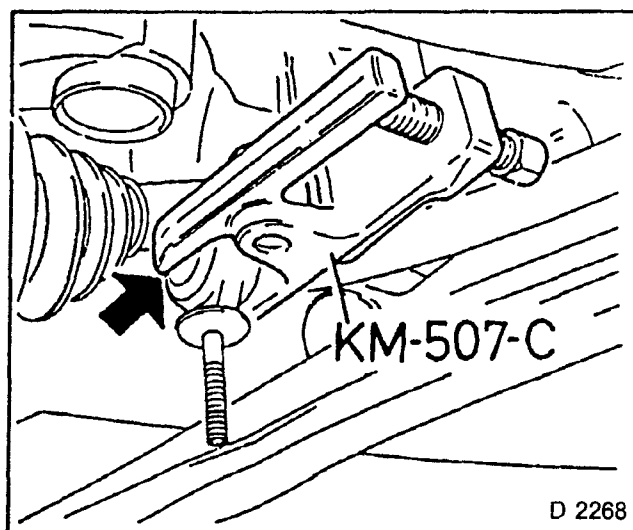


Fig. 78

### INSTALL, CONNECT

1. Clean stabilizer.
2. Pendulum on stabilizer — if necessary, coat with liquid soap solution. See fig. 79 for installation position.
3. Ball joint to steering knuckle — 70 Nm (new retaining clamp.)
4. Pendulum to control arm — if necessary, replace rubber buffer.
5. Maintain pre-tension dimension "1" = 38 — 39 mm. Use new Nuts, counterhold with self-locking Nuts — 20 Nm.
6. Front wheel — 110 Nm.

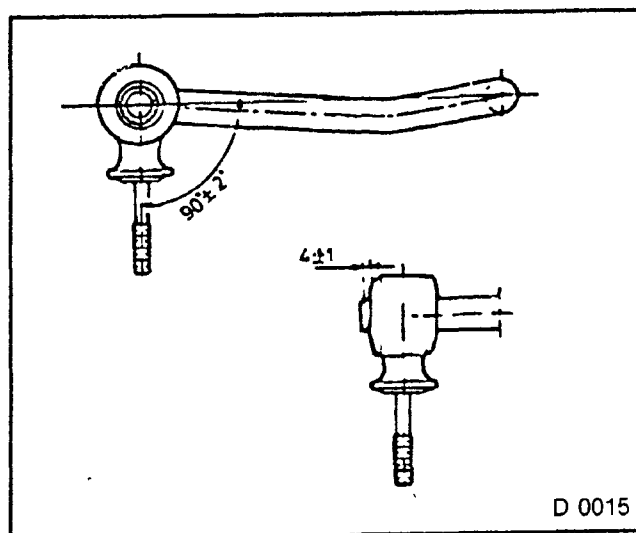


Fig. 79

## Wheels and Tyres

All ASTRA-F models are fitted ex works with tubeless steel-belted radial tyres.

Breakdown of Tyre Designation:

Example: 175/65 R14 — 82T

175 = Tyre width (in mm)

65 = Tyre height (in % of tyre width)

R = Radial design

14 = Rim diameter (in inches)

82 = Carrying load — identification number

T = Speed classification

Only disc wheels with safety rims — so-called hump rims — may be used in conjunction with tubeless tyres. The hump is a ring-shaped bead on the shoulder of the rim, which prevents the tyre from slipping into the wheel rim.

With asymmetric deep well rims, the tyre must be mounted across the narrow shoulder of the disc wheel, i.e. from the outside of the wheel.

The disc wheels are centred on the wheel hubs by means of the centre hole. To prevent rusting, the centring seat of the disc wheel is to be lightly coated with Bearing Grease 19 41 574 (90 001 812) before each mounting.

The tyre pressures can be found on page 41 and in the Owner's and Driver's Manual.

## Wheel Balancing

To balance the wheels properly, commence with “stationary” balancing. If necessary, eliminate any remaining imbalance on the vehicle with a mobile “precision balancer”.

