

Ordering-No.: 5871 207 002 E

ZF – AXLE

A-132



ZF Passau GmbH
Donaustr. 25 - 71
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REPAIR MANUAL

ZF – AXLE A-132

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

Observe the specifications of the **Lubrication and Maintenance Instructions** (ZF order no. 5871 207 902) and **ZF List of Lubricants TE-ML 12** when carrying out repair works.

The ZF List of Lubricants will be constantly updated – To order it or have a look at it, please contact:

- Any ZF plant
 - Any ZF After Sales Service Center
 - Internet <http://www.zf.com/> **Service / Techn. Information**
-

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 Passau GmbH

Donaustr. 25 - 71

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Dept : ASDM

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With the reserve of technical modifications!

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PREFACE

The present document was prepared for expert staff trained by the ZF Passau regarding maintenance and repair of ZF-systems.

Documented is a ZF series product representing the design state at the date of publication of this document.

However, in view of technical further developments of the product, the repair of the system available to you can require deviating working steps as well as deviating settings and test data.

Therefore, we recommend to you, to give your ZF-product into the hand of masters and qualified fitters whose practical and theoretical training is permanently updated and supplemented in our after-sales service training centre.

The service stations established all over the world by the Zahnradfabrik Friedrichshafen are offering to you the following:

1. Continuously trained staff

2. Specified equipment, e.g. special tools

3. Genuine-ZF spare parts representing the latest state of development

All works are carried out here with utmost care and reliability.

Within the scope of the respectively valid contract terms, repair works performed by ZF service stations are additionally covered by the ZF warranty.

Damage occurring due to works carried out improperly or in a non-workmanlike manner by others than ZF staff with possibly resulting consequential costs are excluded from this contractual liability.

The same applies, if the use of genuine ZF parts is renounced.

ZF Passau GmbH

After-sales Service

GENERAL

The Service Manual covers all works required for dismantling and the pertaining installation.

When repairing the transmission, ensure utmost cleanliness and that the works are carried out in an expert-like manner.

The transmission should only be disassembled for renewing damaged parts. Covers and housing parts installed with seals must be loosened by slight blows with a plastic mallet after screws and nuts have been removed. For removing parts being in tight contact with the shaft such as antifriction bearings, bearing races, and similar, use suitable pulling devices.

Dismantling and mounting works must be carried out at a clean working place. Use the special tools developed for this purpose. Prior to the re-installation of the parts, clean the contact surfaces of housings and covers from the residues of old seals. Remove burrs, if any, or similar irregularities with an oil stone. Clean housings and locking covers with a suitable detergent, in particular corners and angles. Damaged parts or parts heavily worn down must be renewed. Here, the expert must assess, whether parts such as antifriction bearings, thrust washers etc. subjected to normal wear during operation, can be installed again.

Parts such as sealing rings, lock plates, split pins etc. must generally be renewed. Radial sealing rings with worn down or torn sealing lip must also be renewed. Particularly ensure that no chips or other foreign bodies remain in the housing. Lube oil bores and grooves must be checked for unhindered passage.

All bearings must be treated with operating oil prior to installing them:

REFERENCE: For heating up parts such as bearings, housings etc., only a heating furnace or an electric drier is permitted to be used!

CAUTION

When assembling the transmission, absolutely observe the indicated torque limits and adjustment data. Screws and nuts must be tightened according to the enclosed standard table, unless otherwise specified.

In view of the risk of functional failures in the control unit, the use of liquid sealing agents is not permitted.

By no means, Molykote is permitted to be used.

Lined plates must not be washed. They must be cleaned with a leather cloth.



DANGER

When using detergents, observe the instructions given by the manufacturer regarding handling of the respective detergent.

Structure of the Repair Manual

The structure of this Repair Manual reflects the sequence of the working steps for completely disassembling the dismantled transmission. Dismantling and installing as well as the disassembly and assembly of a main group are always summarized in one chapter.

Special tools required for performing the respective repair works are listed under „Special tools“.

Important information on industrial safety

Generally, the persons repairing ZF-sets are responsible on their own for the industrial safety.



The observation of all valid safety regulations and legal impositions is the pre-condition for avoiding damage to persons and to the product during maintenance and repair works.

Persons performing repair works must familiarize themselves with these regulations.

The proper repair of these ZF-products requires the employment of suitably trained and skilled staff.

The repairer is obliged to perform the training.

The following safety references are used in the present Repair Manual:

	Serves as reference to special working procedures, methods, information, the use of auxiliaries etc..
CAUTION	Is used, if a deviating and improper working procedure can damage the product .
 DANGER	Is used, if lacking care can lead to personal injury or danger to life .
<hr/>	
REFE- RENCE	Prior to starting the checks and repair works, thoroughly study the present instructions.
CAUTION:	Illustrations, drawings and parts do not always represent the original; the working procedure is shown. The illustrations, drawings, and parts are not drawn to scale; conclusions regarding size and weight must not be drawn (not even within one representation). The works must be performed according to the description..
REFE- RENCE:	After the repair works and the checks, the expert staff must convince itself that the product is properly functioning again. .

TRAGBILDBEISPIELE ZUR GLEASONVERZÄHNUNG

EXAMPLES OF GEAR-TOOTH-CONTACT PATTERNS FOR THE GLEASON GEAR-TOOTH SYSTEM

EXEMPLES POUR LA DENTURE GLESON

Ideales Tragbild d.h. die Ritzeldistanz stimmt

Ideal tooth-contact pattern i.e. pinion distance is correct

L'engrènement idéal, c'est-à-dire, la distance du pignon est correcte

Bild / Figure 1/3/5

Schubflanke (Konkav)

Coast side (concave)

Côté poussé (concave)

Bild / Figure 1



Bild / Figure 2/4/6

Zugflanke (Konvex)

Drive side (convex)

Côté entraîné (convexe)

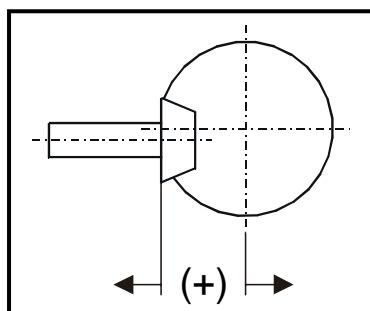
Bild / Figure 2



Ritzeldistanz muß größer werden

Pinion distance must be increased

La distance du pignon doit être augmentée



Ritzeldistanz muß kleiner werden

Pinion distance must be decreased

La distance du pignon doit être diminuée

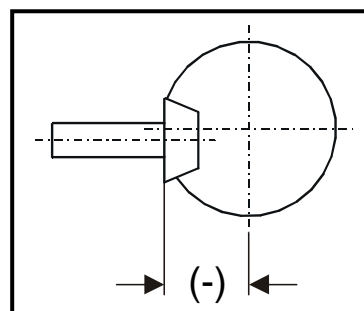


Bild / Figure 3



Bild / Figure 5



Bild / Figure 4



Bild / Figure 6



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)	=	14,5 psi (pound force per squar 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

