REPAIR MANUAL

ZF – WHEEL HEAD RL-85

ZF – INDEPENDENT WHEEL SUSPENSION RL-85 E/EC

ZF – FRONT-/ TRAILING AXLE RL-85 A

5871.201.102 en

REPAIR MANUAL

ZF – WHEEL HEAD RL-85
ZF – INDEPENDENT WHEEL SUSPENSION RL-85 E/EC
ZF – FRONT- / TRAILING AXLE RL-85 A

Note:

The great variety of ZF units compels a restriction of the Disassembly and Reassembly Manuals to a
standard ZF production unit.
This documentation has been developed for the skilled Serviceman, trained by ZF Passau for the repair on ZF-units.
Continuous technical improvement of the ZF units as well as extensions concerning design possibilities might require deviating work steps as well as deviating setting and test data.

This Disassembly and Reassembly Manual is based on the design level of a ZF production unit
at the time of preparation of the Repair Manual**.**

ZF Friedrichshafen AG reserves the right to replace this Disassembly and Reassembly Manual by an updated edition at any time without prior notice. Upon request, ZF Friedrichshafen AG shall advise which edition is currently valid.

Observe the specifications of the relevant brake manufacturer and vehicle manufacturer for service and maintenance works on the brake facility.

ATTENTION:
Observe the vehicle manufacturer's instructions and specifications for installation and commissioning of the unit!

ZF Friedrichshafen AG
ZF Services
Donaustr. 71
D - 94034 Passau

Dept.: MAIP21

Design level 1998/11
4. Edition 2014/05

TABLE OF CONTENTS

PREFACE

The present documentation has been developped for qualified personnels, which has been trained by the Zahnradfabrik Passau for the maintenance and repair operations on ZF-Units.

Documented is a ZF-Serial product according to the design phase of the date of edition.

However, due to technical developments of the product , the unit in your hands can require differing steps as well as also different setting and test data.

We recommend therefore, to commit your ZF-Unit to Masters and Servicemen, whose practical and theoretical training will be constantly hold up-to-date in our training school.

The Service Stations, established by the Zahnradfabrik Friedrichshafen all over theworld, offes you:

1. Continuously trained personnel

2. Prescribed installations, e.g. Special tools

3. Original ZF-Spare Parts, in accordance with the latest state of development

Here, all operations will be carried out for you with utmost care and reliability.

Repairs carried out by ZF-Service Stations are in addition covered within the terms of actually valid contractual conditions by the ZF-Warranty.

Damages caused by inappropriate or unskilled work, carried out by personnel not making part of the ZF, ander after-expenditures arising from it are excluded from this contractual liability.
This applies also in case of renunciation of Original Sparte Parts.

Zahnradfabrik Passau GmbH

Service Department

GENERAL WORKING INSTRUCTIONS

At all operations, pay attention to cleanliness and skilled work.
Transmissions removed out of the vehicle must therefore be cleaned prior to the opening.

It is assumed that the Special tolos such as specified by ZF will be used.

The Special tools have 10-digit part-numbers and can be acquisted from the ZF-Passau.

After the dismantling, all components must be cleaned.
This applies especially for corners, pockets and recesses of housings and covers.

The old sealing compound has to be removed carefully.

Lube oil ducts, lube oil grooves and lube oil pipes must be checked for free passage.
They must be free from deposits, foreign matters or protective agetents.
The latter refers especially to new parts.

Parts which have been inevitably damaged at a dismantling, have to be generally replaced by new ones, as for example:
Radial sealing rings, O-rings, U-section rings, cap boots, protective caps etc.
Components such as antifriction bearings, thrust washers, synchronizer parts etc., which are subject to normal wear in the driving range, have to be checked by a specialist.
He will decide if they can be reused.

For the heating of bearings etc., heating plates, rod heaters or heating furnaces must be used.
Never heat with the direct flame. As an auxiliary solution, the bearing can be immersed in a vessel filled with oil,which is then heated with the flame.

Ball bearings, covers, flanges and parts like that should be heated to about 90° C to 100° C.

Hot-mounted parts must be reset after the cooling down, to ensure a safe contact.
Prior to press in shafts, bearings etc., both parts must be oiled.

At the assembly, all specified setting values, test data and torque limits have to be observed.

Prior to a test run resp. the commissioning, the ZF-Units must be filled with oil.
The procedure has to be taken from the ZF-Lubrication and Maintenace Instructions, the released oil grades from the corresponding ZF-List of lubricants.
The ZF-Lists of lubricants are available at all ZF-Service Stations.
After the oil filling, the oil level check plugs and oil drain plugs have to be tightened to the prescribed torque limits.

IMPORTANT INSTRUCTIONS

CONCERNING THE WORK SAFETY

Repairers of ZF-Units are principally themselves responsible for the work safety.

The observance of all applicable safety regulations and legal provisions is a prerequisite to prevent damages to Individuals and Products at Maintenance and Repair operations.

The correct repair of these ZF-Products requires correspondingly trained personnel.
The training is the Repairer's duty.

BEZEICHNUNG DER GESETZLICHEN EINHEITEN
DENOMINATION OF STANDARD DIMENSIONS
DENOMINATION DES DIMENSIONS STANDARDISEES

Hinweis : längenbezogene Maße in kg/m; flächenbezogene Maße in t/m2

Note : linear density in kg/m; areal density in t/m2

Nota : Densité lineaire en kg/m; Densité superficielle en t/m2

Begriff Unit Unité	Formelzeichen	neu New Nouveau	alt old Vieu	Umrechnung Conversion Conversion	Bemerkungen Note Nota
Masse Mass Masse	m	kg (Kilogramm)	kg		
Kraft Force Force	F	N (Newton)	kp	1 kp = 9,81 N	
Arbeit Work Travail	A	J (Joule)	kpm	0,102 kpm = 1J = 1 Nm	
Leistung Power Puissance	P	KW (Kilowatt)	PS (DIN)	1 PS = 0,7355 KW 1 KW = 1,36 PS	
Drehmoment Torque Couple	T	Nm (Newtonmeter)	kpm	1 kpm = 9,81 Nm	T (Nm) = F (N) . r (m)
Kraftmoment Moment (Force) Moment (Force)	M	Nm (Newtonmeter)	kpm	1 kpm = 9,81 Nm	M (Nm) = F (N) . r (m)
Druck (Über-) Pressure (Overpress) Pression (Sur-)	pü	bar	atü	1,02 atü = 1,02 kp/cm2 = 1 bar = 750 torr	
Drehzahl Speed Nombre de Tours	n	min -1			

VERGLEICHSTABELLE FÜR MASSEINHEITEN
CONVERSION TABLE
TABLEAU DE CONVERSION

25,40 mm	=	1 in (inch)
1 kg (Kilogramm)	=	2,205 lb (pounds)
9,81 Nm (1 kpm)	=	7,233 lbf x ft (pound force foot)
1,356 Nm (0,138 kpm)	=	1 lbf x ft (pound force foot)
1 kg / cm	=	5,560 lb / in (pound per inch)
1 bar (1,02 kp/cm^2)	=	14,233 psi (pound force per square inch lbf/in^2)
0,070 bar (0,071 kp/cm^2)	=	1 psi (lbf/in^2)
1 Liter	=	0,264 Gallon (Imp.)
4,456 Liter	=	1 Gallon (Imp.)
1 Liter	=	0,220 Gallon (US)
3,785 Liter	=	1 Gallon (US)
1609,344 m	=	1 Mile (Landmeile)
0° C (Celsius)	=	+ 32° F (Fahrenheit)
0 ° C (Celsius)	=	273,15 Kelvin

TORQUE LIMITS FOR SCREWS (IN Nm) ACCORDING TO ZF-STANDARDS 148

Friction value: μ total = 0,12 for Screws and nuts without after-treatment, as well as phosphatized Nuts. Tightening by hand !

Torque limits, if not especially indicated, can be taken from the following List:

Metric ISO-Standard thread DIN 13, Page 13

Size	8.8		10.9		12.9
M4	2,8		4,1		4,8
M5	5,5		8,1		9,5
M6	9,5		14		16,5
M7	15,5		23		27
M8	23		34		40
M10	46		68		79
M12	79		117		135
M14	125		185		215
M16	195		280		330
M18	280		390		460
M20	390		560		650
M22	530		750		880
M24	670		960		1120
M27	1000		1400		1650
M30	1350		1900		2250
M33	1850		2600		3000
M36	2350		3300		3900
M39	3000		4300		5100

Metric ISO-Fine thread DIN 13, Page 13

Size	8.8		10.9		12.9
M 8 x 1	24,5		36		43
M 9 x 1	36		53		62
M 10 x 1	52		76		89
M 10 x 1,25	49		72		84
M 12 x 1,25	87		125		150
M 12 x 1,5	83		122		145
M 14 x 1,5	135		200		235
M 16 x 1,5	205		300		360
M 18 x 1,5	310		440		520
M 18 x 2	290		420		490
M 20 x 1,5	430		620		720
M 22 x 1,5	580		820		960
M 24 x 1,5	760		1090		1270
M 24 x 2	730		1040		1220
M 27 x 1,5	1110		1580		1850
M 27 x 2	1070		1500		1800
M 30 x 1,5	1540		2190		2560
M 30 x 2	1490		2120		2480
M33 x 1,5	2050		2920		3420
M 33 x 2	2000		2800		3300
M 36 x 1,5	2680		3820		4470
M 36 x 3	2500		3500		4100
M 39 x 1,5	3430		4890		5720
M 39 x 3	3200		4600		5300

Wheel head

(Output - Joint housing)

Figure 1		**Assembly car compl. with tilting device** **Support** Universal use. To clamp the compl. wheel head RL - 85 upon the assembly car. To clamp the compl. wheel head RL - 85 E upon the assembly car. The location is realized on the steering knuckle carrier.	**5870 350 000** **5870 350 094** **5870 350 098**
Figure 6		**Lifting device** Universal use. To remove and mount the brake caliper, which will be installed in a 2-o'clock or 10-o'clock position.	**5870 281 058**
Figure 10		**Lifting device** Universal use. To remove and mount the complete hub..	**5870 281 043**
Fiure 12		**Plastic mallet ∅ 60 mm** Universal use. To separate and join components.	**5870 280 004**
Figure 13		**Internal puller** **Counter support** Universal use. To remove the tapered roller bearing outer races out of the hub bore.	**5870 300 019** **5870 300 020**
Figure 15		**Striker** To remove the seal retainer on the steering knuckle.	**5870 650 001**
Figure 15	Bild 74	**Set of pliers I 1 - I 4** Universal use. To squeeze the circlip 58 x 2 - 0630 502 063 - in the steering knuckle in and out.	**5870 900 013**
Figure 16		**Pressure piece** **Hydraulic spindle 270 KN M40x1,5** **HP-Pump** Universal use. To press off the steering knuckle pin.	**5870 080 037** **5873 003 007** **5870 287 007**

Wheel head

(Output - Joint housing)

Figure 17		**Driver** To drive the sealing rings, the needle sleeve as well as the bush out of the steering knuckle. To be used together with: **Handle**	**5870 055 107** **5870 260 002**
	Figure 60 Figure 61 Figure 63 Figure 64 Figure 65	**Driver** To drive the bush - 0730 260 702 - into the steering knuckle bore. To drive the sealing ring - 0734 300 171 - into the steering knuckle bore. To drive the needle sleeve - 0735 303 001 - into the steering knuckle bore. To be used combined with: **Handle long**	**5870 055 107** **5870 260 003**
	Figure 66	**Digital-Depth gauge** Universal use. For various measuring operations.	**5870 200 072**
	Figure 68	**Assembly disk** To position the steering knuckle pin at the installation into the steering knuckle.	**5870 345 092**
	Figure 69	**Hot-air blower 220 V** **Hot-air blower 110 V** Universal use. To heat bearings, shafts and housing components.	**5870 221 500** **5870 221 501**
	Figure 72	**Centering punch** To align the steering knuckle with the steering knuckle carrier and their componenents.	**5870 912 018**
	Figure 80	**Wheel-stud puller - Basic tool** **Insert M22x1,5** Universal use. To pull the wheel studs into the hub bores.	**5870 610 010** **5870 610 002**
	Figure 81	**Driver *** To drive the tapered roller bearing outer race 32309 = 0750 117 524 into the wheel hub.. To be used together with: **Handle**	**5870 058 051** **5870 260 002**

Wheel head

(Output - Joint housing)

	Figure 83	**Driver *** To drive the tapered roller bearing outer race 0750 117 516 into the wheel hub. To be used combined with: **Handle**	**5870 058 065** **5870 260 002**
	Figure 86	**Driver** To drive the shaft seal 0750 111 402 into the wheel hub.	**5870 048 210**
	Figure 88	**Installer** As assembly aid at the mounting of the pre-Assembled hub upon the hub carrier. **Lifting device** As assembly aid at the mounting of the pre-Assembled hub upon the hub carrier.	**5870 651 071** **5870 281 043**
	Figure 91	**Spring scale 0 - 100 N** Universal use. To check the rolling resistancein the hub bearing.	**5870 230 006**

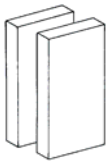
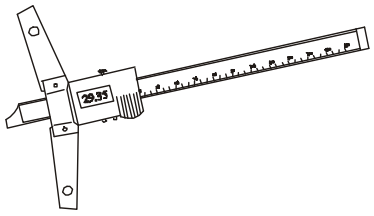
CONTROL ARM

Figure 21	Figure 54	**Press bracket** **3 5/16" -** **Reducer** **3 5/16" - M40x1,5** **Hydraulic spindle** **26 KN M40x1,5** **HP-Pump** Universal use. To press the bolt - 4474 385 030 - out of the control arm and the axle beam. To install the bolt - 4474 385 030 - into the control arm and axle beam. Combined with: **Centering punch**	**5870 285 023** **5870 285 024** **5873 003 007** **5870 287 007** **5870 912 025**
Figure 22	Figure 32	**Set of pliers** Universal use. To squeeze the circlip in the control arm out and in.	**5870 900 014**
Figure24		**Plastic mallet ∅ 60 mm** Universal use. To drive the rubber bearing out of the control arm.	**5870 280 004**
	Figure33	**Driver *** To drive the tapered roller bearing outer race 30208 = 0750 117 224 into the the steering knuckle carrier. To be used combined with: **Handle**	**5870 058 021** **5870 260 002**
	Figure 36	**Assembly drift (compl.)** To adjust the rolling moment on the control arm bearing.	**5870 345 091**
	Figure 42	**Torque spanner** **4 - 16 Nm** Universal use. To check the rolling resistance in the control arm bearing.	**5870 203 005**

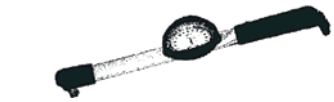
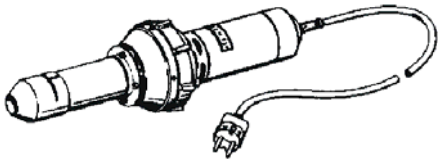
STEERING LEVER

	Figure 117	**Driver tool** For forcing the outer ring of the tapered roller bearing into the relay lever. To be used in combination with: **Handle**	5870 058 084 5870 260 002
	Figure 118	**Assembly mandrel (cpl.)** For setting the rolling torque at the relay lever bearing. **Pressure sleeve** Accessory to assembly mandrel when setting the rolling torque of the relay lever bearing.	5870 345 091 5870 100 064
	Figure 125 Figure 126	**Mounting fixture** For mounting the bearing pin into the relay lever bearing. **Thread insert** Adapter piece between mounting fixture and bearing pin.	5870 000 097 5870 000 104

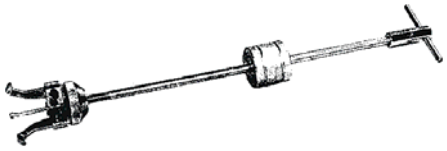
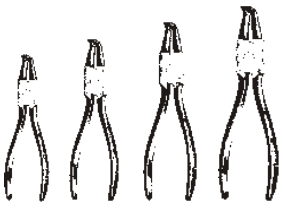
COMMERCIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

Cons. No.	Figure	Designation Order No.	Qty.	Chapter/Fig.
1		**Magnetic stand** **5870 200 055**	1	Universal
2		**Dial indicator** **5870 200 057**	1	Universal
3		**Gage blocks** **5870 200 066** 70 mm **5870 200 067** 100 mm	1	Universal
4		**Digital depth gage** **5870 200 072** 200 mm **5870 200 114** 300 mm	1	Universal
5		**Digital caliper gage** **5870 200 109** 150 mm **4P46 001 065** 300 mm **4P46 000 032** 500 mm	1	Universal

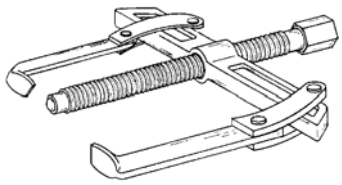
COMMERCIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

Cons. No.	Figure	Designation Order No.	Qty.	Chapter/Fig.
6	 	**Torque wrench** **5870 203 030** 0.6 -6.0 Nm **5870 203 031** 1.0 – 12 Nm **5870 203 032** 3.0 – 23 Nm **5870 203 033** 5.0 – 45 Nm **5870 203 034** 10 – 90 Nm **5870 203 039** 80 – 400 Nm **5870 203 016** 160 – 800 Nm **5870 203 011** 750 - 2000 Nm	1	Universal
7		**Hot-air blower** **5870 221 500** 230 V **5870 221 501** 115 V	1	Universal
8		**Plastic hammer** **5870 280 004** Ø 60 mm **Substitute nylon insert** **5870 280 006**	1	Universal
9		**Lifting strap** **5870 281 026**	1	Universal