Manufacturers’ instructions are to be carried out when using the balancing equipment.

### **Balancing on wheel balancer (stationary)**

Special balancing equipment is used to equalise the imbalance present in the vehicle wheels as far as possible. Stationary wheel balancers for precise balancing and in particular static (vertical) and dynamic (horizontal) balancing are well-known. However, these machines can measure only imbalances caused by the disc wheel and the tyre (wheel assembly).

To maintain a minimum of vehicle imbalance, wheel balancing should be carried out as accurately as possible. The disc wheels of the ASTRA-F are centred at the hub.

Residual imbalances may appear after the wheel has been installed. These are mostly caused by co-rotating parts such as hub, brake drum or brake disc.

### **Balancing with precision balancing equipment (on vehicle)**

To equalise any remaining imbalance which may be present, the wheels on the vehicle can be subsequently balanced with mobile balancers (finish balancer or precision balancing equipment). Raise the vehicle to equalize imbalance.



## Front and Rear Wheels — Electronically Balance

Electronic balancing is carried out with a mobile balancer in conjunction with one or two measuring units (sensor stands) with built-in force sensors.

### CAUTION:

The rotation of the wheels (in direction of travel) can be carried out with a friction wheel.

On manual transmission shift lever in neutral position.

The speed must not exceed 150 km/h when balancing with precision balancer.

If the drive wheels have different directions of rotation or running speeds, the measuring process can possibly be interrupted when using precision balancing equipment with infrared sensing and selective measuring operation.

Rotation of the wheels can be produced by the vehicle's own engine. An exhaust suction system must be present in the service area.

When using a sensor stand (1) on the front axle, place under the vehicle first, and the opposite side then supported with a floor stand (2).

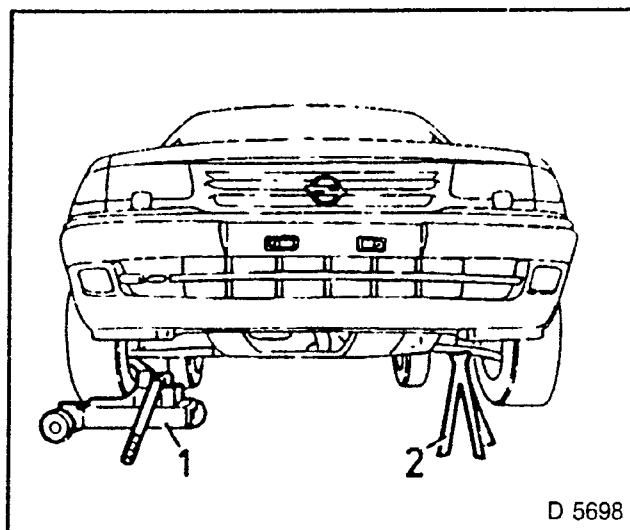


Fig 80

There is an advantage in using two sensor stands. The first wheel balanced can be re-checked without repositioning the sensor stand or the floor stand to determine any influence exerted by the opposite wheel as it rotates with it.

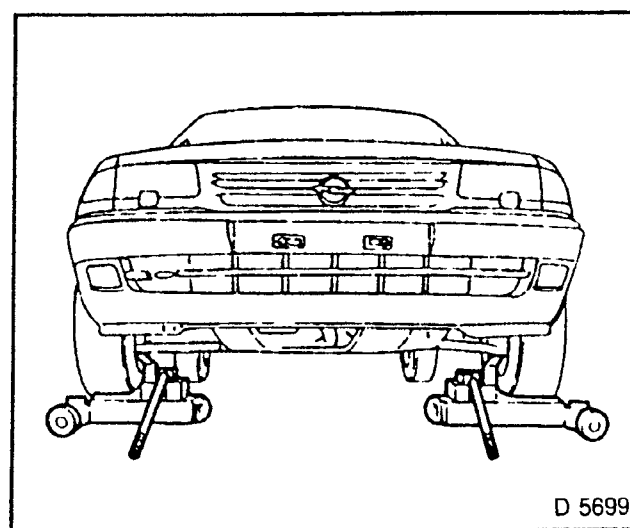


Fig. 81

Support on the control arm below the ball joint rivetted joint.  
Use a suitable sensor stand adapter from the manufacturer of the balancing equipment being used.