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 : Density lineaire en kg/m; Density superficielle en t/m²

Begriff Unit	Formelzeichen	neu New	alt old	Umrechnung Conversion	Bemerkungen Not e Nota
Unité		Nouveau	Vieu	Conversion	
Masse Mass Mass	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/cm ² = 1 bar = 750 torr	
Drehzahl Speed Nombre de Tours	n	min ⁻¹			

TIGHTENING TORQUES FOR PLUGS (IN Nm) ACC. TO ZF-STANDARD 148

Friction coefficient: μ tot.= 0.12 for plugs and nuts without rework, as well as phosphated nuts. **Tighten manually!**

Take tightening torques from the chart below, unless otherwise specified :

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	23	28
M8	23	34	40
M10	46	68	79
M12	79	115	135
M14	125	185	215
M16	195	280	330
M18	280	390	460
M20	390	560	650
M22	530	750	880
M24	670	960	1100
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	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	120	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	1100	1250
M 24 x 2	730	1050	1200
M 27 x 1.5	1100	1600	1850
M 27 x 2	1050	1500	1800
M 30 x 1.5	1550	2200	2550
M 30 x 2	1500	2100	2500
M33 x 1.5	2050	2900	3400
M 33 x 2	2000	2800	3300
M 36 x 1.5	2700	3800	4450
M 36 x 3	2500	3500	4100
M 39 x 1.5	3450	4900	5700
M 39 x 3	3200	4600	5300

LIST OF SPECIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

ZF Axle A - 132 / S-91/PP 4474 035 320 1. Output

Disassembly Chapt./Fig.	Reassembly Chapt./Fig.	DENOMINATION/USE OF SPECIAL TOOLS (S)	PART No.
		<p><u>Assembly truck assy with tilting device</u> <u>Support</u> <u>Clamping bracket</u> 1 set = 2 pcs Universal use. For clamping the axle assy without spring carrier onto the assembly truck.</p>	<p>5870 350 000 5870 350 077 5870 350 075</p>
1 / 2		<p><u>Lifting chain</u> 3-rope Universal use. For various lifting operations.</p>	5870 281 047
1 / 4	1 / 35	<p><u>Slotted nut wrench</u> # To loosen and tighten the slotted nut M 105x1.5 0637 504 082 on the hub carrier.</p>	5870 401 146
1 / 5	1 / 34	<p><u>Lifting bracket</u> To facilitate removal and reinstallation of the hub assy including brake disk.</p>	5870 281 043
1 / 9		<p><u>Pry bar</u> Universal use.</p>	5870 345 071
1 / 14	1 / 16	<p><u>Adjusting screws</u> 1 set = 2 pcs Universal use. To facilitate removal and reinstallation of the hub carrier.</p>	5870 204 029
	1 / 20	<p><u>Wheel bolt puller</u> In connection with : <u>Insert</u> M22x1.5 <u>Insert</u> 7/8 – 11 BSF to mount the wheel bolts 4474 306 180 M22x1,5 4472 335 281 / 461 7/8 – 11 BSF into the hub hole. Repair solution.</p>	<p>5870 610 010 5870 610 002 5870 610 008</p>



LIST OF SPECIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

ZF Axle A - 132 / S-91/PP 4474 035 320 1. Output

Disassembly Chapt./Fig.	Reassembly Chapt./Fig.	DENOMINATION/USE OF SPECIAL TOOLS (S)	PART No.
	1 / 23	<u>Driver #</u> To mount the bearing outer rings 0735 371 966 into the hub hole. To be used in connection with: Handle	5870 050 007 5870 260 004
	1 / 30 1 / 31	<u>Driver #</u> To mount the bearing outer rings 0734 319 643 and 0734 319 644 into the hub hole.	5870 051 053
	1 / 33	<u>Inner installer #</u> To align and position the preassembled hub on the hub carrier.	5870 651 085
		# = Very important special tools.	

LIST OF SPECIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

ZF Axle A-132 / S-91/PP 4474 035 320 2. Axle insert S-91/PP

Disassembly Chapt./Fig.	Reassembly Chapt./Fig.	Denomination and use	Part No.
2 / 12	2 / 38	<p><u>Slotted nut wrench #</u> To loosen and tighten the slotted nut 4460 391 147 on the input pinion.</p> <p><u>Clamping fork #</u> To lock the input flange when loosening and tightening the pinion bolt connection.</p>	<p>5870 401 114</p> <p>5870 240 002</p>
2 / 17		<p><u>Gripping insert #</u> To pull the roller bearing 0501 211 092 off the pinion. Only to be used in connection with:</p> <p><u>Basic tool</u></p>	<p>5873 002 049</p> <p>5873 002 001</p>
2 / 18	2 / 29	<p><u>Set of external pliers</u> A1-A2-A3-A4 Universal use. To snap externally clamped retaining rings out and in.</p>	5870 900 015
2 / 19		<p><u>Three-armed puller</u> Universal use. To pull the roller bearing off the pinion.</p>	5870 971 002
	2 / 20	<p><u>Measuring shaft #</u></p> <p><u>Fitting pieces #</u> 1 set = 2 pcs</p> <p><u>Digital depth gauge #</u> 300 mm</p> <p>To measure the axle drive housing and determine the adjusting shim for the pinion.</p>	<p>5870 500 001</p> <p>5870 500 015</p> <p>5870 200 114</p>
	2 / 24 2 / 30	<p><u>Pressing bush #</u> To support the bearing bush assy during various operations.</p>	5870 506 143
	2 / 26	<p><u>Straightedge #</u> 295 mm</p> <p><u>Gauge blocks #</u> 1 set = 2 pcs</p> <p><u>Digital depth gauge #</u> 300 mm</p> <p>Universal use. For various measuring operations.</p>	<p>5870 200 108</p> <p>5870 200 066</p> <p>5870 200 114</p>