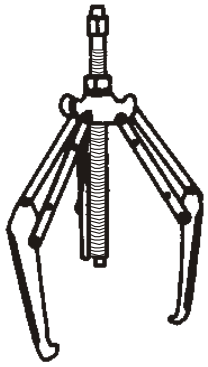
COMMERCIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

Cons. No.	Figure	Designation Order No.	Qty.	Chapter/Fig.
10		**Lifting chain** **5870 281 047**	1	Universal
11		**Pry bar** **5870 345 071**	1	Universal
12		**Striker** **5870 650 004**	1	Universal
13		**Set of internal pliers** I1-I2-I3-I4 **5870 900 013**	1	Universal
14		**Set of internal pliers** I11-I21-I31-I41 90° **5870 900 014**	1	Universal

COMMERCIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

Cons. No.	Figure	Designation Order No.	Qty.	Chapter/Fig.
15		**Set of external pliers** A1-A2-A3-A4 **5870 900 015**	1	Universal
16		**Set of external pliers** A01-A02-A03-A04 90° **5870 900 016**	1	Universal
17		**Two-armed puller** **5870 970 001** Jaw width 80 mm Throat depth 100 mm **5870 970 002** Jaw width 120 mm Throat depth 125 mm **5870 970 003** Jaw width 170 mm Throat depth 125 mm **5870 970 004** Jaw width 200 mm Throat depth 175 mm **5870 970 006** Jaw width 350 mm Throat depth 250 mm **5870 970 007** Jaw width 520 mm Throat depth 300 - 500 mm **5870 970 026** Jaw width 250 mm Throat depth 200 mm **5870 970 028** Jaw width 380 mm Throat depth 200 mm	1	Universal

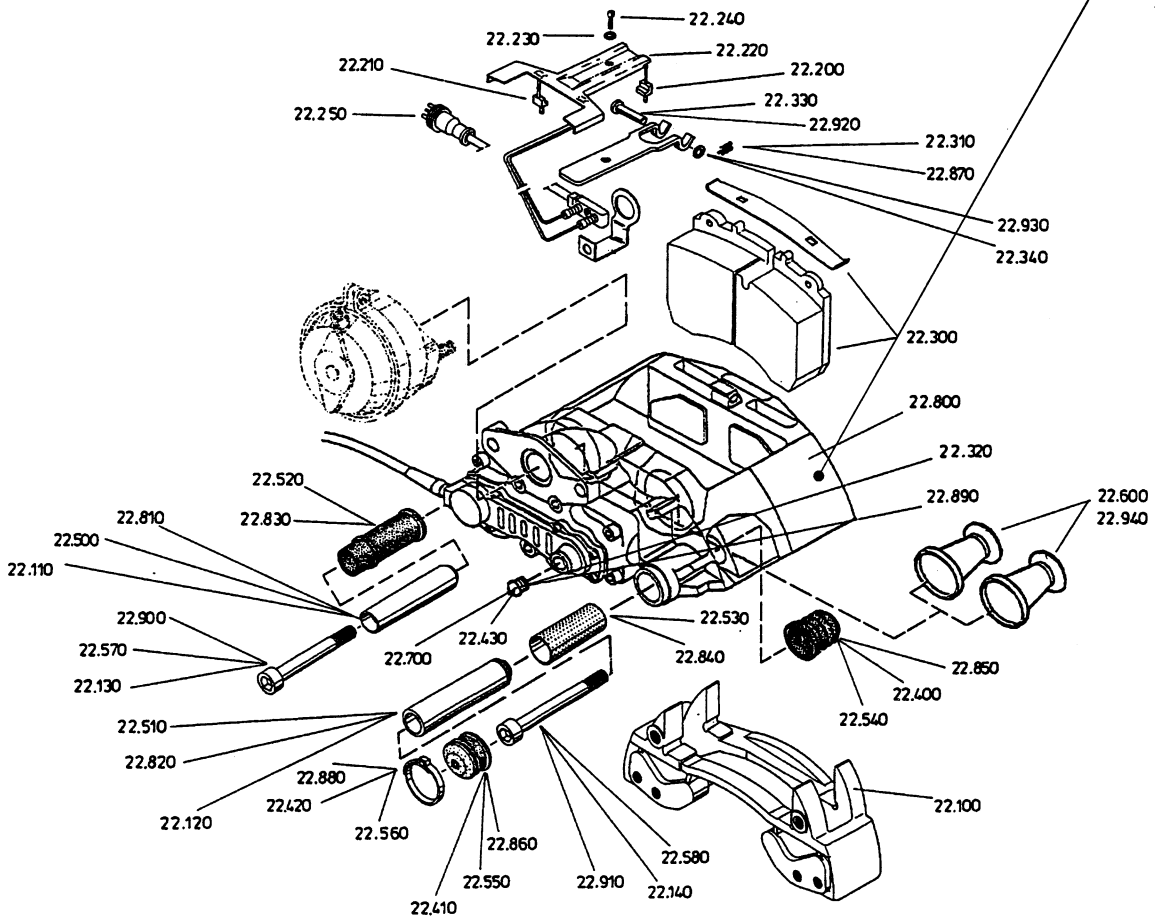
COMMERCIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

Cons. No.	Figure	Designation Order No.	Qty.	Chapter/Fig.
18		**Three-armed puller** **5870 971 001** Jaw width 85 mm Throat depth 65 mm **5870 971 002** Jaw width 130 mm Throat depth 105 mm **5870 971 003** Jaw width 230 mm Throat depth 150 mm **5870 971 004** Jaw width 295 mm Throat depth 235 mm **5870 971 005** Jaw width 390 mm Throat depth 230 mm **5870 971 006** Jaw width 640 mm Throat depth 290 mm	1	Universal

RL-85
BREMSE
BRAKE
4474 085 023

Spezial

5870 281 058

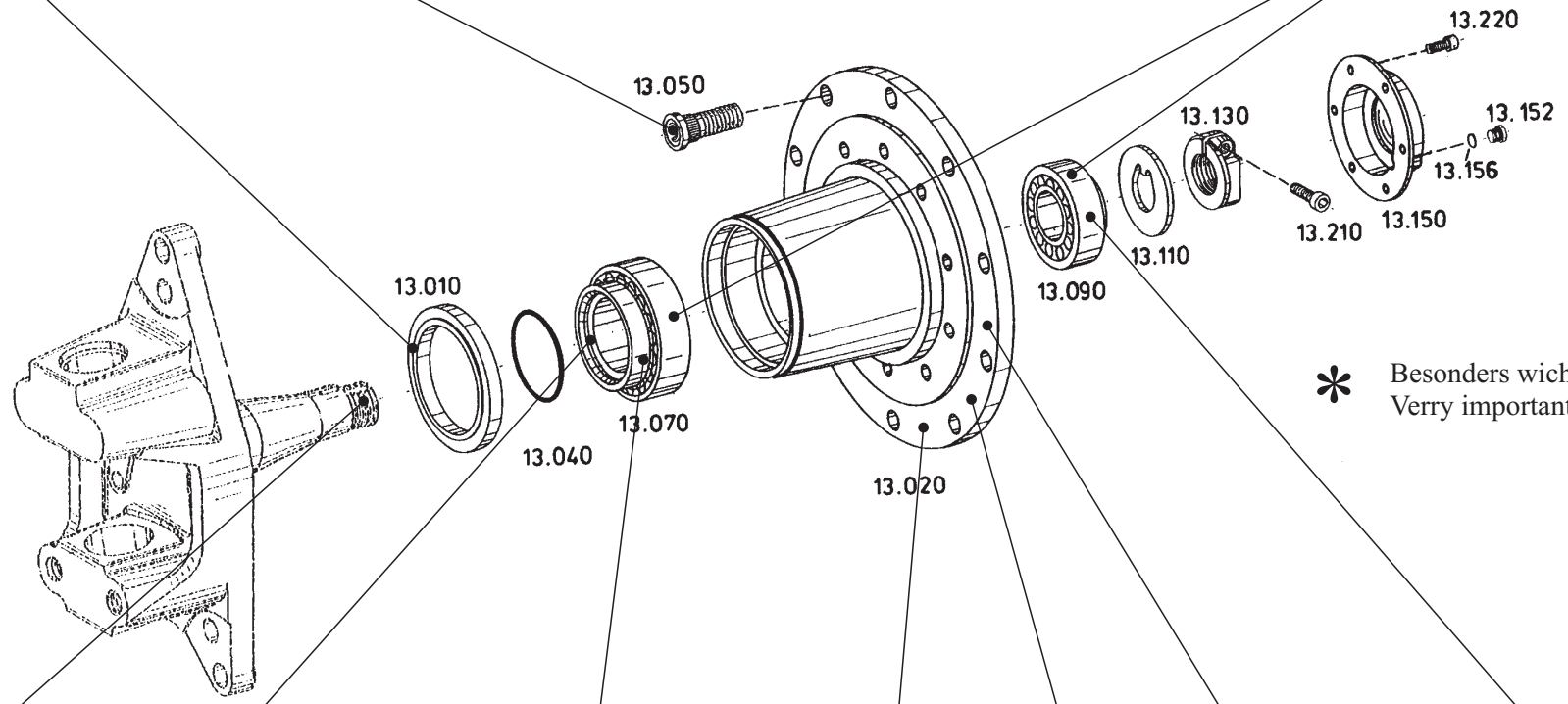


WB-01

RL-85
ABTRIEB
OUTPUT / SORTIE
4474 085 023

Spezial

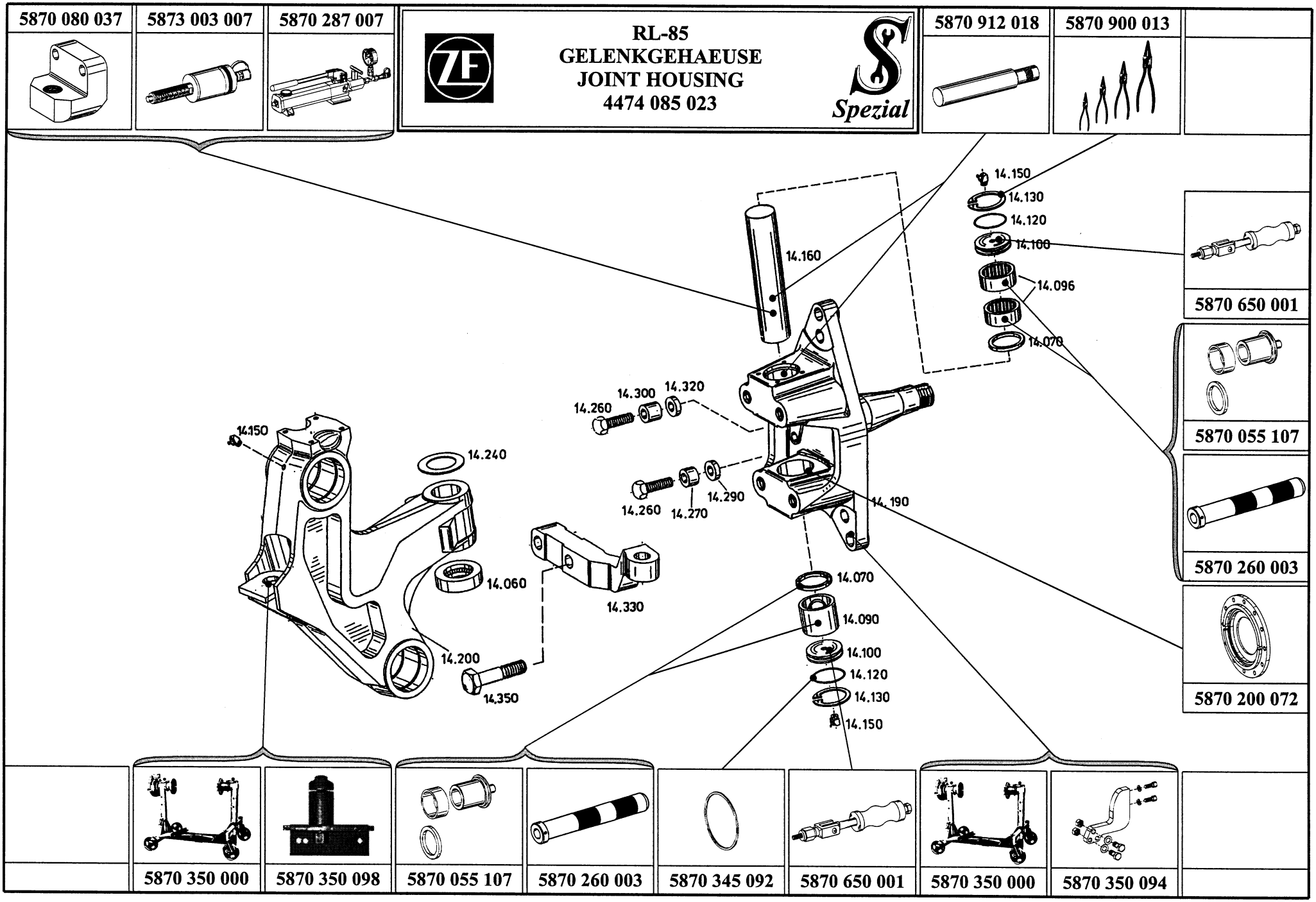
5870 048 210	5870 610 002	5870 610 010	5870 058 065	5870 058 051	5870 260 002
*					



* Besonders wichtige Werkzeuge
Verry important tools

5870 651 071	5870 221 500	5870 221 501	5873 012 018	5873 002 000	5870 280 004	5870 230 006	5870 281 043	5870 300 019	5870 300 020
	220 V	110 V	*	*					

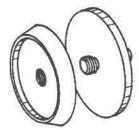
WB - 02

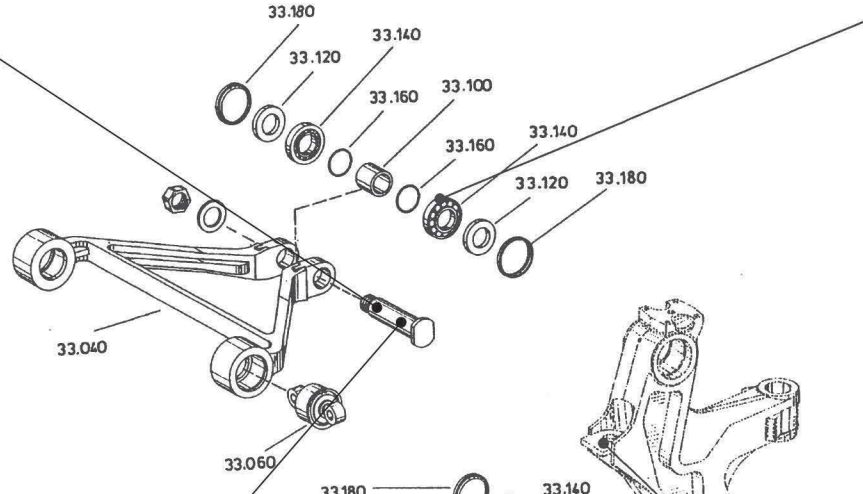

5870 080 037
5873 003 007
5870 287 007
RL-85
GELENKGEHAEUSE
JOINT HOUSING
4474 085 023
Spezial
5870 912 018
5870 900 013
14.150
14.130
14.120
14.100
14.160
14.096
14.070
5870 650 001
5870 055 107
5870 260 003
5870 200 072
14.300
14.320
14.260
14.150
14.240
14.260
14.270
14.290
14.190
14.060
14.330
14.070
14.090
14.100
14.120
14.130
14.150
14.200
14.350
5870 350 000
5870 350 098
5870 055 107
5870 260 003
5870 345 092
5870 650 001
5870 350 000
5870 350 094

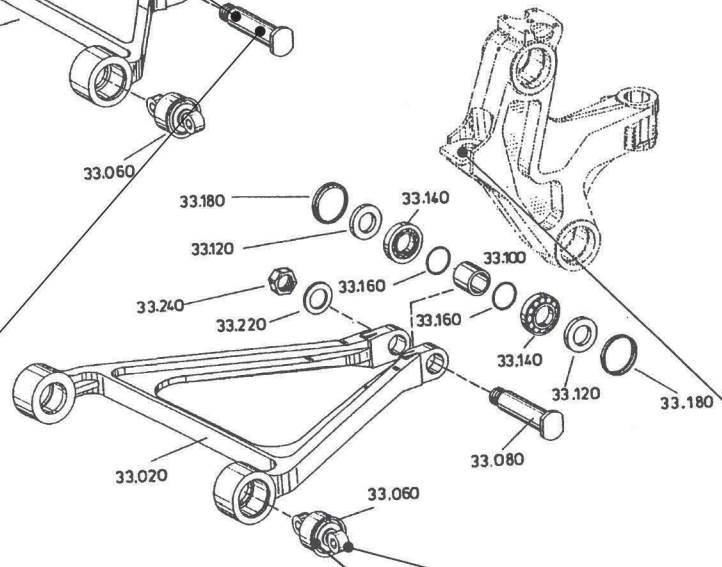
WB-03

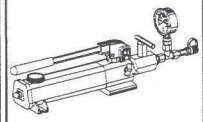
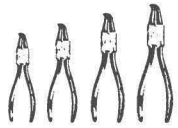
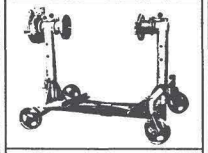
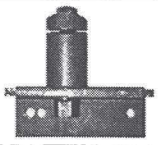
RL-85
QUERLENKER
CONTROL ARM
4474 085 023

Spezial

5870 345 091	5870 203 005		5870 058 021	5870 260 002
				





5870 285 023	5870 285 024	5873 003 007	5870 287 007	5870 912 025	5870 900 014	5870 280 004	5870 350 000	5870 350 098
								

WB-04

Fasten the indpendent wheel suspension RL-85 E on the assembly car.