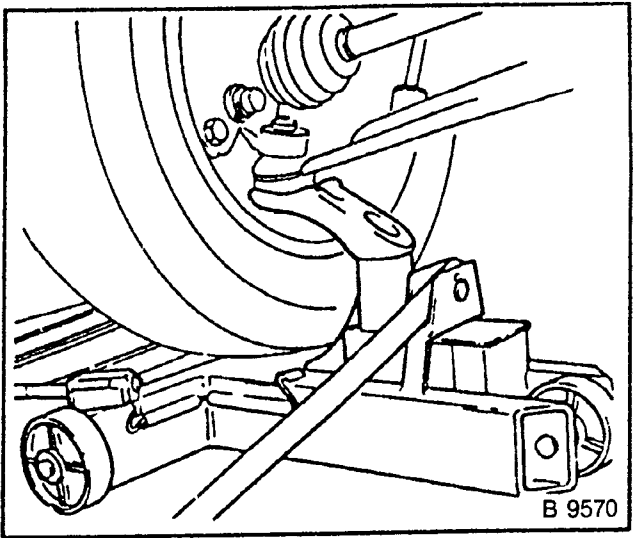


Fig 82

“Stationary balancing” of the rear wheels is generally sufficient. Should it be necessary to re-balance the vehicle, one is to proceed with the use of sensor stands as with the front axle.  
The vehicle is supported on the lower shock absorber fastening.  
When doing this, it is permissible that when using a sensor stand, the opposite side is not lifted.