LIST OF SPECIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

ZF Axle A-132 / S-91/PP 4474 035 320 2. Axle insert S-91/PP

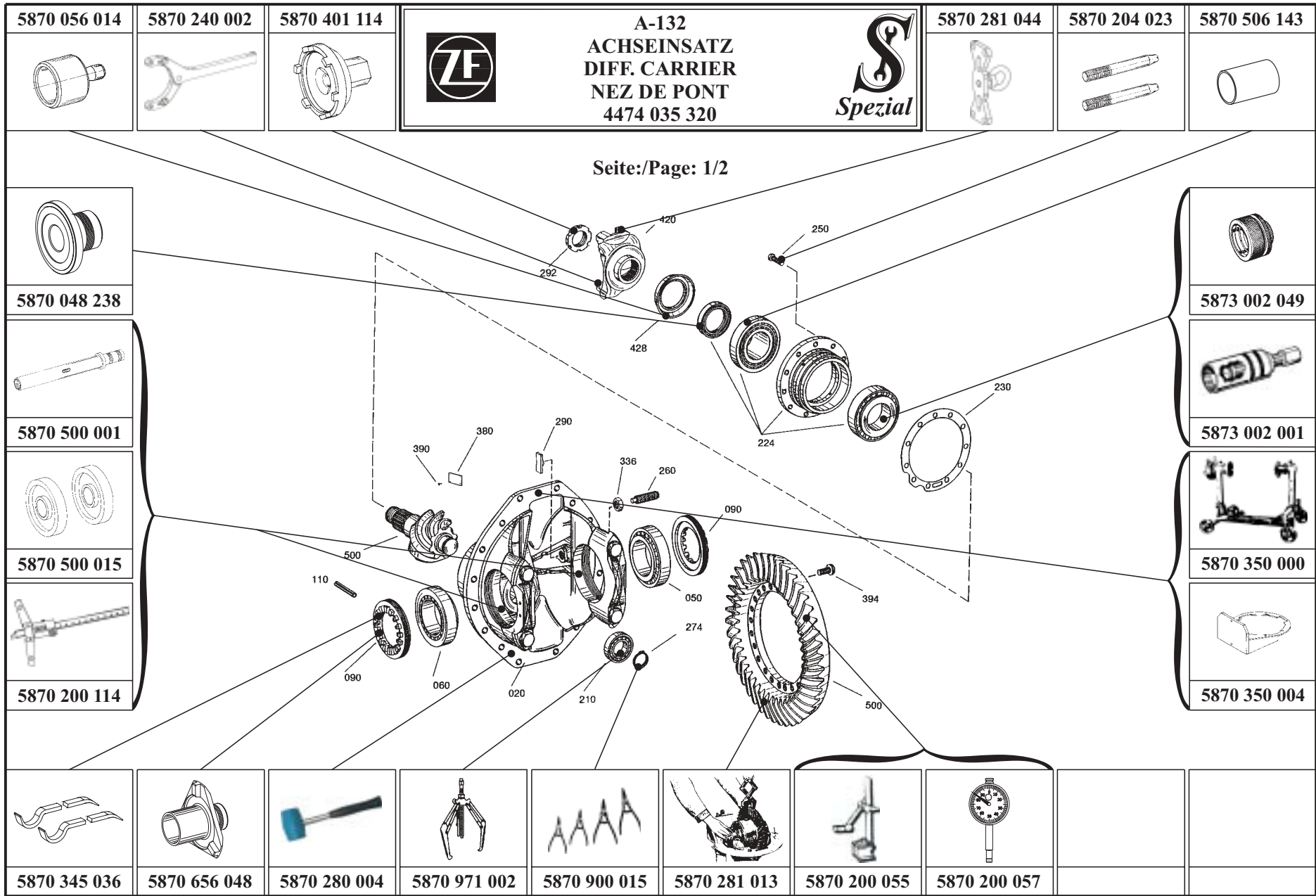
Disassembly Chapt./Fig.	Reassembly Chapt./Fig.	Denomination and use	Part No.
	2 / 32	<u>Driver</u> To mount the screen set to the input flange.	5870 056 014
	2 / 34	<u>Adjusting screws #</u> 1 set = 2 pcs Universal use. To align and position the adjusting shim and the pinion unit assy at the axle drive housing.	5870 204 023
	2 / 37	<u>Driver #</u> To mount the shaft seal 0734 310 400 into the bearing bush.	5870 048 238
	2 / 53	<u>Socket wrench #</u> 1" – square input To loosen and tighten the adjusting nut 4460 391 244 in the axle drive housing.	5870 656 048
	2 / 53	<u>Plastic hammer #</u> ø 60 mm To prevent damage during installation of components and to relieve the differential bearing.	5870 280 004
	2 / 53	<u>Magnetic stand #</u> <u>Dial indicator#</u> Universal use. To determine the backlash between ring gear and pinion.	5870 200 055 5870 200 057
	2 / 53	<u>Micrometer #</u> ø 300 - 400 mm Universal use. To determine the bracket width 397.95 on the preassembled axle insert.	5870 340 510
	2 / 61	<u>Adjusting screws #</u> 1 set = 2 pcs Universal use. To align and position the axle insert towards the axle housing.	5870 204 040



LIST OF SPECIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

ZF Axle A-132 / S-91/PP
4474 035 320 2. Axle insert S-91/PP

Disassembly Chapt./Fig.	Reassembly Chapt./Fig.	Denomination and use	Part No.
		# Highly important special tools for partial repairs (repair of wear parts) !	



WB/1



Repair Manual

Off-Road Transmissions
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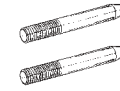