(S) Assembly car	5870 350 000
(S) Support (RL-85)	5870 350 094
(S) Support (RL-85 E)	5870 350 098

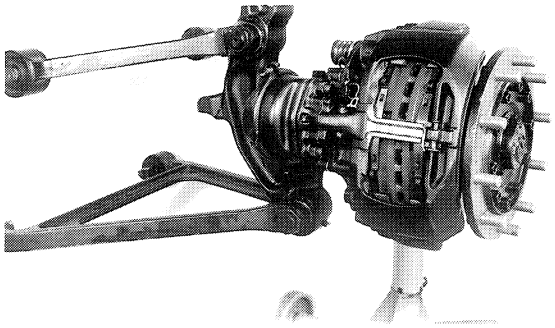


Figure 1

1. DISASSENBLY - WHEEL HEAD

The disassembly of the wheel head RL-85, RL-85 E and RL-85 A, is identical !

Separate brake caliper from wheel head (Figure 2 ... 6)

At works on the brake system, the Instructions and Specifications of the respective Component Manufacturer are binding, see in this connection the Repair Manual of the Brake Manufacturer !

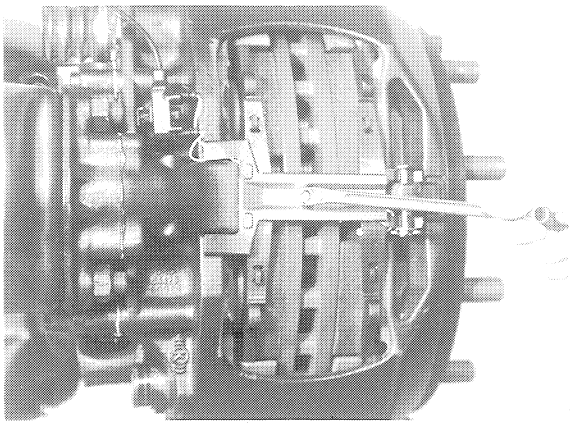


Figure 2

The following Figures describe the removal of the brake caliper, Version SB 7000 of the Firm of KNORR.

Loosen socket head screw and remove cable guide plate.
Now, remove pad retainer.

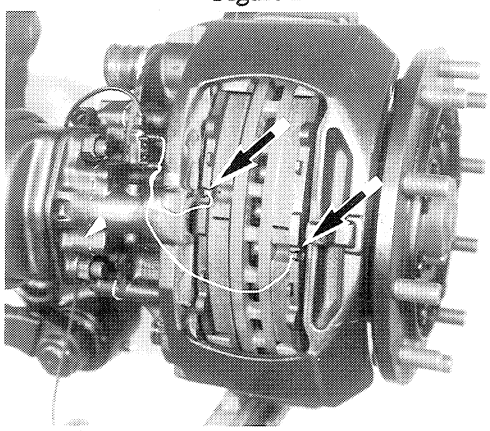


Figure 3

Separate both clip sensors (electrical wear indicator) from the brake pads.

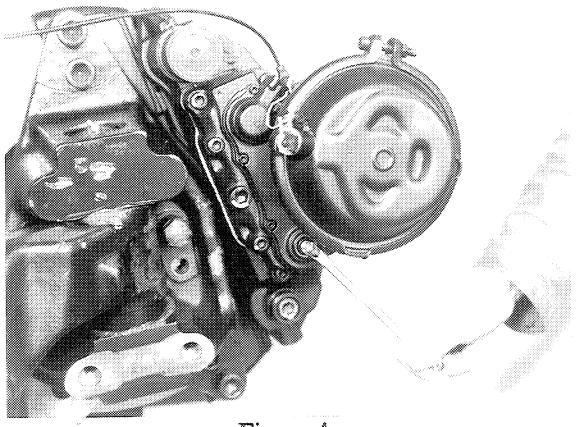


Figure 4

Remove protection cap and reset hexagon (WAF 8) of the slack adjuster in counterclockwise direction (Figure 4) until the brake pads can be pulled out (Figure 5).

☞ **By the breakaway torque of the overload clutch, a „clicking" noise will be created !**

⚠ **Do not exert an overload on the hexagon (WAF 8) !**
Do not use an open-end spanner !

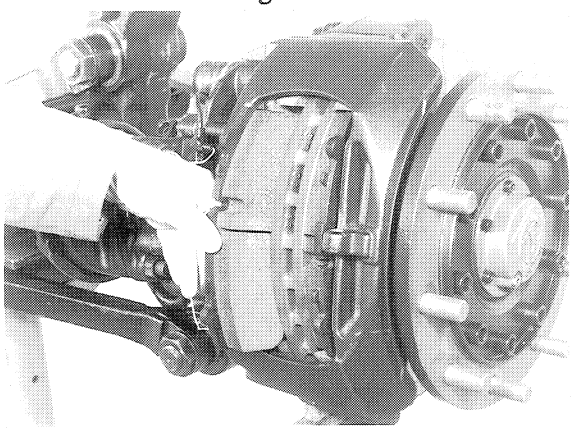


Figure 5

Secure brake caliper by means of lifting device.

Loosen mounting bolts and separate brake caliper from wheel head.

(S) Lifting device 5870 281 058

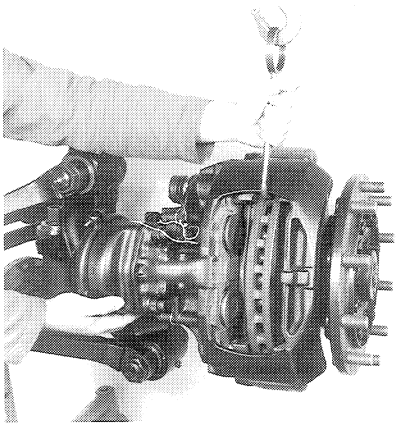


Figure 6

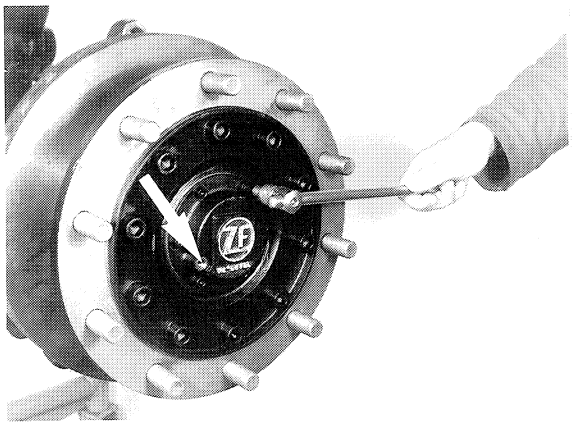


Figure 7

Loosen screw plug (Arrow) and drain oil.

Loosen socket head screws and separte cover from hub.

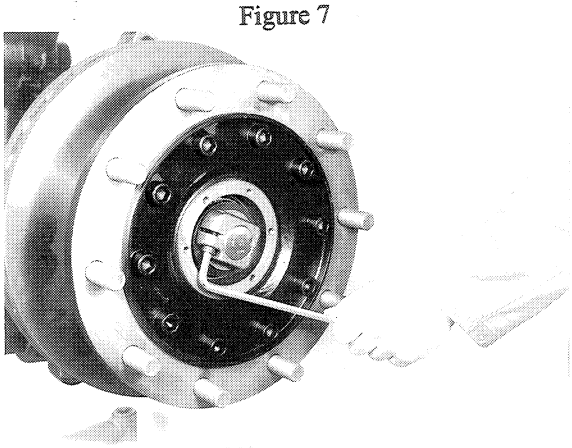


Figure 8

Loosen socket head screw on the clamping nut.

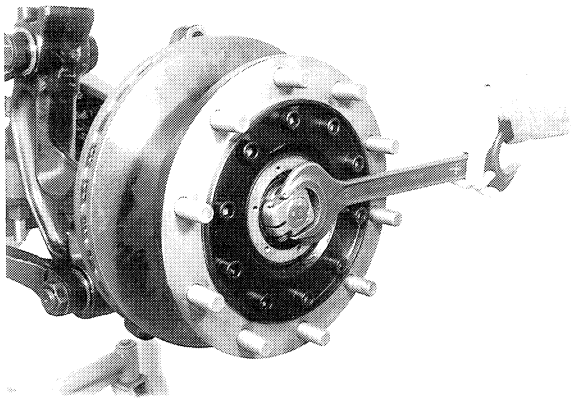


Figure 9

Loosen clamping nut and remove support shim.

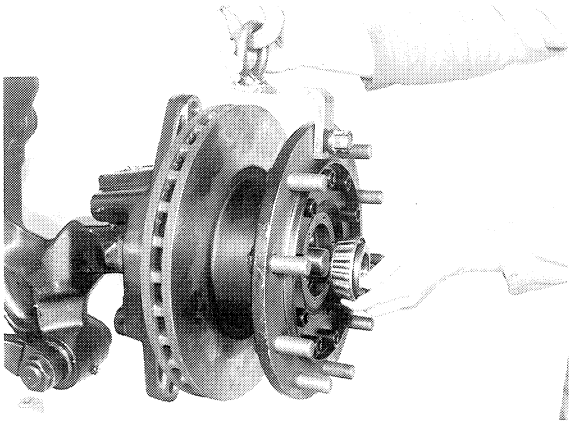


Figure 10

Separate hub from steering knuckle, using lifting device.

☞ **Pay attention to the released bearing inner race !**

(S) Lifting device 5870 281 043

Remove O-ring.

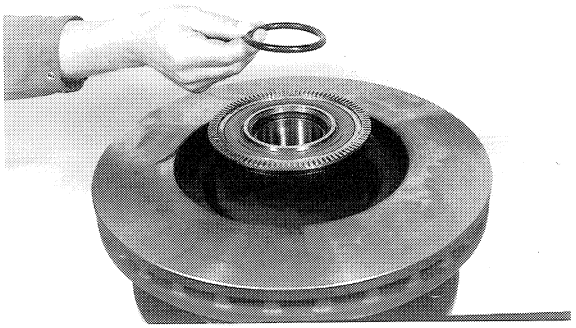


Figure 11

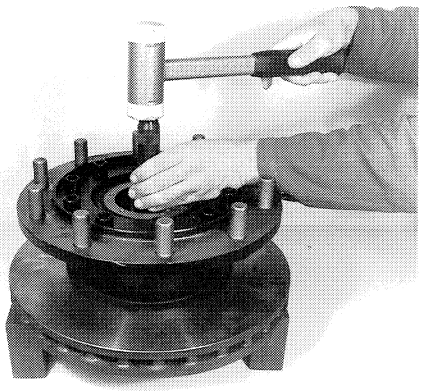


Figure 12

Drive bearing inner race as well as shaft seal together out of the hub bore.

(S) Plastic mallet 5870 280 004

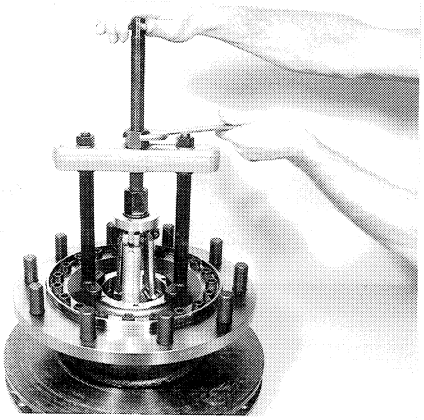


Figure 13

Pull both bearing outer races out of the hub bores.

(S) Internal puller 5870 300 019
(S) Counter support 5870 300 020

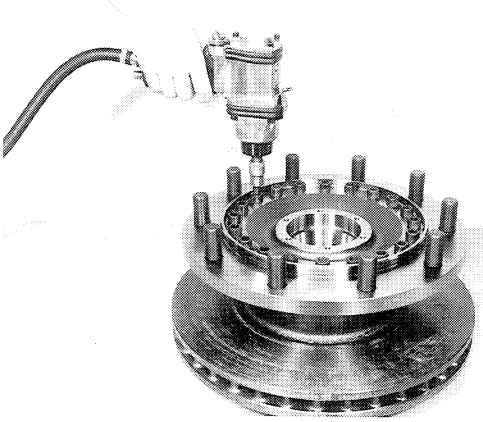


Figure 14

Loosen screw connection and separate hub from brake disk.

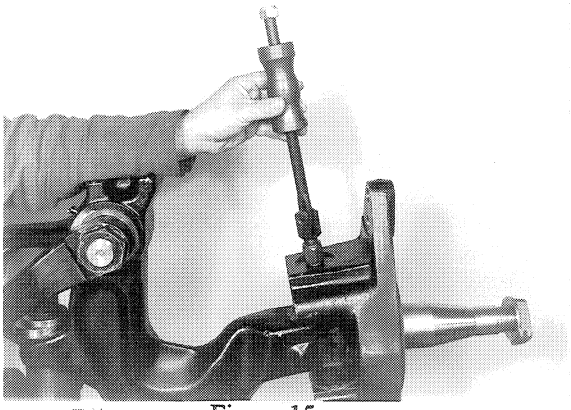


Figure 15

Squeeze circlip out.

Remove grease nipple and drive seal retainer out of the steering knuckle bore, using striker.
Remove lower seal retainer accordingly.

(S) Set of pliers	5870 900 013
(S) Striker	5870 650 001

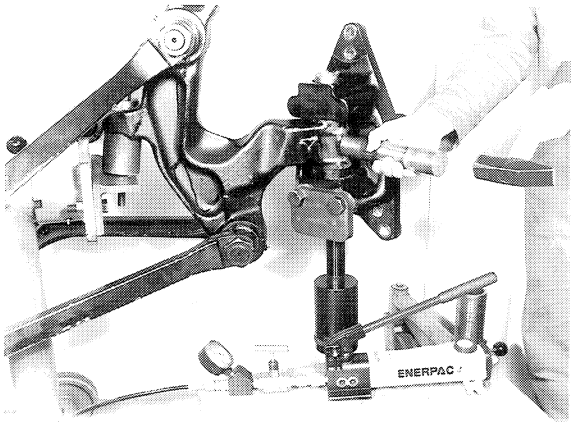


Figure 16

Fasten forcing device on the steering knuckle.

Press steering knuckle pin out, using hydraulic cylinder.

☞ **Tapping onto the steering knuckle carrier will be an aid at the pressing out step !**

(S) Pressure piece	5870 080 037
(S) Hydraulic spindle	5873 003 007
(S) HP-Pump	5870 287 007

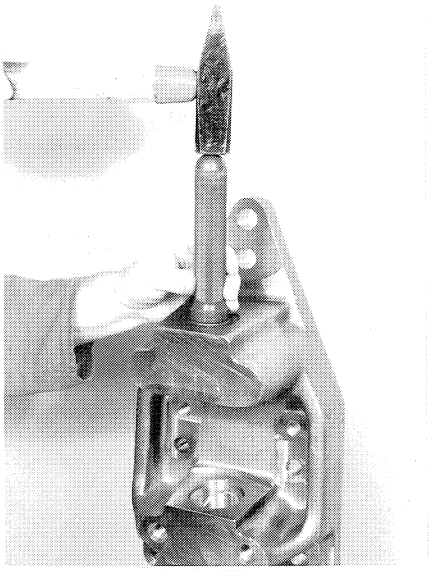


Figure 17

Fasten joint housing in a vise.

Drive sealing rings, needle sleeve as well as bush out of the steer-ing knuckle bores.

(S) Driver	5870 055 107
(S) Handle	5870 260 002

2. DISASSEMBLY - CONTROL ARM RL-85 E

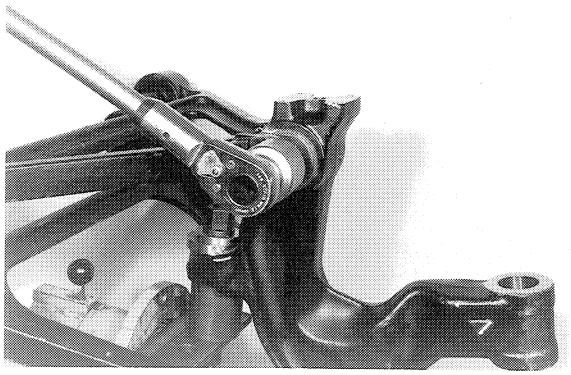


Figure 20

Loosen hex. nut.