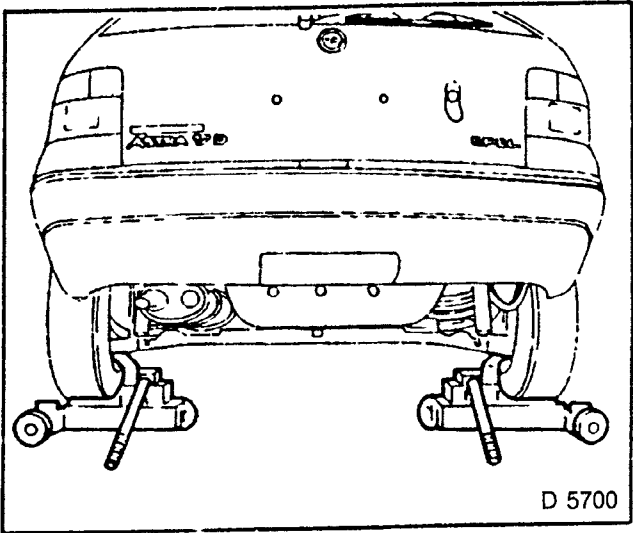


Fig 83

Tyre Sizes and Pressures

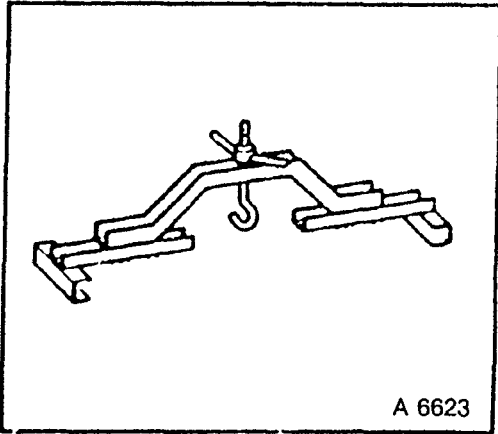
MODEL	DESIG-NATION	RIM SIZE	TYRE TYPE	TYRE SIZE	TYRE REVS/KM	kPa	
						TYRE PRESSURE FRT/RR (UNLADEN)	TYRE PRESSURE FRT/RR (LADEN)
ASTRA	140	5J x 13	STEELBELT	155 SR 13	567	200/180	210/230
	160i S	5.5J x 14	STEELBELT	175/65 TR 14	561	210/190	220/240
	160i	5J x 13	STEELBELT	165 SR 13	550	200/180	210/230
	160i E	5.5J x 14	STEELBELT	175/65 TR 14	561	210/190	220/240
	180i	5 5J x 14	STEELBELT	185/65 HR 14	550	210/190	220/240
	180i AT	5.5J x 14	STEELBELT	185/65 HR 14	550	210/190	220/240
	200i	5 5J x 14	STEELBELT	185/65 HR 14	550	210/190	220/240
KADETT	200i E	5 5J x 14	STEELBELT	195/60 VR 14	556	210/190	220/240
	140	5J x 13	STEELBELT	155 SR 13	567	200/180	210/230
	140 S	5J x 13	STEELBELT	165 SR 13	550	200/180	210/230
	160i	5J x 13	STEELBELT	165 SR 13	550	200/180	210/230
	200i S	6J x 15	STEELBELT	195/50 HR 15	569	230/210	240/250
	200i S	6J x 16	STEELBELT	205/45 ZR 16	555	220/220	250/260

Pressure values refer to cold tyres. The pressure increase of 0.2 to 0.4 bar occurring after extended driving must not be reduced.

# Special Service Tools

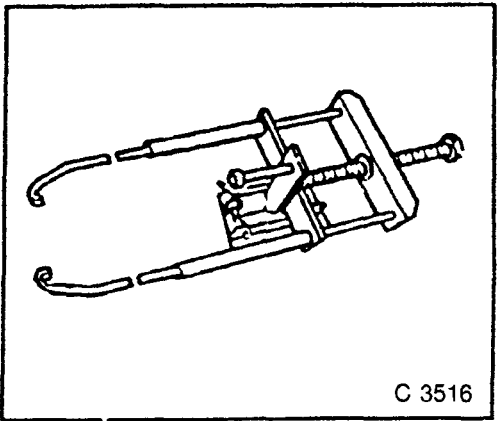
## KM-263 Engine Lifter/Holder

To hold engine with Engine Lifter on clip with two commercially available guiding hooks.



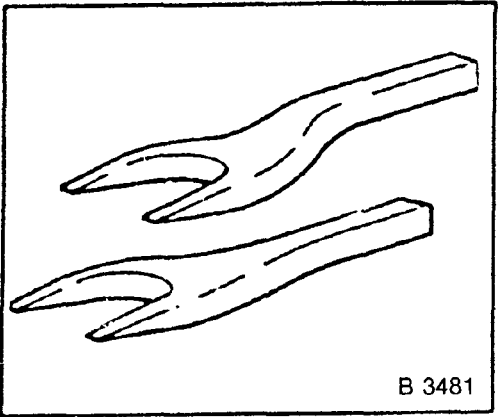
## KM-329-A Front Spring Compressor

To tension front spring with spring strut removed.



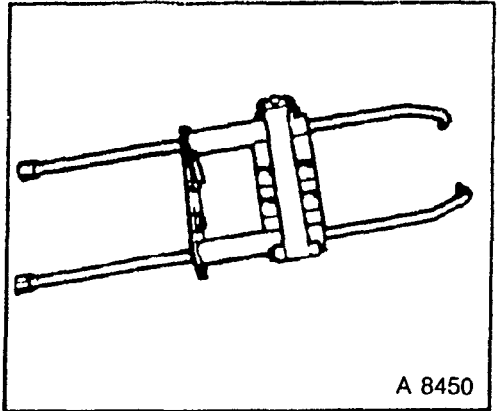
## KM-460-A Removing Forks

To remove axle driving shafts from transmission housing (F10, F13 manual transmission).  
To remove right drive shaft from transmission housing (F16).