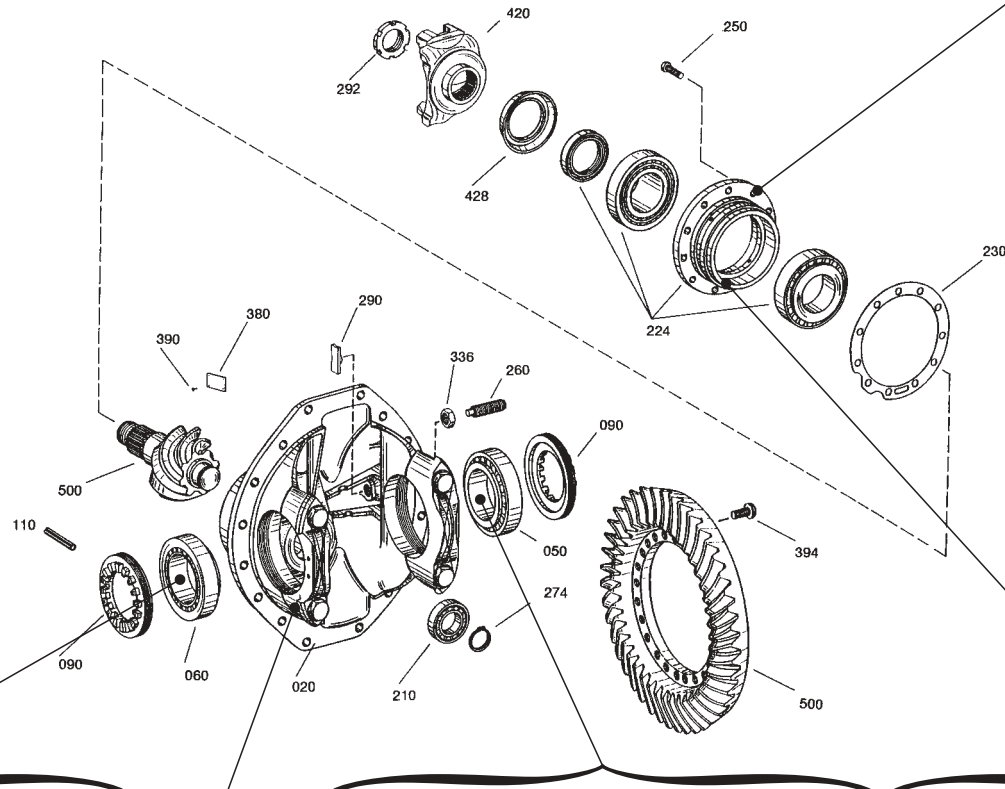
A-132
 ACHSEINSATZ
 DIFF. CARRIER
 NEZ DE PONT
 4474 035 320



5870 204 023



Seite:/Page: 2/2



WB/2



5873 003 029



5873 003 011



5873 002 001



5870 340 510



5873 003 029



5873 003 011



5873 002 001



5870 200 108



5870 200 066



5870 200 114



Repair Manual

Off-Road Transmissions
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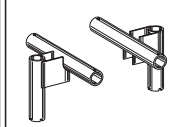
A-132
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AXLE CASING
CORPS DE PONT
4474 035 320



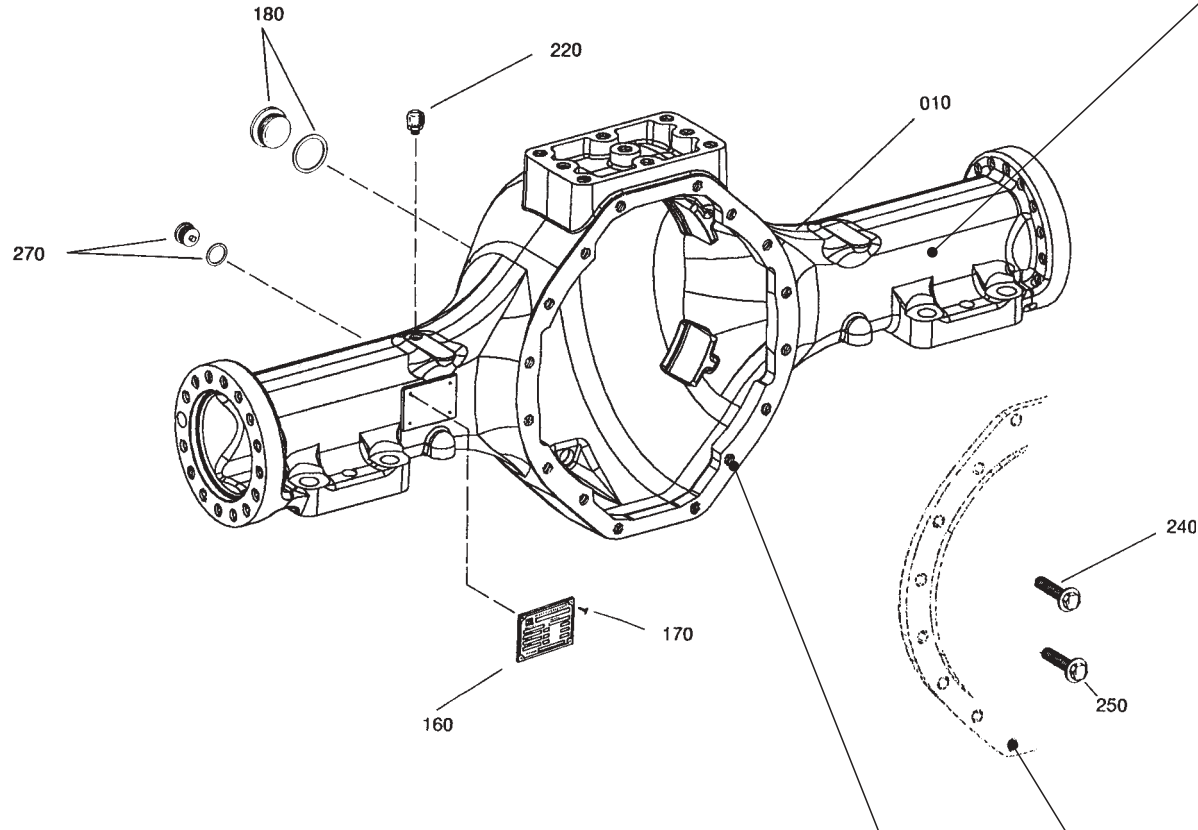
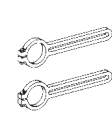
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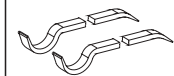
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5870 350 075