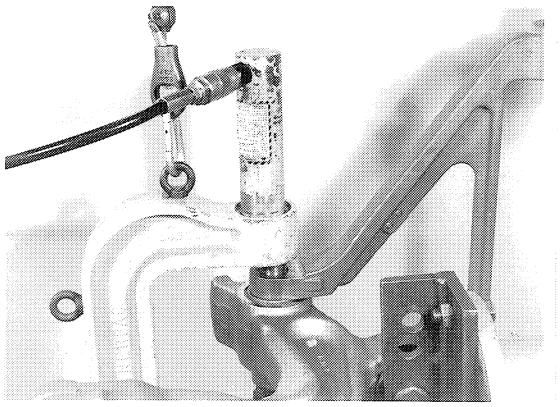


Figure 21

Tilt steering knuckle carrier 90°.

Press the pin out, using special device.

(S) Hydrospindle	5873 003 007
(S) Press bracket	5870 285 023
(S) Reducer	5870 285 024
(S) HP-Pump	5870 287 010

☞ **Pay attention to the released control arm !**

Now, remove components of the control arm bearing.

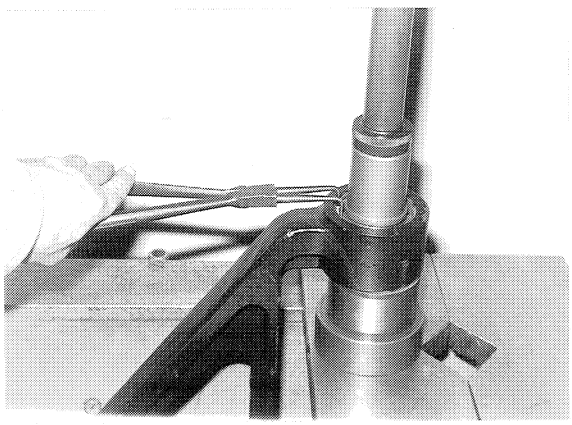


Figure 22

Preload rubber bearing by means of press and squeeze circlip out.

(S) Set of pliers 5870 900 014

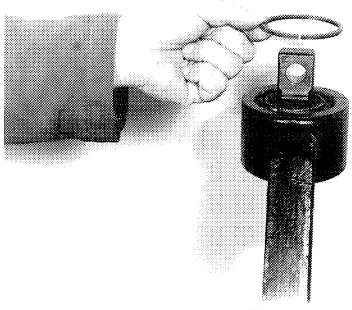


Figure 23

Remove snap ring.

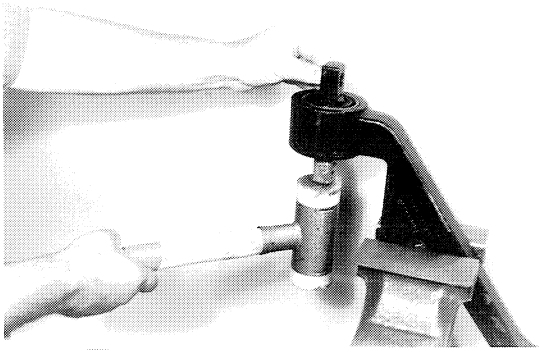


Figure 24

Separate rubber bearing from control arm.

(S) Plastic mallet 5870 280 004

3. ASSEMBLY - CONTROL ARM RL-85 E

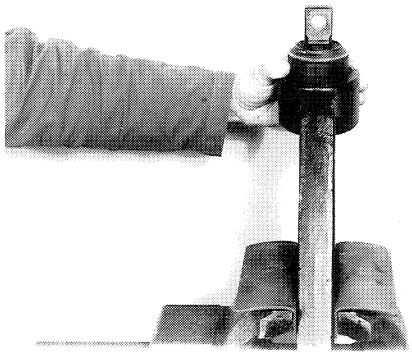


Figure 30

Insert rubber bearing into the control arm bore.

☞ **Pay attention to the radial installation position - bore parallel to the control arm brace, see Figure!**

Insert snap ring.

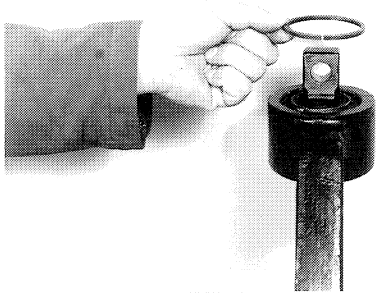


Figure 31

Preload rubber bearing by means of press and squeeze circlip in.

(S) Set of pliers 5870 900 014

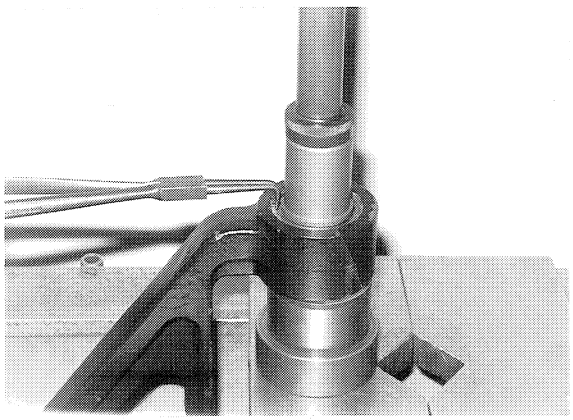


Figure 32

Install both bearing outer races.

(S) Driver 5870 058 021
(S) Handle 5870 260 002

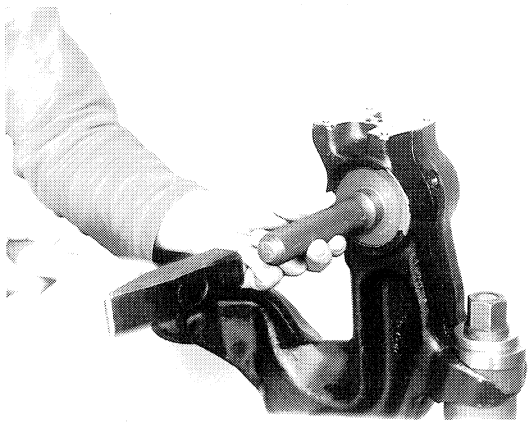


Figure 33

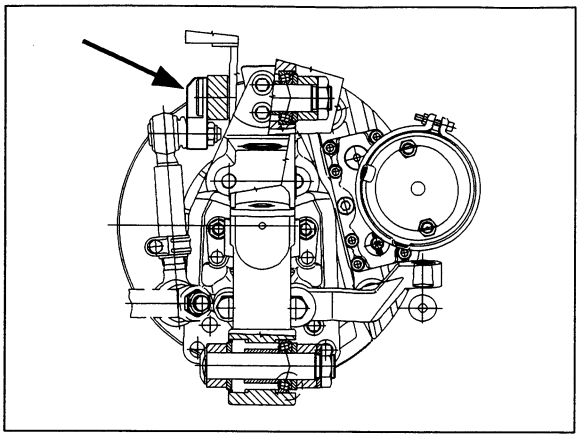


Figure 34

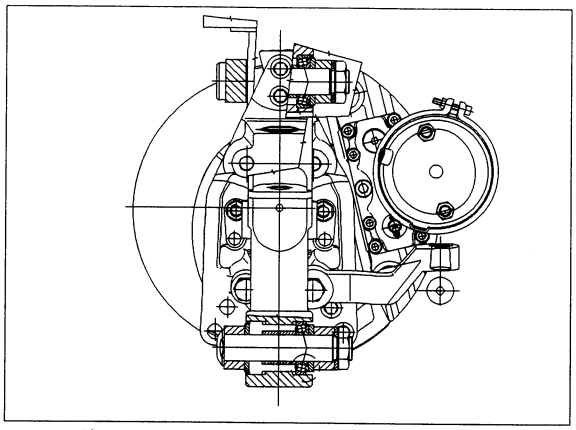


Figure 35

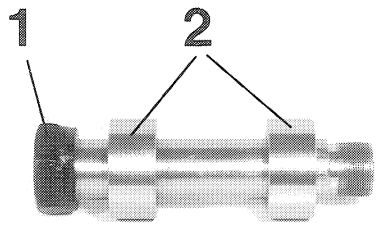
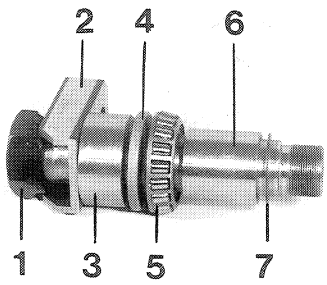


Figure 36



Fgure 37

At the upper control arm, different Versions are possible !

Version A: with bracket (Arrow) for stabilizer connection, see Figure 34 !

Version B: without bracket for stabilizer connection, see Figure 35 !

The lower control arm corresponds generally to Version B !

Adjust rolling moment of the control arm bearing 8 ... 15 Nm (without sealing elements) see Figure 36 ... 42)

The Figure on the left shows the Special tool, required for the adjustment of the rolling moment.

1 = Assembly drift
2 = Assembly bush (2x)

(S) = Assembly drift (compl.) 5870 345 091

Version A:

Assemble components according to Figure 37 over the assembly drift.

1 = Assembly drift (S)
2 = Bracket
3 = Assembly bush (S)
4 = Ring
5 = Bearing inner race
6 = Bush
7 = Shim(s) - optional

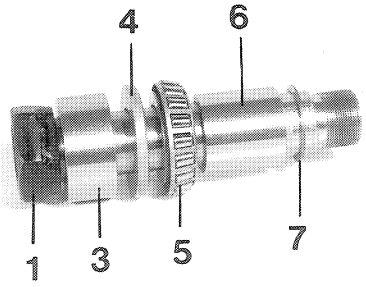


Figure 38

Version B:

Assemble components according to Figure 38 over the assembly drift.

1 = Assembly drift (S)
3 = Assembly bush (S)
4 = Ring
5 = Bearing inner race
6 = Bush
7 = Shim(s) - optional

Insert assembly drift and line up bearing inner race.

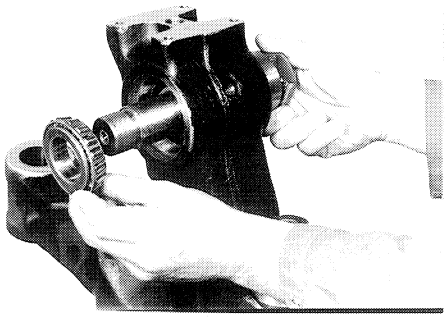
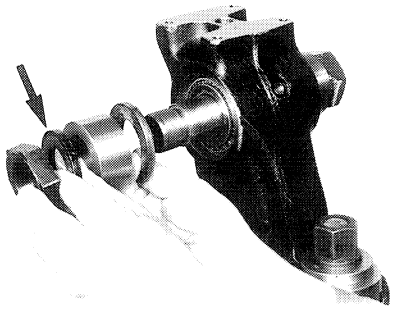


Figure 39

Line up second ring and assembly bush.

Line up disk (Arrow) (install only at Version B), and mount hex. nut.



Fgure 40

☞ **Install the hex. nut with the collar facing the disk resp. the assembly bush !**

Tighten hex. nut.

Torque limit ..... 1000 Nm

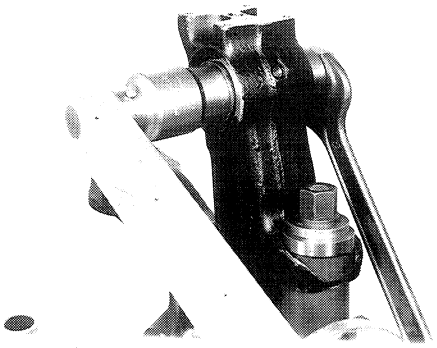


Figure 41

☞ **During the tightening, rotate the control arm bearing several times in both directions !**

Check rolling moment 8 ... 15 Nm.

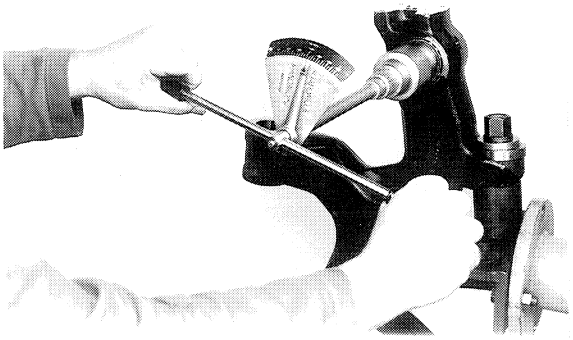


Figure 42

☞ **At deviations from the required rolling moment, correct with corresponding shim (Item 7, Figure 37 resp. 38) !**

Loosen hex. nut again and remove components.

(S) Torque spanner 5870 203 005

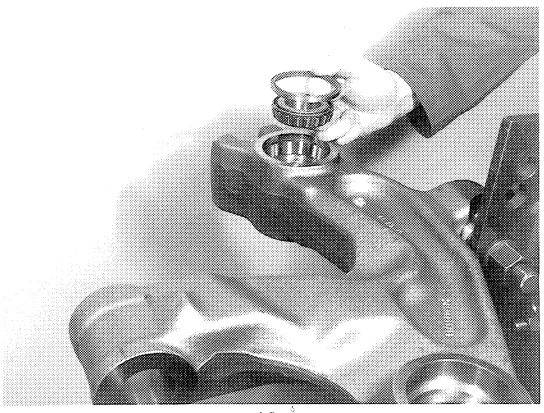


Figure 43

Insert bearing inner race and install sealing ring.

☞ **Pay attention to the installation position of the sealing ring, see Arrow/Figure 44 !**

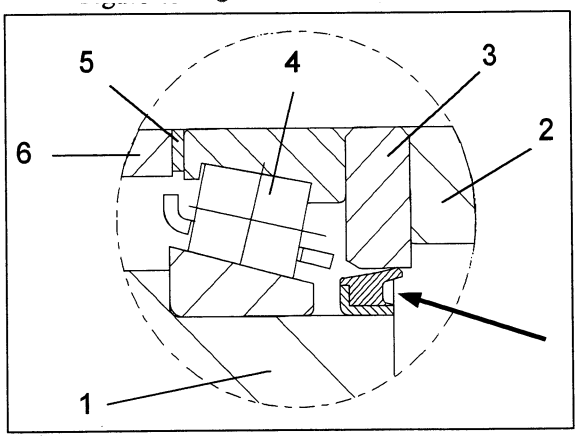


Figure 44

Ref. Figure 44:

1 = Steering knuckle carrier
2 = Control arm
3 = Ring
4 = Tapered roller bearing
5 = Shim(s)
6 = Bush

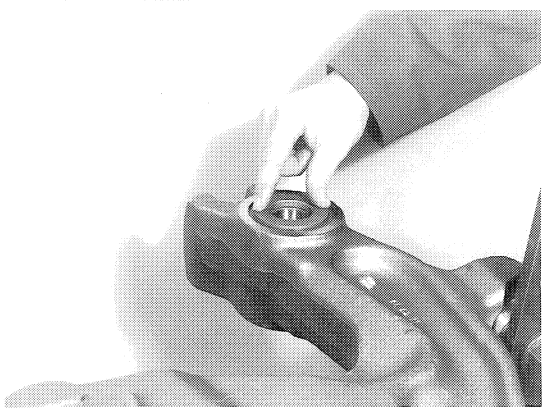


Figure 45

Insert ring with grease, with the radius on the outer diameter facing the bearing inner race.

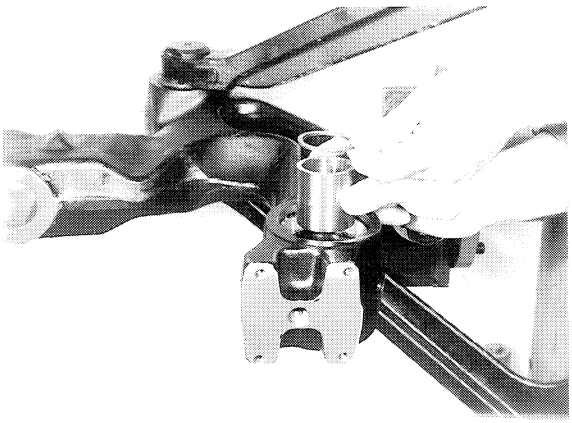


Figure 46

Tilt steering knuckle carrier 180°.

Install bush and the determined shim(s).

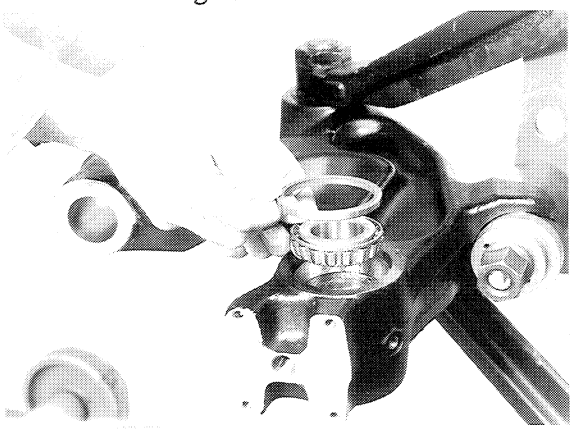


Figure 47

Insert bearing inner race and install sealing ring.

☞ **Pay attention to the installation position, see Figure 44 !**

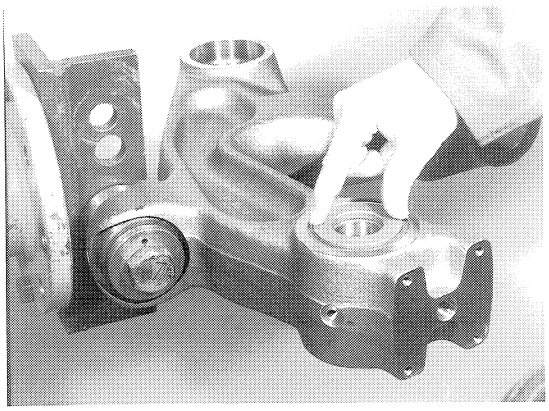


Figure 48

Install ring, with the radius on the outer diameter facing the bearing inner race.