## KM-465-A Front Spring Compressor

To tension front spring together with KM-329-A

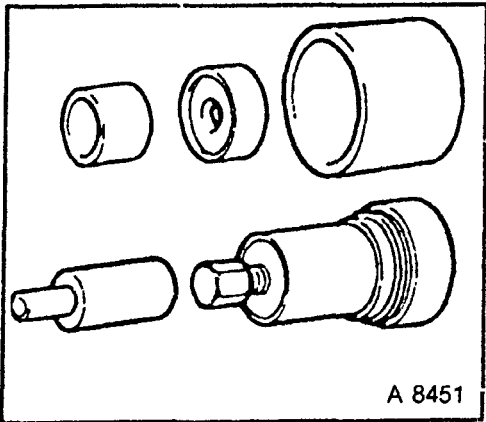


**KM-466-A      Remover/Installer**

To remove and install wheel bearing (F10, F13 manual transmission).

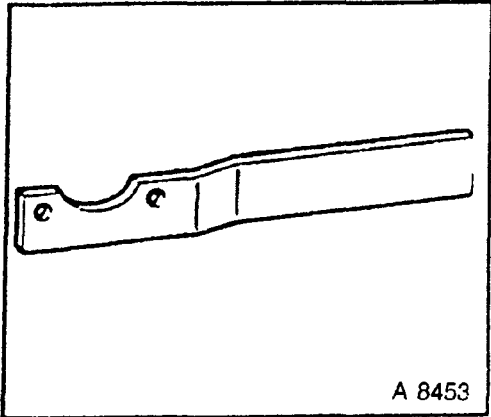
**IMPORTANT**

Shorten Remover KM-466-4 by 1 mm by plane grinding on the bearing sided heel. New KM-466-4-A tools have been changed accordingly.



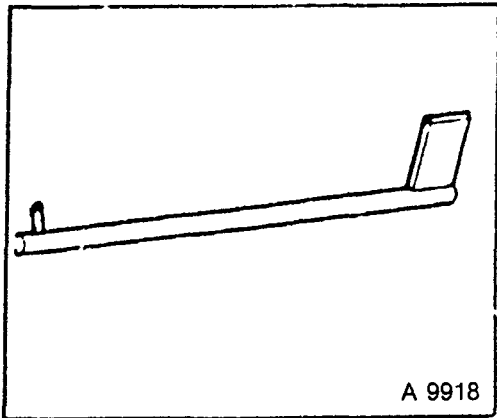
**KM-468      Holding Wrench**

To counterhold when tightening wheel bolts to hub.



**KM-476      Measuring Device**

To check straight ahead drive position.

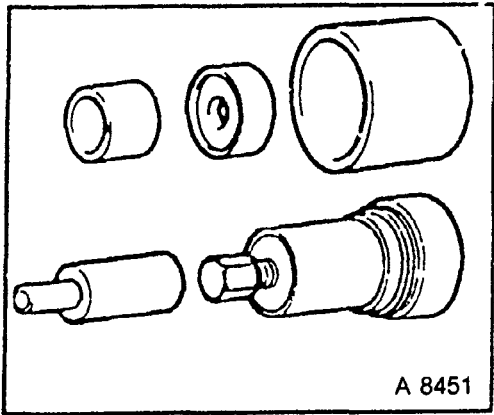


**KM-500-A      Remover/Installer**

To remove and install wheel bearing.

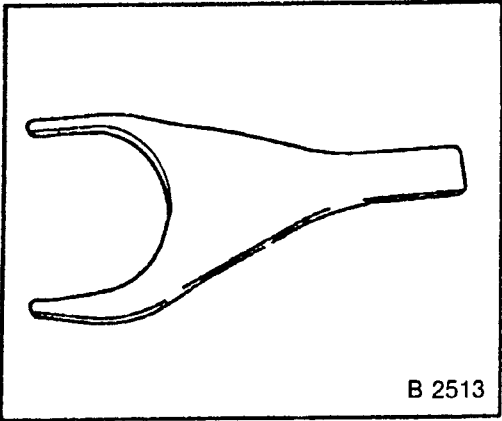
**IMPORTANT**

Shorten Remover KM-500-4 by 1 mm by plane grinding on the bearing sided heel. New KM-500-4-A tools have been changed accordingly.