5870 204 040



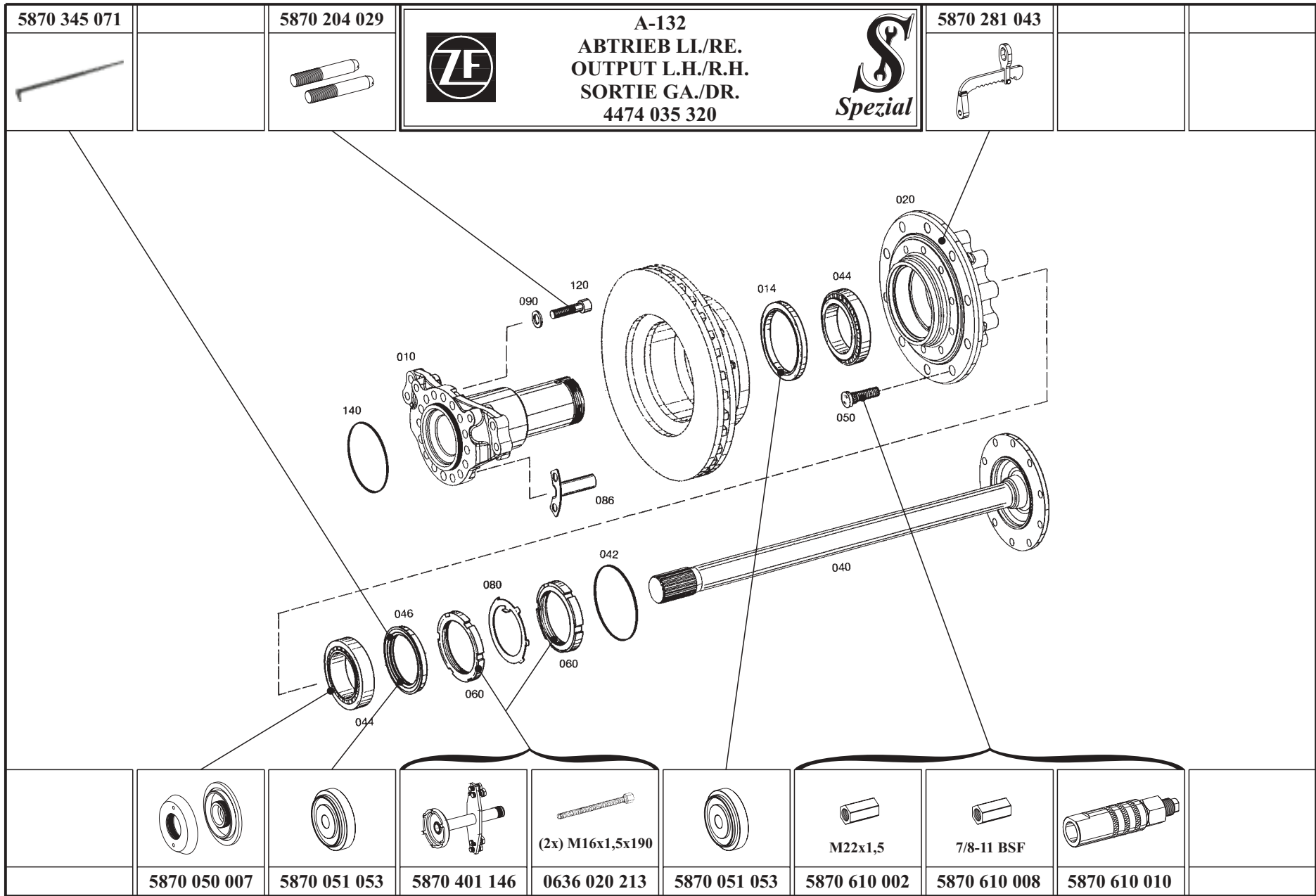
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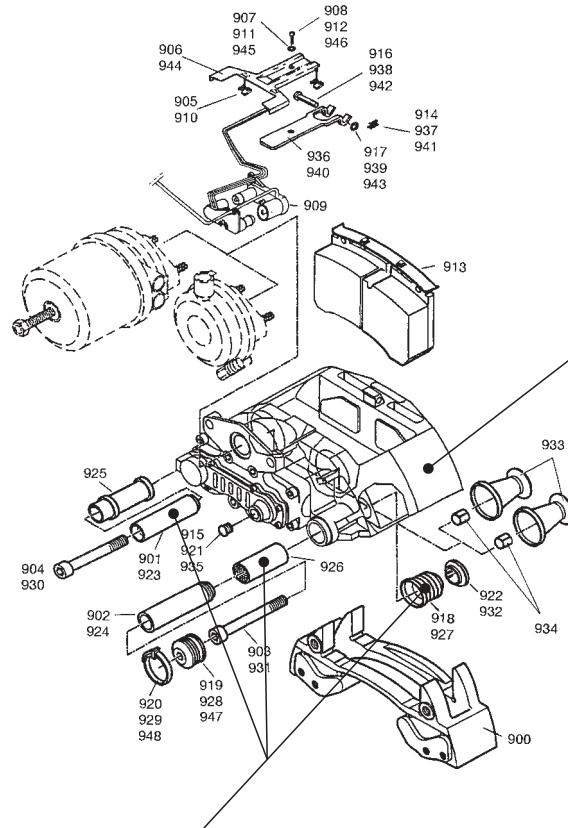




A-132
BREMSE LI./RE.
BRAKE L.H./R.H.
FREIN GA./DR.
4474 035 320



5870 281 047



5870 080 050

WB/S



Repair Manual

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1. OUTPUT

1.1 DISASSEMBLY

Remove spring carrier and longitudinal control arm and fix axle onto the assembly truck.

(S) Assembly truck	5870 350 000
(S) Supports	5870 350 077
(S) Clamping brackets	5870 350 075



Figure 1

Loosen screw plug (arrow) and drain oil.



Oil to be disposed of ecologically and according to the legal provisions!



The following pictures show the axle 90° offset to the installation position!

Separate brake from the axle (Figure 2):



For any operations done on the brake system, the information and instructions given by the brake manufacturer are mandatory!

The relating information is included in the service manuals of the component manufacturer!

The applicable instructions are to be requested from the brake manufacturer or can be viewed on the brake manufacturer's internet site.

Brake manufacturer and brake type are indicated on the identification plate of the brake caliper!



Figure 2

Remove brake linings according to the brake manufacturer's instructions.

Loosen hexagon screws and separate brake caliper from the axle (Figure 2).

(S) Lifting chain	5870 281 047
-------------------	--------------



Figure 3

Loosen hexagon screws and separate flange shaft from the axle.



Watch out for low quantities of residual oil!



Figure 4

Unlock and loosen outer slotted nut.

Remove retaining plate and loosen inner slotted nut.

(S) Slotted nut wrench 5870 401 146



Figure 5

Separate hub/brake disk from the hub carrier.

(S) Lifting bracket 5870 281 043



Figure 6

Fix hub/brake disk by means of press.

Loosen threaded connection and separate hub from the brake disk.



Locate press-fit mandrel at the hub mounting face!



Figure 7

Remove O-ring (arrow).



Figure 8

Use a lever to remove the shaft seal at brake disk side from the hub hole.