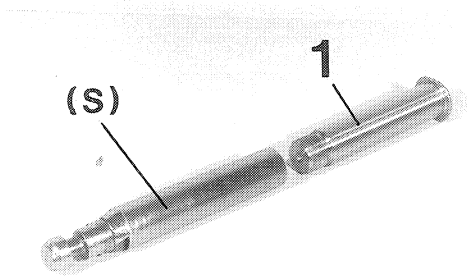


Figure 49

<u>Install control arm pin (Figure 49 ... 56)</u>

Figure 49 shows the Special tool (S), required for the assembly of the control arm pin.

Screw control arm pin into the centering punch until contact is obtained.

(S) Centering punch 5870 912 025

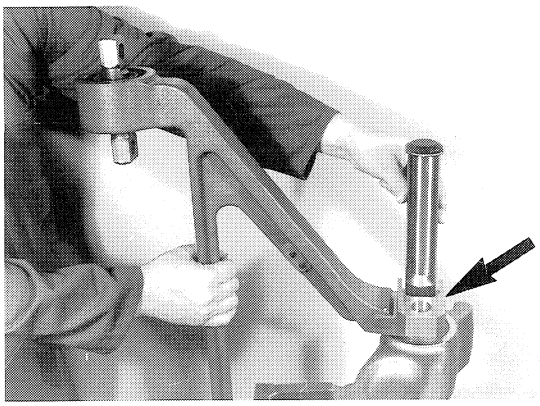


Figure 50

Version A: with bracket (stabilizer connection)

Position control arm and bracket (Arrow) and fix by means of centering punch.

☞ **Pay attention to the radial installation position of the bracket 2 and the control arm pin 1 - bracket must be installed, in attached condition, parallel to the spot facing of the control arm (Arrow), see Figure 51 !**

⚠ **The installation direction of the control arm pins, Position 1 and 2, is permitted in driving direction only, see Figure 52 !**

ref. Fig. 52: ⋯⋯► = Install. direction control arm pins
——► = Driving direction

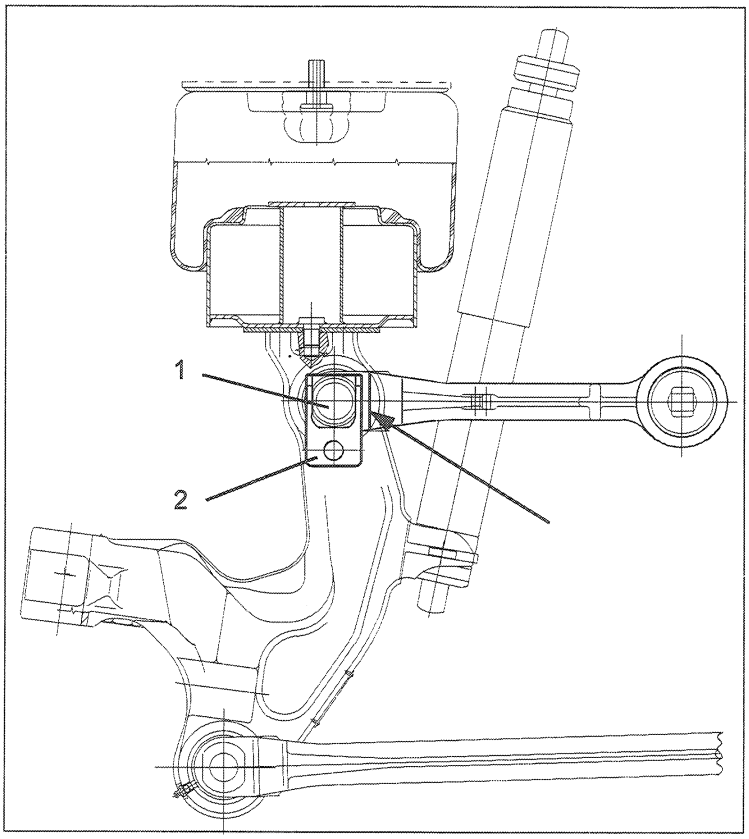


Figure 51

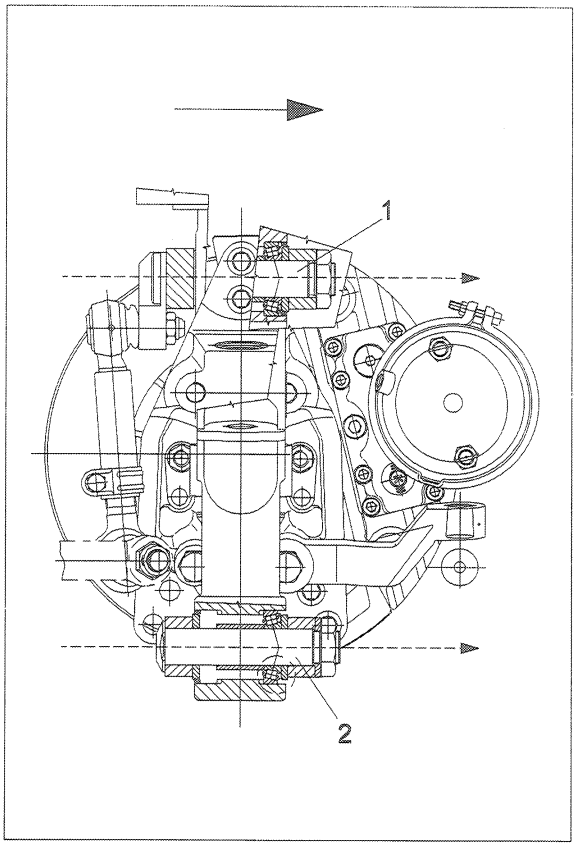


Figure 52

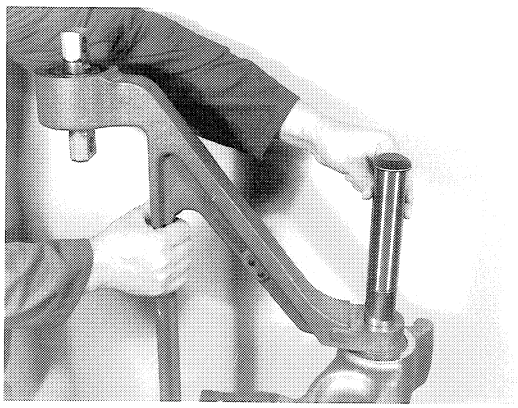


Figure 53

Version B: without bracket (stabilizer connection)

Position control arm and fix it by means of centering punch.

⚠ **The Installation direction of the control arm pins, Position 1 and 2, is permitted in driving direction only, see Figure 52 !**

ref. Fig. 52: ⋯⋯► = Install. direction - control arm pins
——► = Driving direction

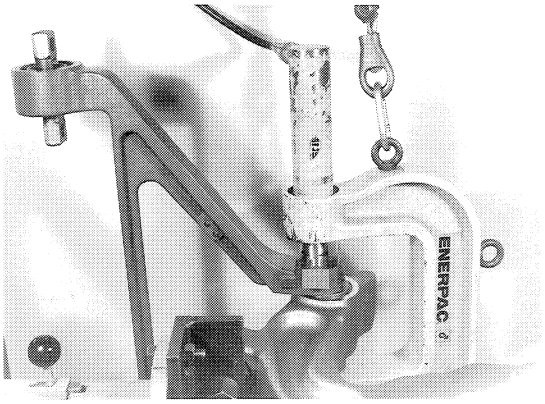


Figure 54

Press control arm pin against shoulder.
Now, remove centering punch.

(S) Centering punch	5870 912 025
(S) Press bracket	5870 285 023
(S) Reducer	5870 285 024
(S) Hydrospindle	5873 003 007
(S) HP-Pump	5870 287 007

Figure 55

Line up disk (Arrow) and install hex. nut.

At Version A (with bracket for stabilizer connection), the assembly of the disk (Arrow) is cancelled !
Mount collar of hex. nut facing the disk resp. the control arm !
Wet thread of hex. nut with Loctite, Type-No. 262 !

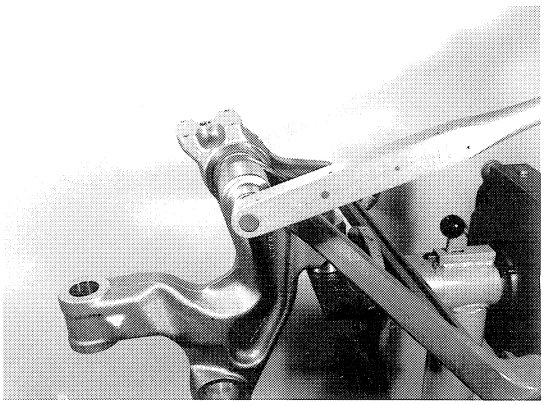


Figure 56

Tighten hex. nut.

Torque limit ..... 1000 Nm

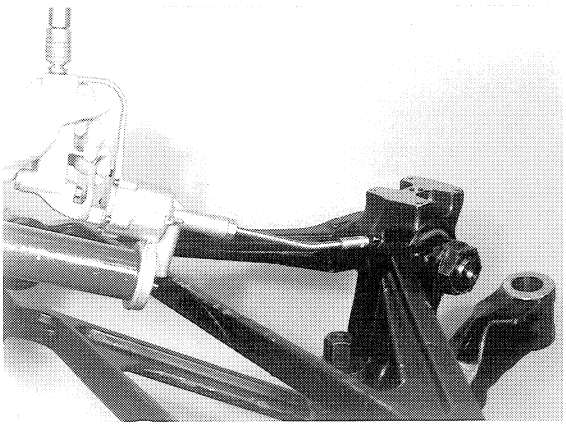


Figure 57

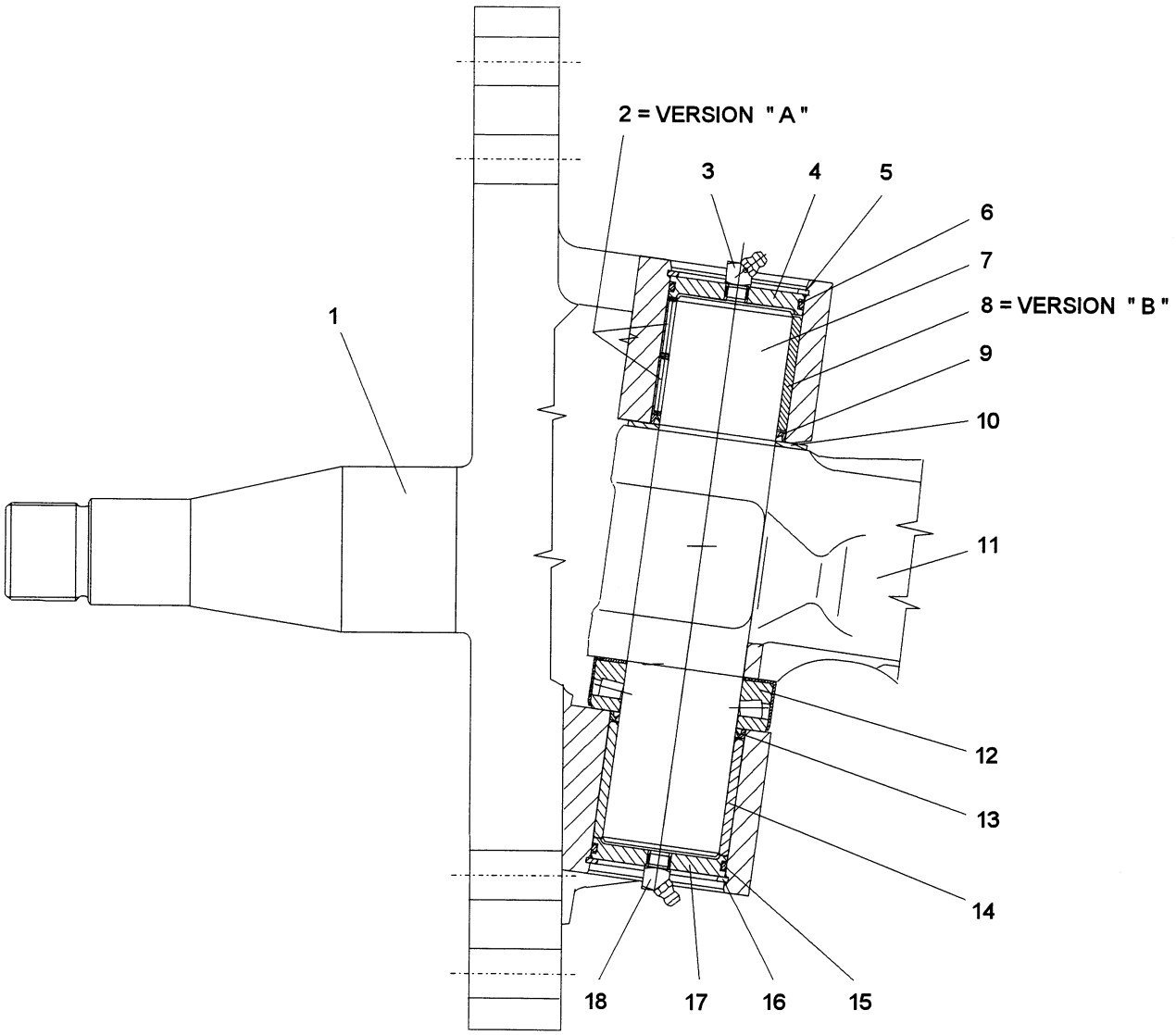
Install grease nipple and lubricate control arm bearing.

Úse Industrial - EP - Multi-purpose grease,
Type Glissando 283 EP 2 LF (Firm of DEA) !
ZF-Order-No. 0671 190 079!

Install lower control arm correspondingly as at Version B (without bracket for stabilizer connection).
Installation direction of the control arm pin is permitted in driving direction only !

4. ASSEMBLY - WHEEL HEAD RL-85, RL-85 E AND RL-85 A

Pre-assemble and mount steering knuckle (Page 1.16 ... 1.21)



Ref. Draft:

1 = Steering knuckle
2 = Needle bearing (2x) „Version A“
3 = Grease nipple
4 = Seal retainer
5 = Circlip
6 = O-Ring
7 = Steering knuckle pin
8 = Bush „Version B“
9 = Sealing ring
10 = Shim
11 = Steering knuckle carrier
12 = Axial roller bearing
13 = Sealing ring
14 = Bush
15 = O-Ring
16 = Circlip
17 = Seal retaine
18 = Grease nipple

The Draft shows different Versions in the zone of the upper steering knuckle bearing !
Version A: with two needle bearings
Version B: with one bush
The different Versions can be taken from the corresponding Spare-Parts List !

The Figure on the left shows the Special tool (S) required for the installation of the bush 8 and 14, the needle bearings 2 as well as the sealing rings 9 and 13.

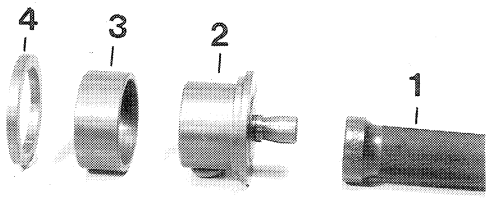


Figure 60

At application of the prescribed Special tool, the exact instal-lation position of the components will be determined !

(S) Driver (Part 2, 3 and 4)	5870 055 107
(S) Handle (Part 1)	5870 260 003

Fasten steering knuckle in a vise (use protective jaws).

Drive bush 14 (Arrow) by means of Special tool (Part 1 and 2) into the lower steering knuckle bore.

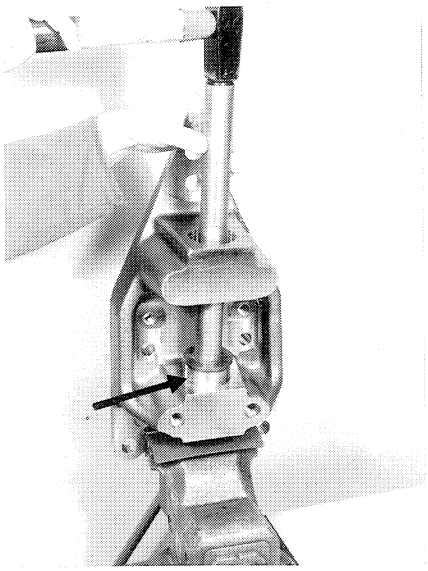


Figure 61

Pay attention to the installation position of the bush - runout of the lubrication grooves (see Arrows, Figure 62) must face the grease nipple 18 !

(S) Driver (Part 2)	5870 055 107
(S) Handle (Part 1)	5870 260 003

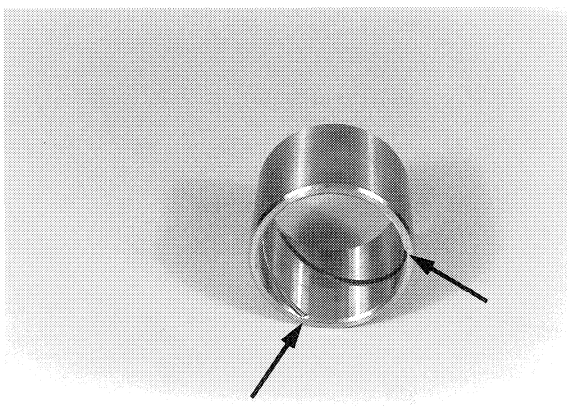


Figure 62

Figure 63

Install sealing ring 13 (Arrow), using Special tool (Part 2 and 4).