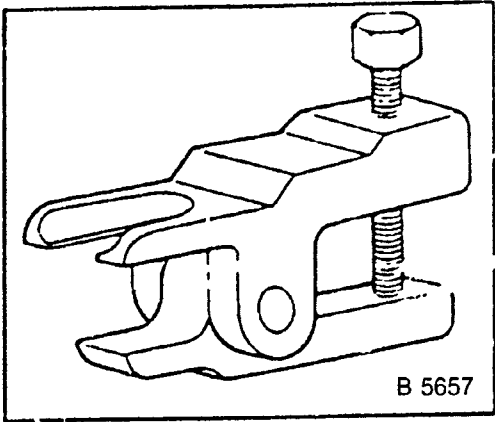
**KM-503-A      Removing Forks**

To remove left axle driving shaft from the transmission housing (F16, F20 manual transmission).



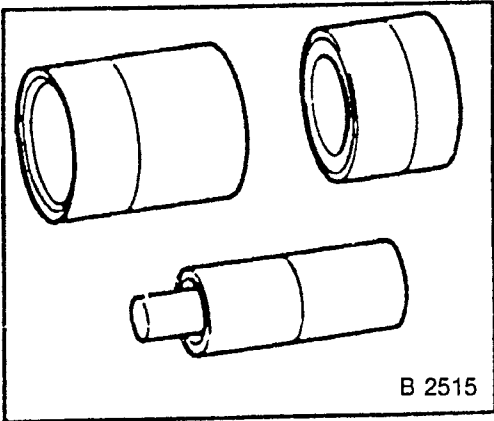
**KM-507-C      Remover**

To press out ball joint and tie rod joint.



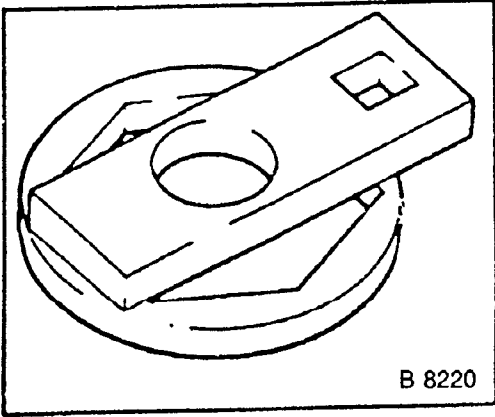
**KM-508-A      Remover/Installer**

To remove and install front damping bushing in control arm



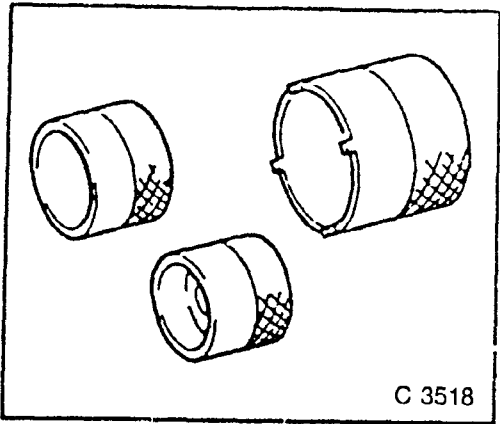
**KM-563      Wrench (replacement for KM-331)**

To unscrew and screw on threaded ring (plate nut) from/onto carrier tube.