Figure 9

Use a lever to remove the outer shaft seal from the hub hole.

(S) Pry bar

5870 345 071

Remove compact bearing (Figures 10 to 12)

☞ Inspection of the compact bearing inside followed by a grease change is also required when the following criteria are applicable:

- Within the maintenance interval, see List of Lubricants TE-ML 12.
- In case of grease leakage on the shaft seal at brake disk side or when replacing the shaft seals.
- In case of overheated brake parts (e.g. burnt bellows at pressure pieces)

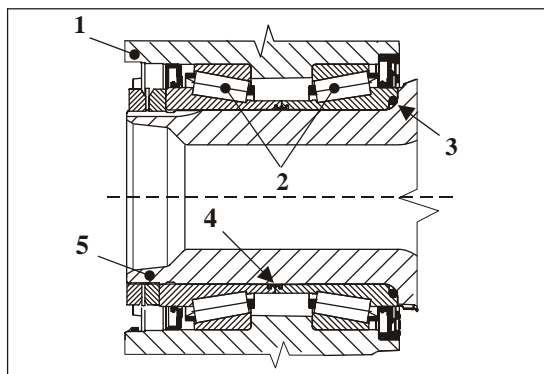


Figure 10

Legend to figure 10:

- | | |
|---------------------|----------------------|
| 1 = Hub | } Complete component |
| 2 = Compact bearing | |
| 3 = O-ring | |
| 4 = Retaining ring | |
| 5 = Hub carrier | |



Figure 11

Snap out retaining ring (arrow).



Figure 12

Remove both bearing inner rings.

Remove both bearing outer rings, if required.

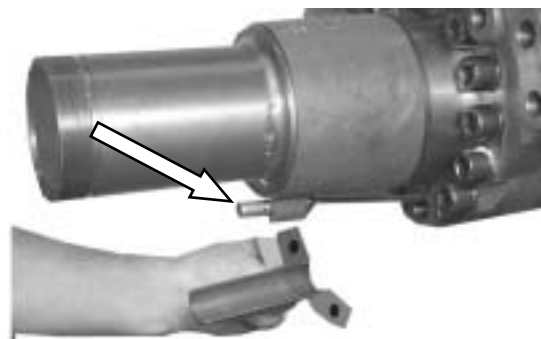


Figure 13

Loosen hexagon screws and remove protection shield. Press speed sensor (arrow) off the bore and remove it.

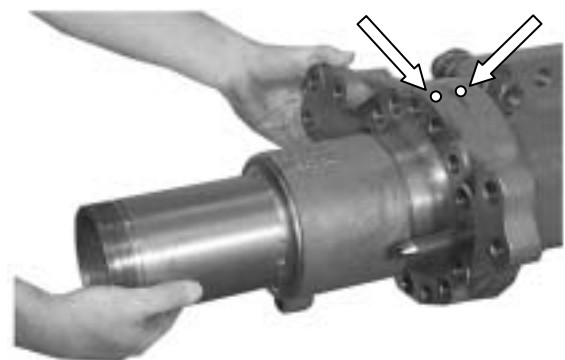


Figure 14

Mark radial installation position (arrows), loosen screw joint and separate hub carrier from the axle housing.

(S) Adjusting screws

5870 204 029



Figure 15

1.2 REASSEMBLY

Place O-ring (arrow) into the annular groove of the hub carrier and grease it.



The following pictures show the axle 90° offset to the installation position!



Figure 16

Mount two adjusting screws.
Mount hub carrier and fix it by means of cylindrical screws.



**Pay attention to radial installation position. Refer to the markings done during disassembly!
Install washers of thickness 3.0 mm !**

Tightening torque (M18x1.5/10.9) $M_A = 440 \text{ Nm}$

(S) Adjusting screws 5870 204 029

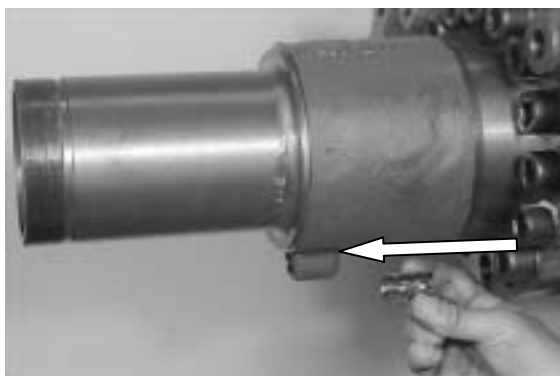


Figure 17

Grease bushing (silicone grease, ZF No. 0750 199 012) and place it into the hole in arrow direction.

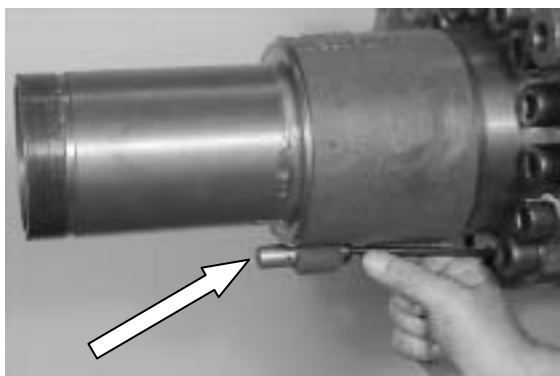


Figure 18

Install speed sensor until contact is obtained.



**During later mounting of the hub, the speed sensor is brought into its final position!
Contact surface (arrow) must be free of any grease!**



Left and right speed sensors can be identified by the different color markings at the connection plug!



Mount protection shield for speed sensor.

Tightening torque (M8 / 8.8) $M_A = 23 \text{ Nm}$

Figure 19



Figure 20

Mount wheel bolt.

 **Pay attention to radial installation position!**

(S) Wheel bolt puller basic tool	5870 610 010
(S) Insert 7/8 – 11	5870 610 008
(S) Insert M22x1.5	5870 610 002

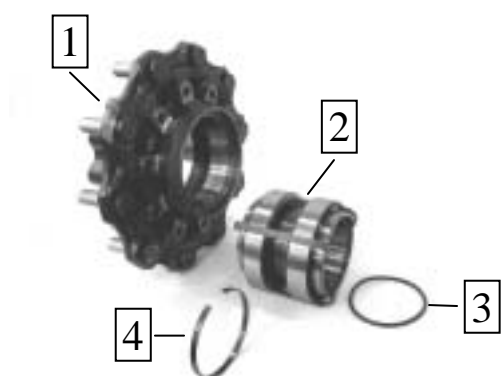



Figure 21


Mount compact bearing (Figures 21 ... 29)

 **When replacing the compact bearing or when changing grease within the maintenance interval, make sure that hub and compact bearing are cleaned thoroughly.**

Figures 21 and 22 show the individual components of the compact bearing and the installation position.