☞ **Install the open side of the sealing ring facing the thrust bearing 12 !**

(S) Driver (Part 2 and 4)	5870 055 107
(S) Handle (Part 1)	5870 260 003

Fasten steering knuckle in a vise (upper steering knuckle bore is showing downward).

☞ **Use protective jaws !**

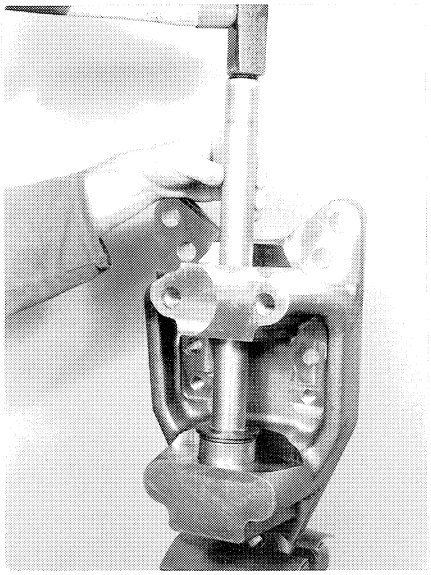


Figure 64

Version A - with two needle bearings (Figure 64)

Insert first needle bearing for the present against shoulder, using Special tool (Part 1 and 2).
Now, bring the needle bearing into final position, using Special tool (Part 1,2 and 3).

Install second needle bearing by means of Special tool (Part 1 and 2).

⚠ **The end-face side marking of the needle bearings (reinforced shell) must each time face the Special tool ! Otherwise, the needle bearings will be damaged !**

Version B - with bush (without Figure)

Insert bush 8, by means of Special tool (Part 1 and 2).

☞ **Pay attention to the installation position of the bush - runout of the lubrication grooves (see Arrow, Figure 62) must face the grease nipple 3 !**

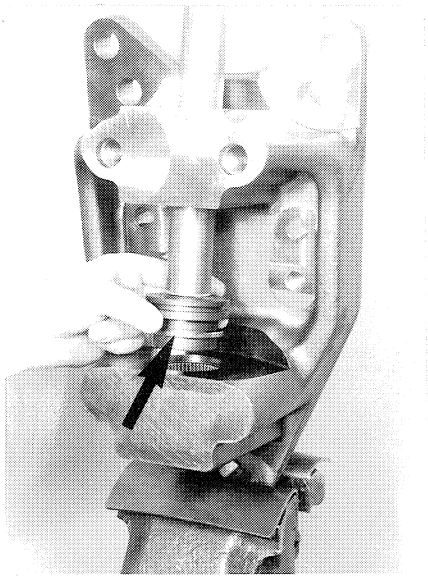


Figure 65

Install sealing ring 9 (Arrow) by means of Special tool (Part 1, 2 and 4),.see Figure 65 !

☞ **Install the open side of the sealing ring facing the shim 10 !**

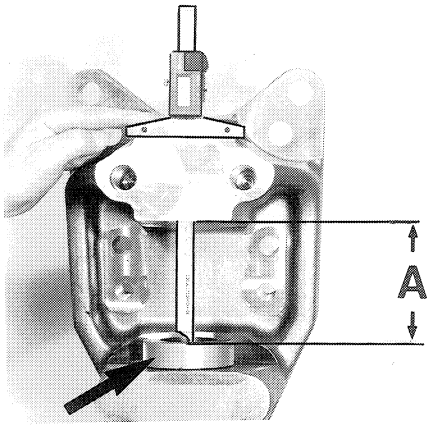


Figure 66

Adjust axial play - Steering knuckle 0,05 ... 0,15 mm
(Figure 66 ... Example A)

Mount axial bearing (Arrow) and determine Dimension A, see Figure 66 !

Dimension A e.g. ..... 102,05 mm

(S) Digital-Depth gauge 5870 200 072

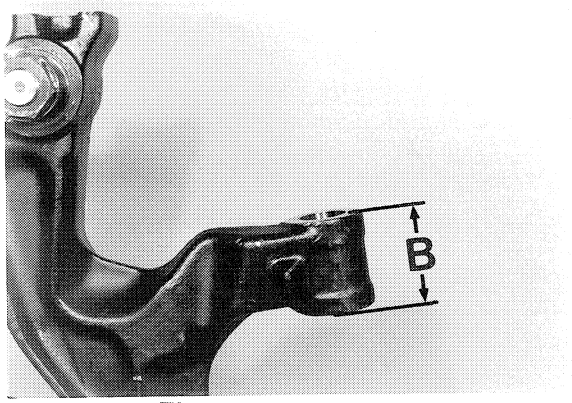


Figure 67

Determine Dimension B on the steering knuckle carrier.

Dimension B e.g. ..... 99,60 mm

EXAMPLE A

Dimension A		102,05 mm
Dimension B		- 99,60 mm
Difference	=	2,45 mm
required axial play. e.g.	-	0,10 mm
gives shim	**s =**	**2,35 mm**

The installation of the shim is realized at Figure 70 !

Figure 68

Insert assembly disk (s = 1,00 mm) into the seal retainer 17.

Insert the seal retainer (for the present without O-ring) into the lower bore of the steering knuckle (Arrow) and fix it by means of circlip.

☞ **The installation of the assembly disk is necessary to ensure the exact, axial position of the steering knuckle pin, resp to allow the later lubrication of the steering knuckle bearing !**

⚠ **After the installation of the pin, the assembly disk must be removed again !**

(S) Assembly disk 5870 345 092

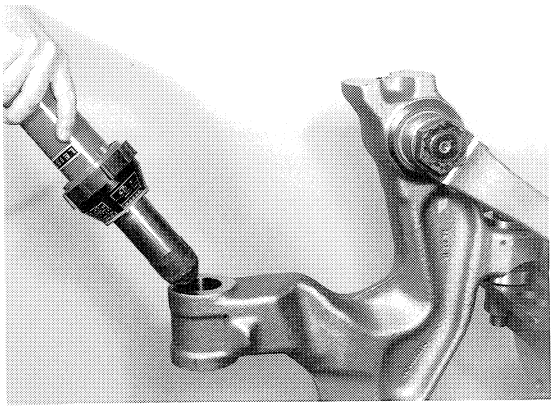


Figure 69

To allow the later assembly of the steering knuckle pin (Figure 73), it is absolutely essential to heat the bore of the steering knuckle carrier to about 100 ... 120° C (Figure 69) !
The steering knuckle pin must be supercooled to at least – 70° C !
Carry out the steps (Figure 69 ... 73) in direct chronological order !

(S) Hot-air blower 220 V	5870 221 500
(S) Hot-air blower 110 V	5870 221 501

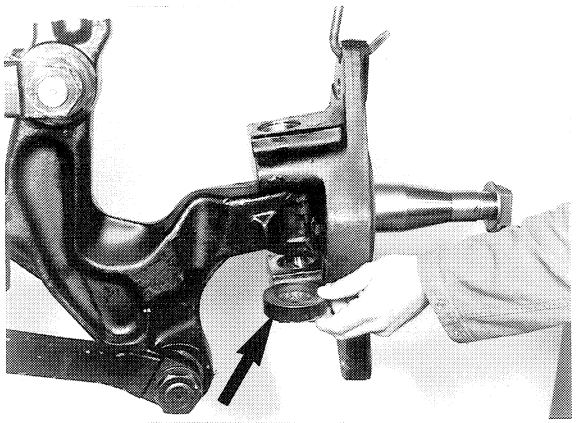


Figure 70

Position steering knuckle by means of lifting device and install axial roller bearing 12 (Arrow).

The metal cage of the axial roller bearing is bordered on different points !
The bordering must show downward !

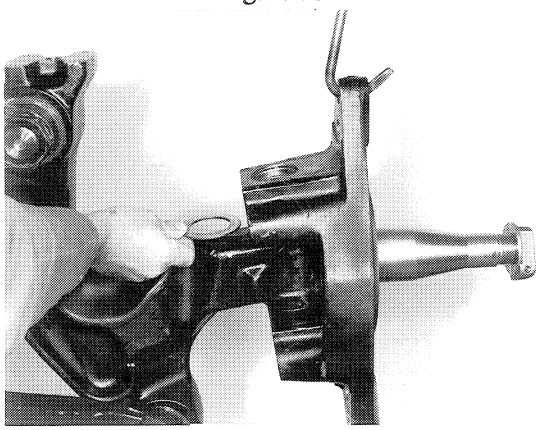


Figure 71

Install shim 10 (e.g. s = 2,35 mm, see Example, Page 1.19).

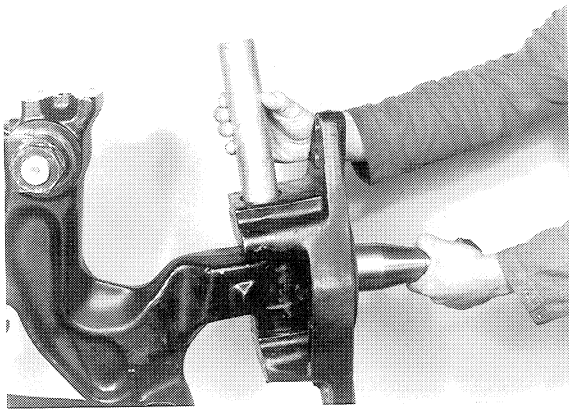


Figure 72

Align components by means of centering punch.

(S) Centering punch	5870 912 018

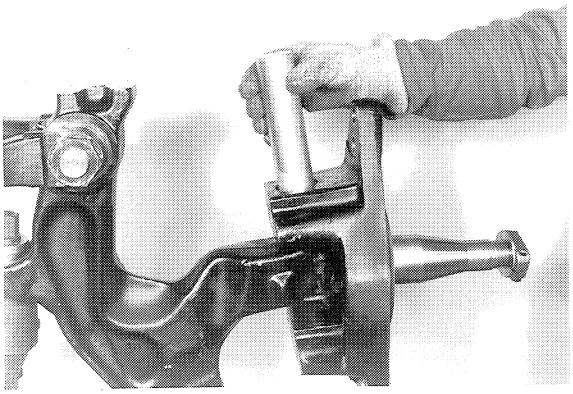


Figure 73

Introduce the supercooled steering knuckle pin (at least - 70° C) against shoulder until contact is obtained.

Use protective gloves !

Insert O-ring 6 (Arrow) into the recess of the seal retainer 4 and grease it.

Insert seal retainer and fix it by means of circlip 5.

(S) Set of pliers 5870 900 013

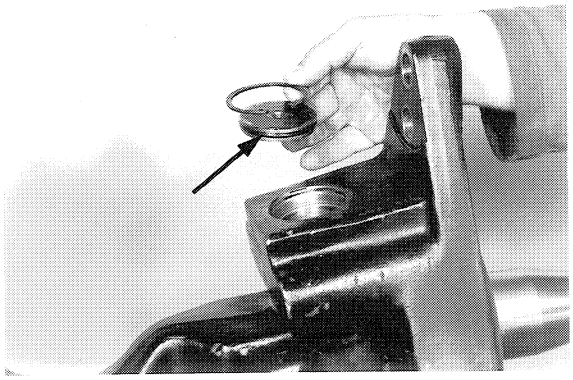


Figure 74

Install grease nipple 13 and lubricate the upper steering knuckle bearing.

Use Industrial - EP - Multi-purpose grease,
Type Glissando 283 EP 2 LF (Firm of DEA) !
ZF-Order-No. 0671 190 079!

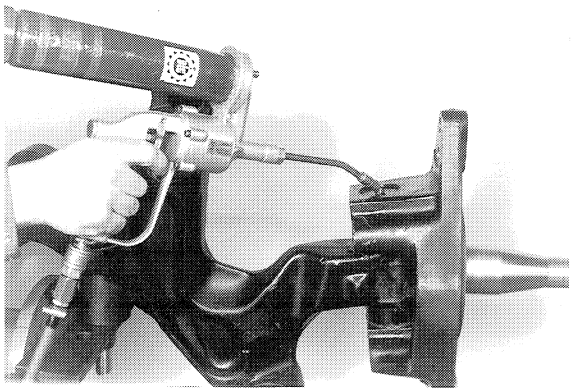


Figure 75

Demount lower seal retainer 17 again and remove assembly disk (see also Figure 68, Page 1.19).
Now, install the seal retainer again and lubricate the lower steer-ing knuckle bearing (correspondingly as at Figure 74 and 75).

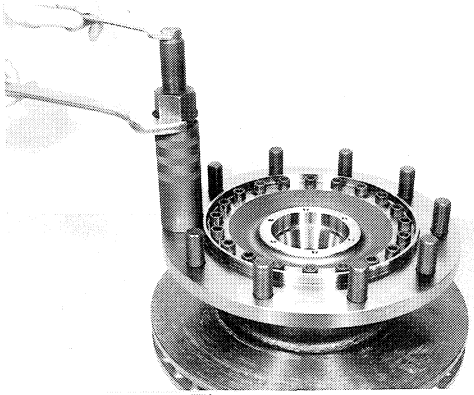


Figure 80

Pre-assemble and mount hub (Figure 80 ... 92)

Fasten brake disk on the hub, using socket head screws.

Different screw connection possible !

Version A: Socket head screws M12x1,5/10.9, = 120 Nm
secure socket head screws with Loctite, Type-No. 649

Version B: Socket head screws M16x1,5/10.9, = 300 Nm
(without Loctite)

Now, install wheel studs, see Figure 80 !

(S) Wheel-stud puller - Basic tool 5870 610 010
(S) Insert (M22x1,5) 5870 610 002

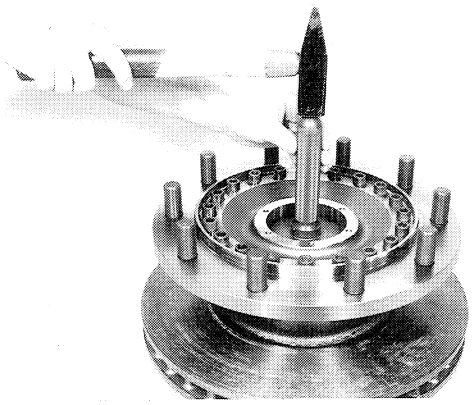


Figure 81

Insert bearing outer race until contact is obtained.

(S) Driver 5870 058 051
(S) Handle 5870 260 002

Figure 82

Install pulse disk.

Figure 83

Insert bearing outer race until contact is obtained.

(S) Driver 5870 058 065
(S) Handle 5870 260 002

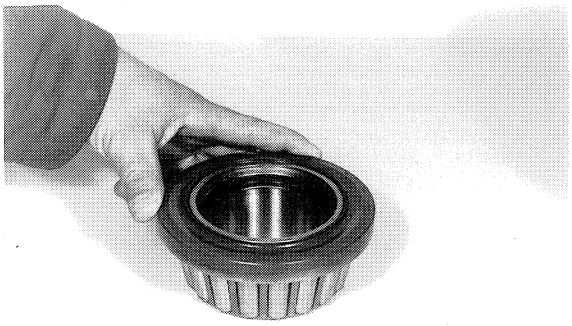


Figure 84

Assemble shaft seal, with the sealing lip facing the oil chamber, over the collar of the bearing inner race.

☞ **Grease sealing lip !**

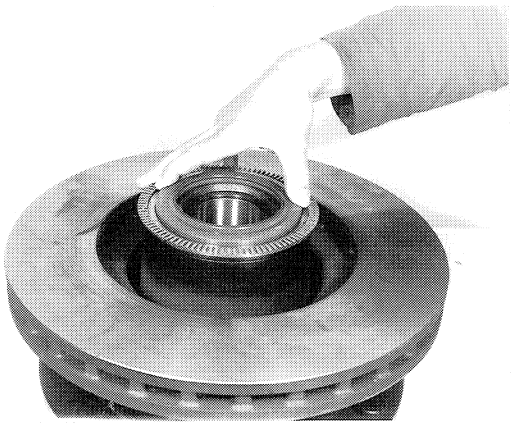


Figure 85

Slip bearing inner race along with shaft seal into the hub bore. At this step, press the shaft seal about 8 mm uniformly into the hub bores.

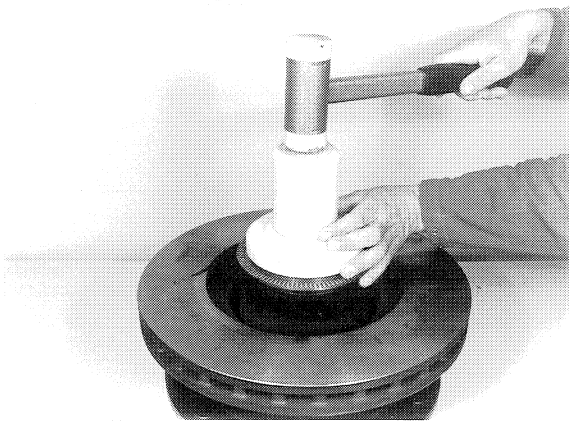


Figure 86

Position shaft seal finally, using driver (S).

(S) Driver 5870 048 210

Grease O-ring slightly and insert it into the bearing inner race.