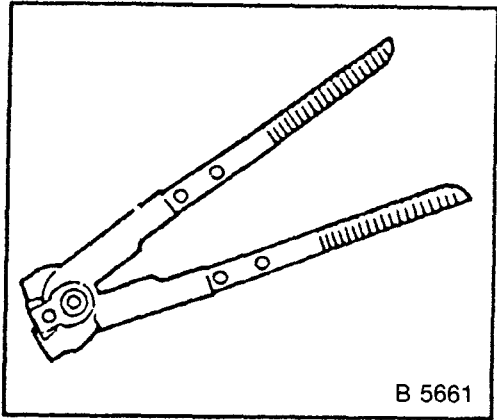
**KM-613-A      Remover/Installer**

To remove and install rear damping bushing in control arm.



**KM-J-22610      Pliers**

To tension folding cover retaining strap of axle driving shaft.



**38-A      Kukko Hub Remover**

To remove axle driving shaft from front wheel hub. See supplier.

## Front Wheel Adjustment

The tyre pressure is to be taken from the tyre pressure table on page 41.

Laden:	The given values are valid for a vehicle with each front seat laden with 70 kg. Fuel tank approximately half full.
Camber laden: (not adjustable)	- 1° 05' ± 45' Deviation from left to right wheel: 1° max.
Caster laden:	+ 2° 15' ± 1° Deviation from left to right wheel: 1° max.
Toe-out (refers to both wheels without thrust rod)	
Laden:	0° 15' ± 10' 2,5 mm toe-out to 0,5 mm toe-out When re-adjusting, as close as possible to average value.
Toe-in variation (with inner wheel angle at 20°; toe-in = 0)	
Laden:	1° 25' ± 45' Deviation from left to right wheel: 40' max.

## Radial/Lateral Runout

### Steel disc wheel:

Wheel offset (mm)	Max. permissible runout (mm)	
	radial	lateral
49 ± 1	0,8	1,0

### Light alloy disc wheel:

Wheel offset	Max permissible runout (mm)	
	radial	lateral
49 ± 1	0,25	0,3

The maximum permissible radial runout is measured at the rim shoulder, and the maximum permissible lateral runout is measured at the side surface of the rim flange.



## Recommended Torque Values

	Nm
ABS SENSOR BRACKET TO STEERING KNUCKLE .....	8
BALL JOINT TO CONTROL ARM .....	60
BALL JOINT TO STEERING KNUCKLE .....	70
BRAKE CALIPER BRACKET TO STEERING KNUCKLE .....	95
BRAKE CALIPER TO STEERING KNUCKLE .....	95
BRAKE DISC TO FRONT WHEEL HUB .....	4
COVER PLATE TO STEERING KNUCKLE ..	4
DAMPING WEIGHT TO CONTROL ARM .....	20
FRONT AXLE BODY TO FLOOR CROSSMEMBER (3) .....	*1)
FRONT AXLE BODY TO RADIATOR CROSSMEMBER (1) .....	1151)
FRONT AXLE BODY WITH CONTROL ARM TO SUPPORT (2) .....	1701)
FRONT CONTROL ARM TO FRONT AXLE BODY .	**
LOCK NUT TO STABILIZER .....	20
PISTON ROD TO SUPPORT BEARING .....	55
REAR CONTROL ARM WITH FRONT AXLE BODY TO SUPPORT .....	170
SPRING STRUT TO WHEEL WELL .	30
STABILIZER TO CONTROL ARM .....	202)
STABILIZER TO FRONT AXLE BODY .....	20
SUPPORT BEARING TO PISTON ROD .....	55
THREADED RING FOR SPRING STRUT CARTRIDGE TO SUPPORT TUBE .....	200
TIE ROD CLAMP CONNECTION .....	20
TIE ROD JOINT TO TIE ROD LEVER .....	60
TRANSMISSION BRACKET TO FRONT AXLE BODY .....	40
VIBRATION DAMPER TO AXLE SHAFT .....	10
WHEEL BOLTS ....	110

- \* Must be tightened in two stages: 100 Nm + 75° to 90°
- \*\* Must be tightened in two stages: 100 Nm + 60° to 75°
- 1) Use new bolts
- 2) Use new nuts maintain pretension dimension of 38 — 39 mm.