Legend to figure 21 and 22:

1 = Hub	} Complete component
2 = Compact bearing	
3 = O-ring	
4 = Retaining ring	
5 = Hub carrier	

 **Items 3 and 4 are supplied with the compact bearing as loose parts!**

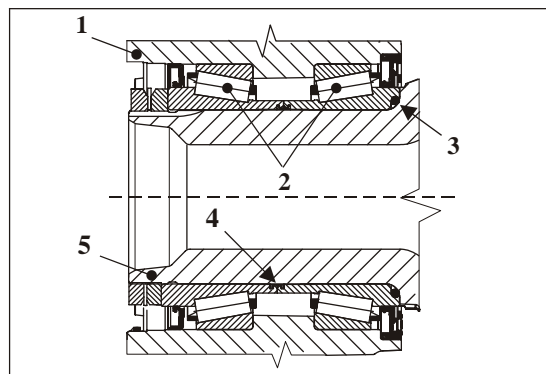


Figure 22

Press in both bearing outer rings until contact is obtained.

(S) Driver	5870 050 007
(S) Handle	5870 260 004



Figure 23

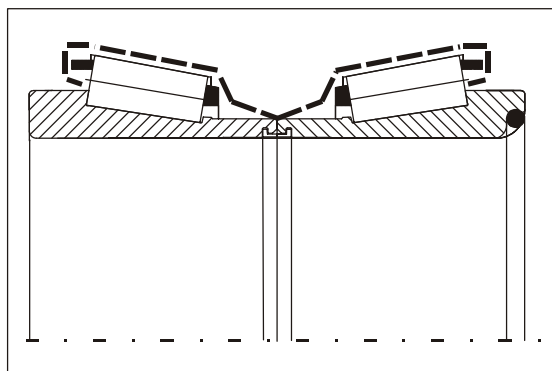


Figure 24

Grease compact bearing in the marked area - - - .

Total grease quantity of each output side: 130 grams (max. 150 g).



Richly grease the bearing rollers inside, outside and on the front sides!



Only use grease types which have been released by ZF (e.g. Renolit LX-PEP 2, ZF order No.: 0671 190 122).

ZF List of lubricants TE-ML 12 is binding!

The latest update of the List of Lubricants is available at internet site www.zf.com Service/Techn. Information!



Figure 25

Mount bearing inner ring at brake disk side.



To ensure the exact contact position of the bearing rollers in the bearing outer ring, press bearing inner ring firmly and rotate it several times (rolling in)!

The bearing inner ring at brake disk side can be identified by the annular groove for the O-ring (arrow)!



Figure 26

Turn hub.



Support the bearing inner ring at brake disk side by means of an appropriate assembly mandrel (arrow) to maintain the contact position of the bearing inner ring!



Figure 27

Mount outer bearing inner ring.



To ensure the exact contact position of the bearing rollers in the bearing outer ring, press bearing inner ring firmly and rotate it several times (rolling in)!

Clearance-free contact of both bearing inner rings must be ensured!



Figure 28

Fix both bearing inner rings by means of retaining ring.

- ☞ Pay attention to the exact installation position of the retaining ring, see arrow/figure 29!
When the retaining ring is correctly fixed, the reference dimension is $140^{+/-0.4}$ mm, see figure 29!
Lifting of the outer bearing inner ring shall no longer be possible!

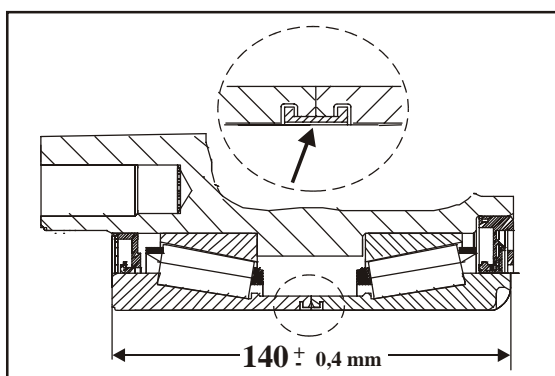


Figure 29



Figure 30

Mount shaft seal at flange shaft side.

(S) Driver 5870 051 053

- ☞ Use of the specified special tool (S) ensures the exact installation depth!
Pay attention to the installation position, designation „OELSEITE / OIL SIDE“ to show upwards!

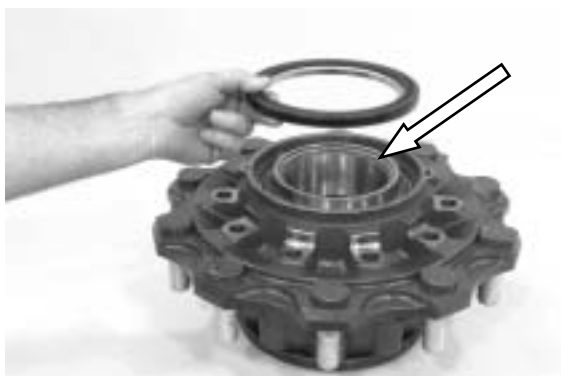


Figure 31

Mount shaft seal at brake disk side.

(S) Driver 5870 051 053


- ☞ Use of the specified special tool (S) ensures the exact location!
Pay attention to the installation position – sensor ring or designation „AUSSENSEITE / OUTSIDE“ to show upwards (outside)!

Place O-ring into the annular groove of the bearing inner ring (arrow).



Figure 35

Mount internal slotted nut.

 **Pay attention to the installation position of the slotted nut – chamfer to show outwards!**
While tightening, rotate the hub in both directions several times !

Tightening torque (inner slotted nut) $M_A = 850 \text{ Nm}$

(S) Slotted nut wrench 5870 401 146




If during the tightening process of the slotted nut (figure 35) no increase of the bearing rolling torque is noticeable, or if an axial play of the wheel bearing is detected (figure 36), this may be caused by the unsnapping of the retaining ring (figures 28 and 29).

Correct assembly fault, if required!



Figure 36

Insert locking plate and mount outer slotted nut.

 **Pay attention to the installation position of the locking plate - securing clip to show inside!**
Pay attention to the installation position of the slotted nut – chamfer to show inside!