Wet end face of bearing inner race (Arrow) with sealing compound (Loctite, Type-No. 574).

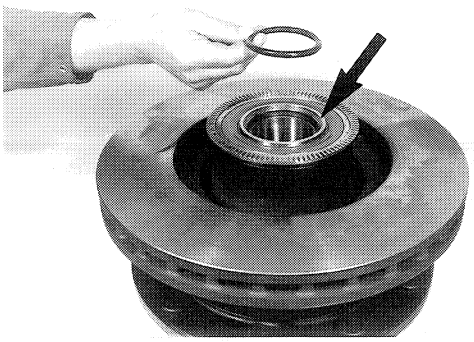


Figure 87

Position pre-assembled hub by means of lifting device and install bearing inner race.

(S) Installer	5870 651 071
(S) Lifting device	5870 281 043

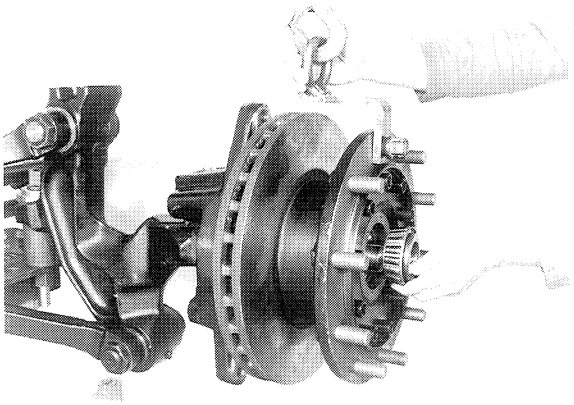


Figure 88

Fix hub by means of disk and clamping nut.

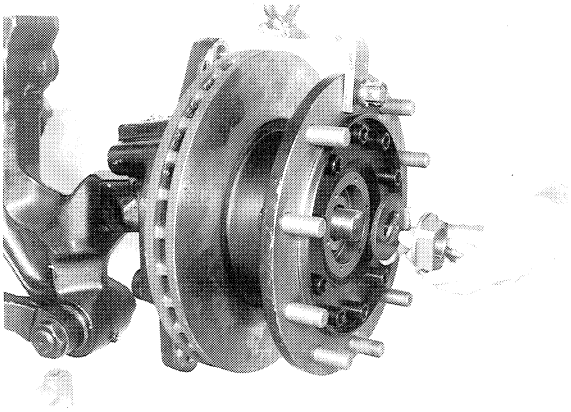


Figure 89

<u>Adjust rolling moment of the wheel bearing 3 ... 6 Nm (with sealing element) (Figure 90 and 91)</u>

Tighten clamping nut by continuous rotation of the hub until the settling of the wheel bearing is ensured (noticeable increase of the rolling moment takes place).

Now, loosen the clamping nut again and relax the wheel bearing again by tapping onto the circumference of the hub (use plastic mallet).

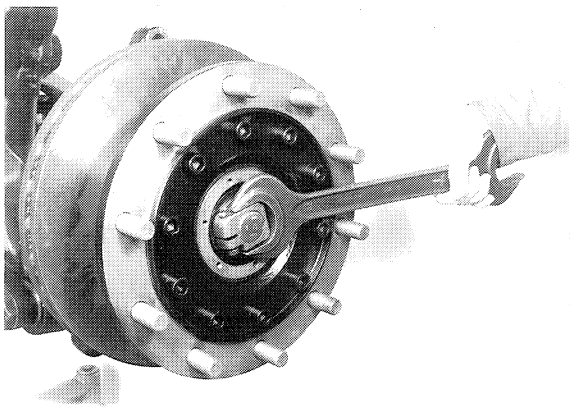


Figure 90

Tighten clamping nut by continuous rotation of the hub until the required rolling moment is obtained.

Check rolling moment, see Figure !

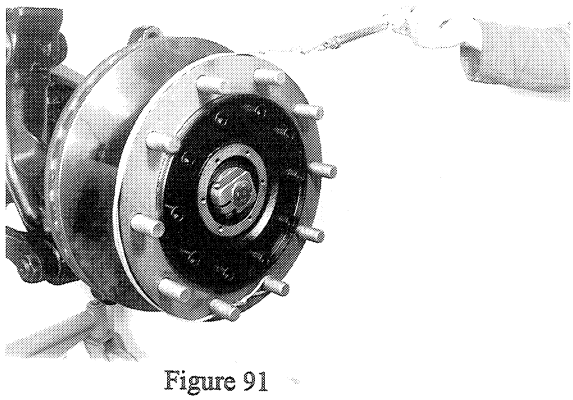


Figure 91

☞ **At new bearings aim at the upper, at already run bearings, at the lower value of the rolling moment !**

(S) Spring scale 5870 230 006

bearing rolling moment T [Nm] = tractive effort F [N] x radius R [m]
rearrangement of formula:
F = T / R
spring scale indication [N] = bearing rolling moment [Nm] / radius R [m]

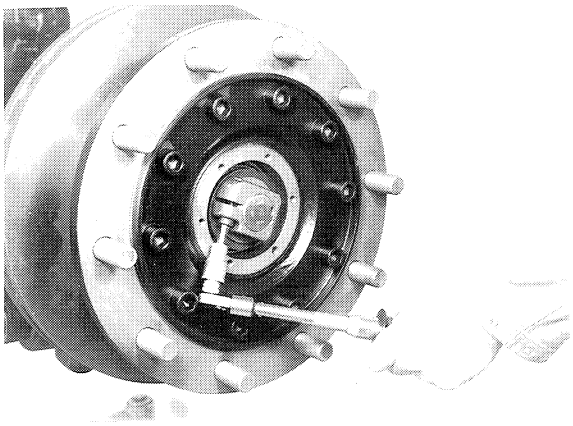


Figure 92

Fix the clamping nut by tightening the socket head screw.

Torque limit (M10/8.8, DIN 6912) ..... 32 Nm

Check rolling moment again (see previous figure).

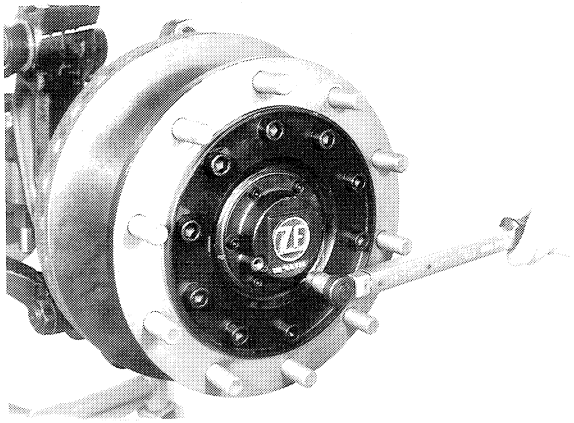


Figure 93

Wet mounting face with sealing compound (Loctite, Type-No. 574) and fasten cover by means of socket head screws.

Torque limit (M8/8.8) ..... 23 Nm

Mount brake caliper.

For the attachment of the brake resp. the Maintenance and Repair, the Instructions and Specifications of the respective Brake Manufacturer are binding.
In this connection, pay attention to the corresponding Manual of the Component Manufacturer.

Torque limit - Brake caliper screws
(Socket head screws M20x1,5/10.9) ..... 620 Nm

☞ **Cover thread of socket head screws with Loctite, Type-No. 649 !**

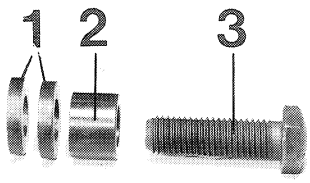


Figure 95

Adjust the steering lock by means of disk(s) 1 - optional, bush 2 and stop screw 3 according to the Specifications of the Vehicle Manufacturer.

Torque limit (stop screw) ..... 390 Nm

☞ **Position of the stop screw, see Arrow 1, Figure 96 !**

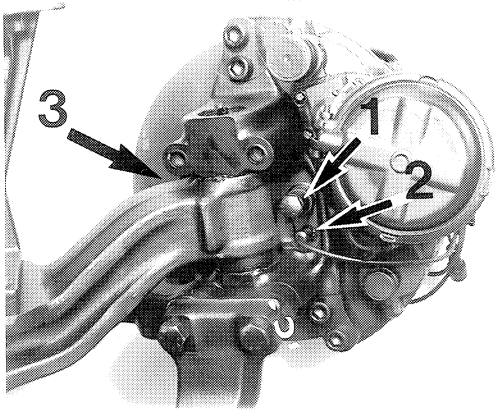


Figure 96

Insert locking bush into the bore (Arrow 2) and press speed sensor against shoulder until contact is obtained.

☞ **Cover outer diameter of sensor with silicone grease (anti-corrosion agent) !**
End face (feeler zone) - greasefree !

Close both bores on the steering knuckle rear side (Arrow 3) by means of plugs.

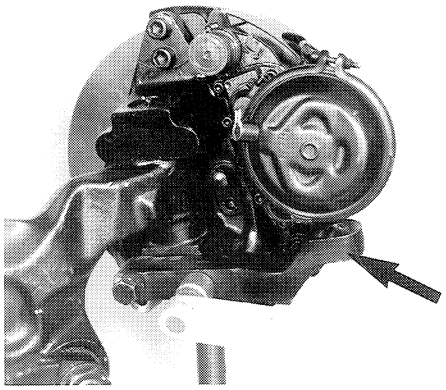


Figure 97

Fasten track lever (Arrow) on the steering knuckle, using hex. head screws.

☞ **Secure hex. head screws with Loctite, Type-No. 262 !**

Torque limit (M22/10.9) ..... 750 Nm

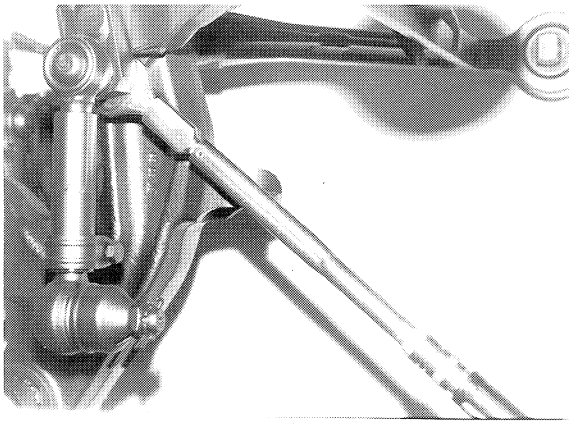


Figure 99

Version with stabilizer connection (Figure 99)

Fasten brace on the bracket.

Torque limit ..... about 220 Nm

Secure castle nut by means of cotter pin !

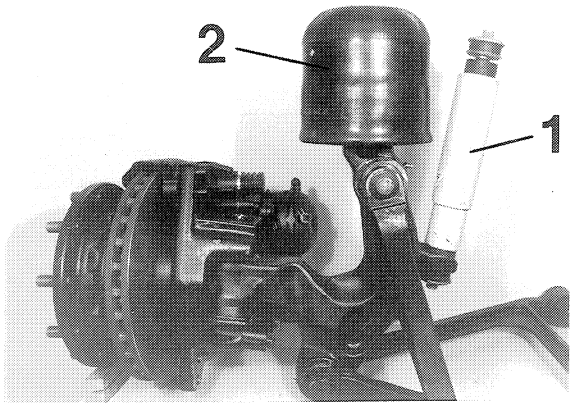


Figure 100

Mount shock absorber 1 according to the Instructions of the Manufacturer, see also Figures 101 and 102 !

Fasten the air spring 2 on the steering knuckle carrier (tighten hand-tight).

Prior to the commissioning of the unit, pay attention to the Lubrication and Maintenance Instructions, Page 0.07 and 0.08 !

For the installation of the unit in the vehicle, the Specifications of the Vehicle Manufacturer are binding !

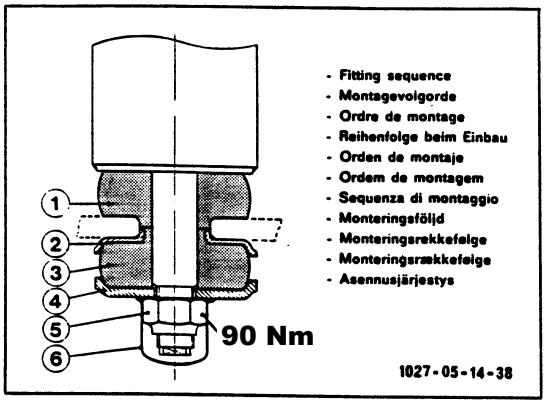


Figure 101

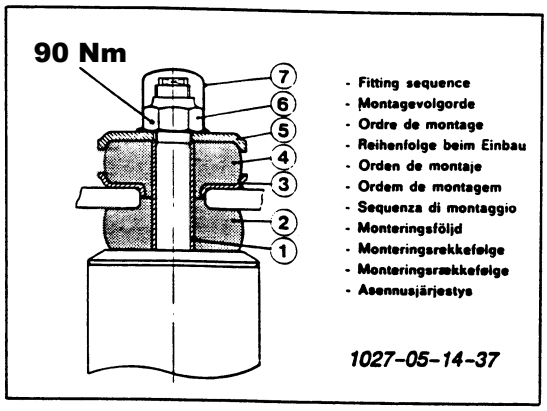


Figure 102

5. RL-85 A, ZF-FRONT- / TRAILING AXLE
Attachment of various peripheral components

☞ **The disassembly and assembly of the wheel head is identical with Version RL-85 E !**

The following Figures describe the attachment of various peripheral components on the steering knuckle and the axle casing. Different Versions can require differing steps, which can be carried out by qualified personnel without greater problems, with the help of the Perspective Illustrations in the corresponding Spare-Parts Lists.

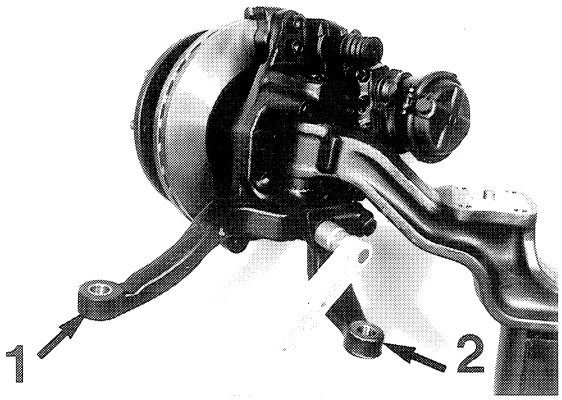


Figure 105

Fasten track lever and steering arm (Arrow 1 and 2) on the steering knuckle, using hex. head screws.

☞ **Secure hex. head screws with Loctite, Type-No. 262 !**

Torque limit (M22/10.9) ..... 750 Nm

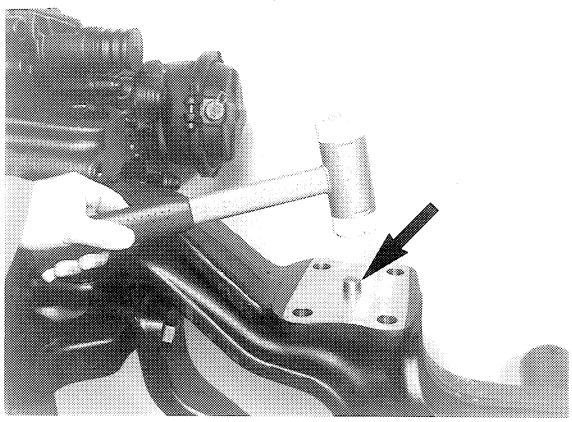


Figure 107

Drive cylindrical pin (Arrow) in until contact is obtained.

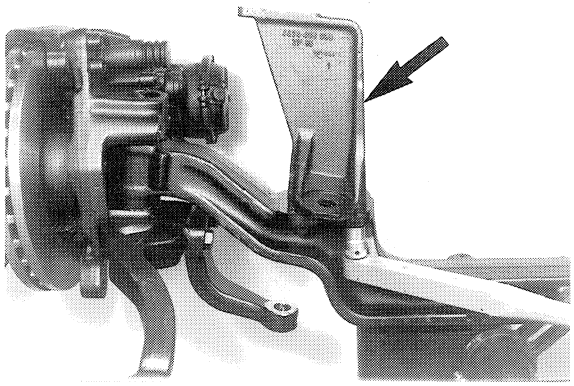


Figure 108

Fasten the spring carrier on the axle casing.

Torque limit (locking screw) ..... 675 Nm

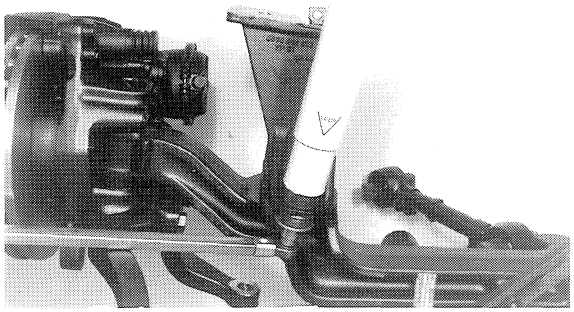


Figure 109

Mount shock absorber according to the Specifications of the Manufacturer, see also Figure 110 and 111 !

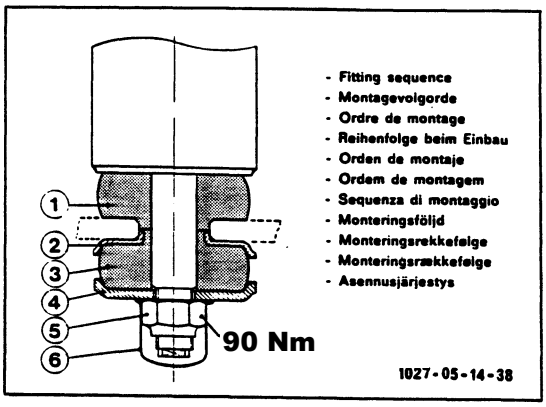


Figure 110

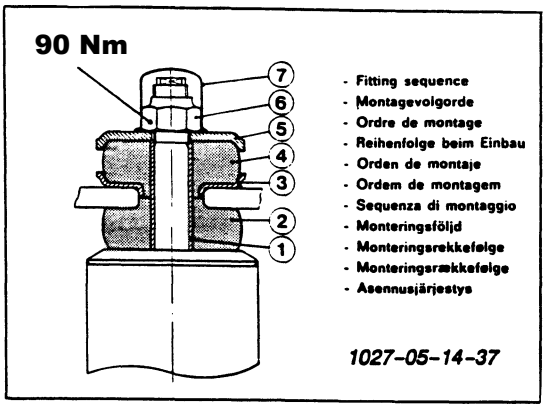


Figure 111

Install air spring (fasten hand-tight).

☞ **Mount right axle casing side accordingly (Figure 105 to 112)!**

Figure 112

Fasten bracket (Arrow) on the axle casing.

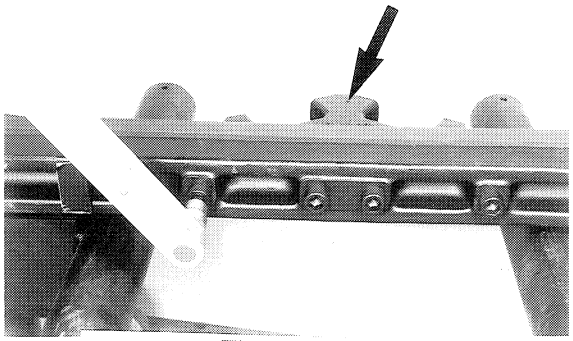


Figure 113

☞ **Insert socket head screws with Loctite, Type-No. 262!**

Torque limit (M20x1,5/10.9) ..... 620 Nm

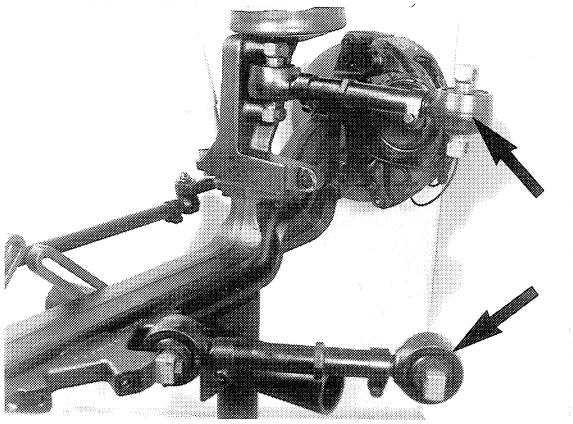


Figure 114

Fasten braces (4 pieces) on the axle casing bracket and on the spring carrier by means of hex. Head screws (mount flat washers s = 3,0 mm).

Torque limit (M18x1,5/10.9) ..... 440 Nm

☞ **Prior to the commissioning of the unit, pay attention to the Lubrication and Maintenance Instructions, Page 0.07 and 0.08!**

⚠ **For the installation of the unit into the vehicle, the indications of the Vehicle Manufacturer are binding!**

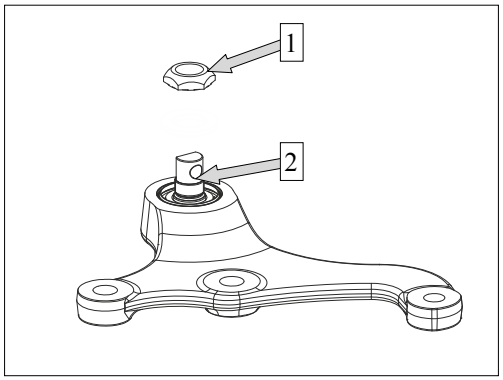


Figure 115

6. Steering lever / general peripheral parts

6.1 Disassembly of steering lever:

Heat hexagon nut (arrow 1). Hold bearing pin (arrow 2) from below and unscrew hexagon nut.

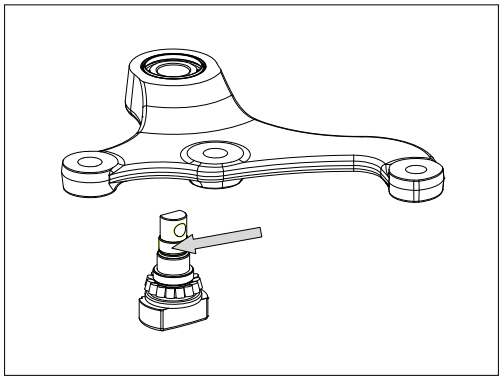


Figure 116

Press bearing pin (see arrow) downwards out of the relay lever/intermediate lever.

Disassemble all single parts.

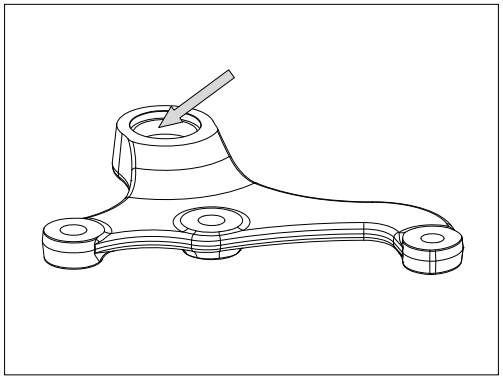


Figure 117

6.2 Reassembly of steering lever:

Set rolling torque of relay lever bearing 5 - 12 Nm
(without sealing elements).

If removed, insert both bearing outer rings into the hole on the relay lever/intermediate lever.

(S) Driver tool	5870 058 084
(S) Handle	5870 260 002

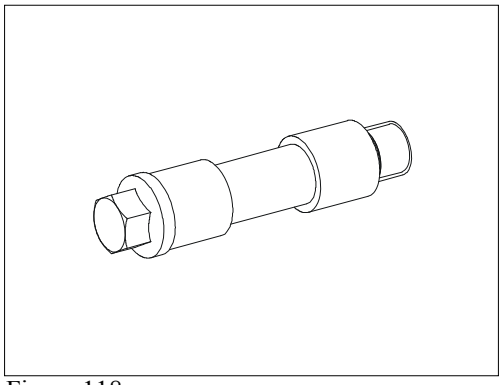


Figure 118

The figure shows the assembly mandrel (S) together with the pressure sleeves for setting the rolling torque.

(S) Assembly mandrel (cpl.)	5870 345 091
(S) Pressure sleeve	5870 100 064

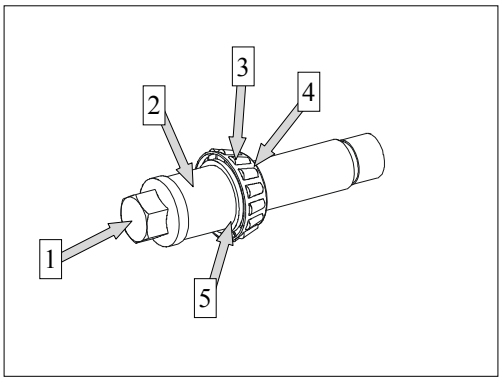


Figure 119

Mount single parts onto the assembly mandrel.

1 = Assembly mandrel
2 = Pressure sleeve
3 = Bearing inner ring
4 = Shim
5 = Ring

☞ **According to our experience, the correct rolling torque is obtained when reusing the shims removed during disassembly. A check, however, is absolutely necessary.**

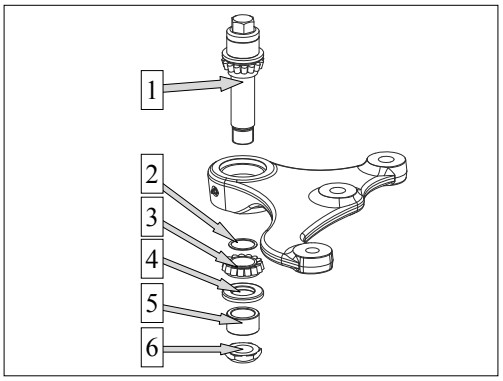


Figure 120

Insert the preassembled assembly mandrel into the relay lever. Mount shim, bearing inner ring, ring and pressure sleeve onto the assembly mandrel and bring them into contact position by means of a hexagon nut.

1 = Assembly mandrel
2 = Shim
3 = Bearing inner ring
4 = Ring
5 = Pressure sleeve
6 = Hexagon nut

☞ **Mount collar of hexagon nut facing the pressure sleeve.**

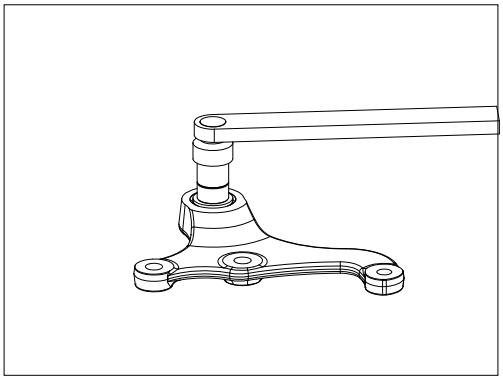


Figure 121

Tighten hexagon nut.

Tightening torque M_A = 500 Nm

☞ **While tightening, rotate relay lever bearing in both directions several times!**

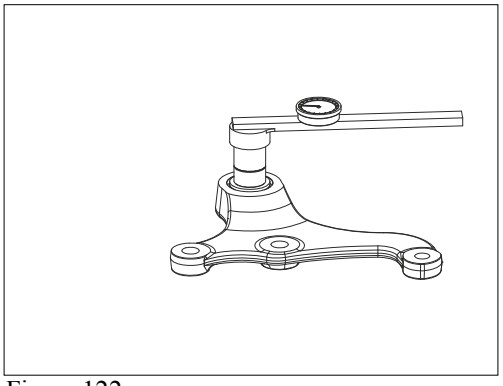


Figure 122

Check rolling torque 5 … 12 Nm.

☞ **In case of deviations from the required rolling torque, correct with appropriate shims (fig. 119 … 120).**

Loosen hexagon nut and remove single parts.

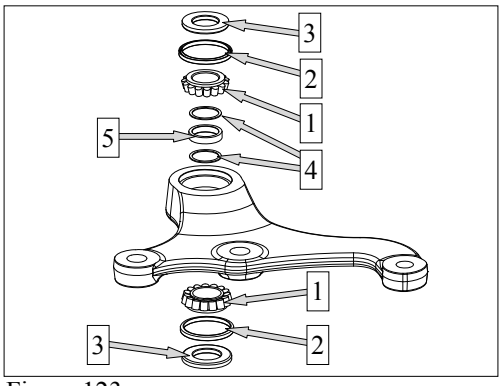


Figure 123

Insert single parts one after the other, as shown in the figure.

☞ **Assembly aid: single parts (except for scrapers) can be fixed by means of grease according to ZF List of Lubricants TE-ML 12.**

☞ **Observe correct installation position of scrapers: Sealing lip to face outwards.**

☞ **Observe correct installation position of rings: Large radius to face inwards.**

☞ **It is imperative to use the shims applied during the successful check (fig. 120).**

1 = Bearing inner ring
2 = Scrapers
3 = Ring
4 = Shim
5 = Bushing

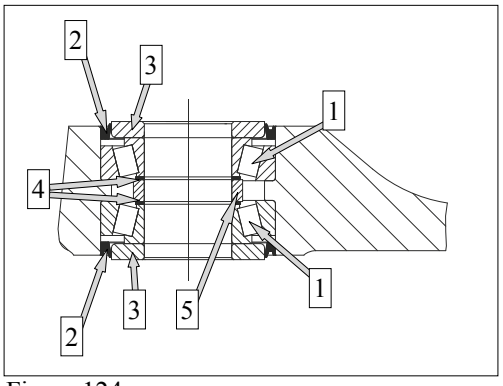


Figure 124

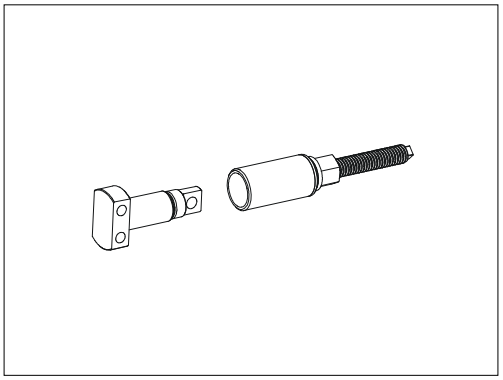


Figure 125

Bolt mounting fixture (S) onto bearing pin as shown in the figure.

(S) Mounting fixture 5870 000 097

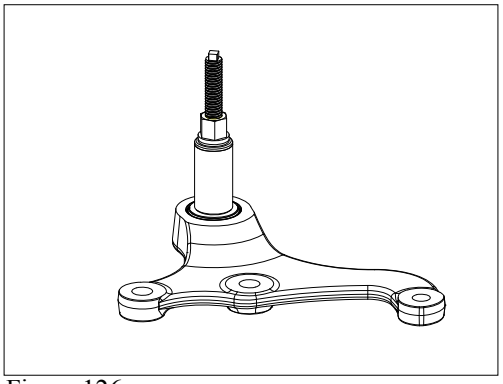


Figure 126

Use mounting fixture (S) to pull in bearing pin on the preassembled relay lever/intermediate lever until contact is obtained.

(S) Mounting fixture 5870 000 097

Unscrew and remove mounting fixture (S).

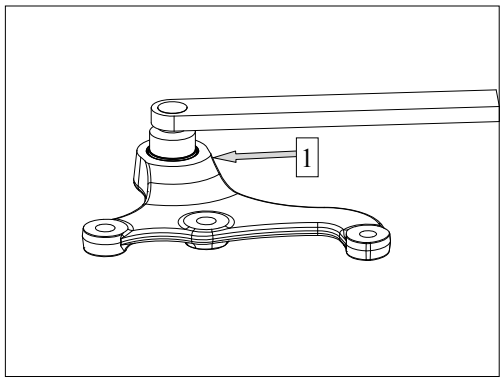


Figure 127

Wet hexagon nut with Loctite 262 and bolt it on with the flat side facing the ring.

Tighten hexagon nut.

Tightening torque M_A = 1000 Nm

Fit grease nipple (arrow 1).

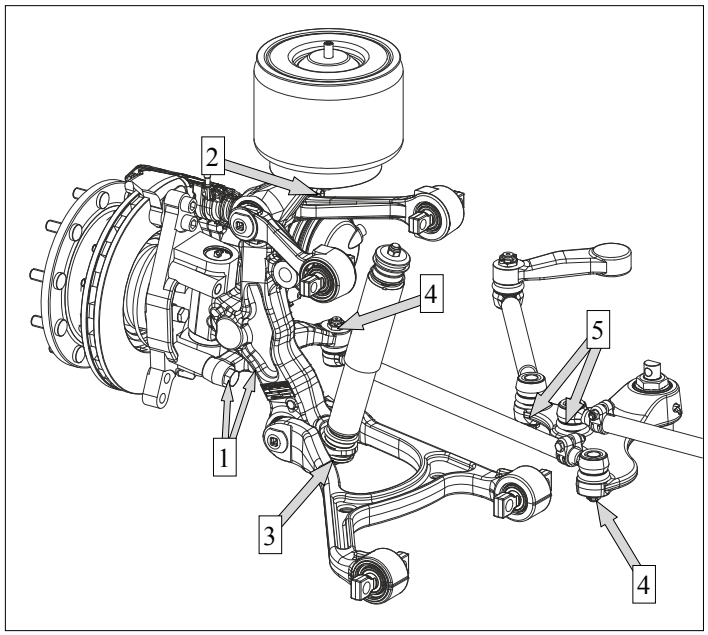


Figure 128

6.3 General peripheral parts

Position track lever on steering knuckle and fix it by means of hexagon screws (arrows 1). Secure threads with Loctite 262.

Tightening torque M_A = 750 Nm
(M22/10.9)

Place pneumatic spring onto steering knuckle carrier and fix it by means of hexagon screw (arrow 2).

Tightening torque M_A = 80 Nm
(M18x1.5)

Position shock absorber on the steering knuckle carrier as shown in the figure, and fix it by means of screw unit (arrow 3).

Tightening torque M_A = 90 Nm
(M16x1.5)

Position tie rods and steering lever as shown in the figure. Fix tie rods by means of castle nuts (arrows 4 and 5). Secure castle nuts by means of cotter pins.

Tightening torque M_A = 210 … 230 Nm
(arrows 4)
Tightening torque M_A = 250 … 280 Nm
(arrows 5)

☞ **Set track according to the vehicle manufacturer's specifications.**
Observe installation position of clamps. The bolted connection of the clamps must be opposite to the tapered pivots.

Tightening torque (clamp) M_A = 70 - 80 Nm

☞ **Prior to putting the axle into operation, lubricate it according to the specifications provided in the Operating Instructions (ZF order no. 5871.201.902).**