Tightening torque (outer slotted nut) $M_A = 1200 \text{ Nm}$



Figure 37

Secure slotted nut by deforming the locking plate, i.e. by indenting the locking plate into a groove of the outer slotted nut.



Figure 38

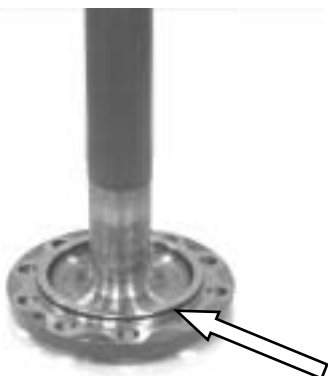


Figure 39

Insert O-ring into the annular groove of the flange shaft (arrow) and grease it.



Figure 40

Insert flange shaft until contact is obtained and fix it by means of hexagon screws.

Tightening torque (M18x1.5/10.9) $M_A = 440 \text{ Nm}$

Mount brake (Figures 41 and 42).



Figure 41

Tightening torque (M16x1.5 / 10.9) $M_A = 270 \text{ Nm}$

For any operations done on the brake system, the information and instructions given by the brake manufacturer are mandatory!

The relating information is included in the service manuals of the component manufacturer!

The applicable instructions are to be requested from the brake manufacturer or can be viewed on the brake manufacturer's internet site.

Brake manufacturer and brake type are indicated on the identification plate at the brake caliper!

Position of identification plate, based on the example of a KNORR brake, see arrow / figure 41 !

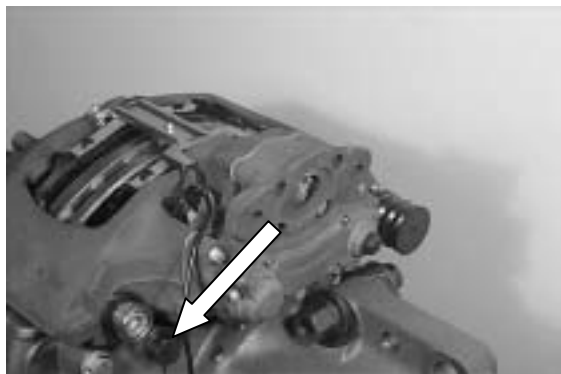


Figure 42

For this version, pay attention to the installation position of the tight-fit screw, see arrow / figure 42!

The figure shows the axle 90° offset to the installation position! In installed condition of the axle, the tight-fit screw must be mounted in "12 o'clock" position (top).

2. ZF – AXLE INSERT / Type: S-91 / PP

2.1 DISASSEMBLY


 Prior to separating the axle insert from the axle bridge, both flanged shafts must be dismantled.



Fig. 1

Loose screw union and separate axle insert from axle bridge using a lifting appliance.

 Mark installation position of the axle insert, see arrows!

(S) Lifting appliance	5870 281 044
(S) Pry bar	5870 345 036



Fig. 2

Fasten axle insert to assembly carriage.

Drive out both slotted pins and unfix adjusting nut.

(S) Assembly carriage	5870 350 000
(S) Seat	5870 350 004
(S) Pry bar	5870 345 036

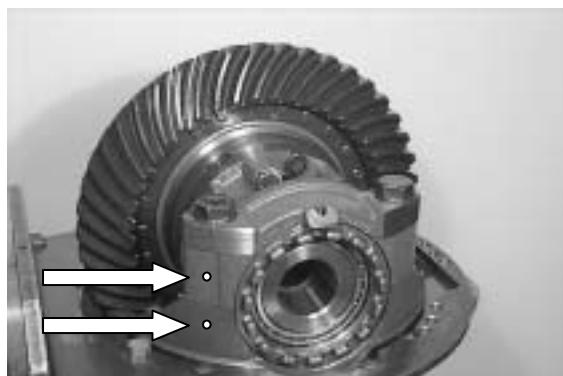


Fig. 3

Mark installation position of the supporting yoke, see arrows!



Fig. 4

Unfix adjusting screw and dismantle sliding pad.



Fig. 5

Unfix hex. bolts and remove supporting yokes.
Then, remove both adjusting nuts.



Fig. 6

Separate differential from the axle drive housing using a lifting
appliance.

(S) Gripper tongues

5870 281 013



Fig. 7

Withdraw both inner bearing rings.

(S) Grip	5873 003 029
(S) Reducer	5873 003 011
(S) Basic tool	5873 002 001



Fig. 8

Unfix hex. bolts, remove housing cover and dismantle components.



Fig. 9

Unfix hex. bolts and press crown gear off the differential case.

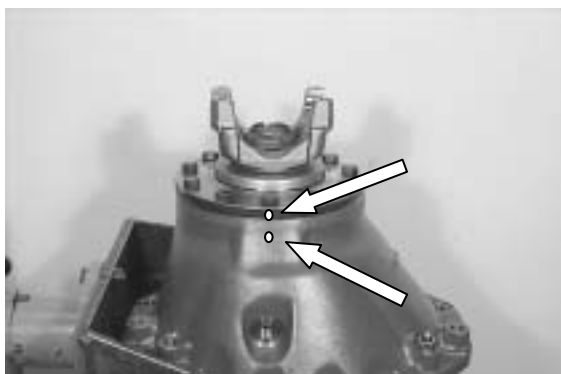


Fig. 10

Mark radial installation position of the bearing bush.



Fig. 11

Relieve grooved nut.

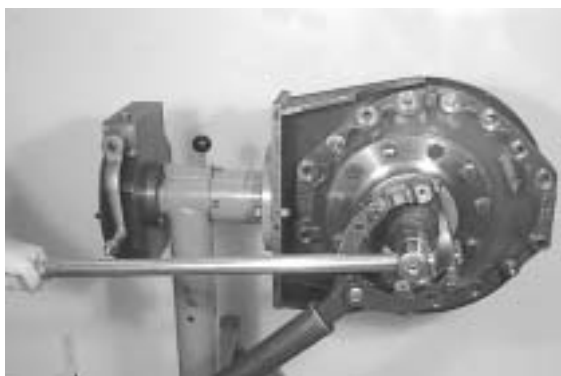


Fig. 12

Unfix grooved nut and withdraw drive flange.

(S) Grooved nut wrench
(S) Clamping fork

5870 401 114
5870 240 002



Fig. 13

Move riding ring off the inner bearing ring.



Fig. 14

Move shaft sealing ring off the bearing bush.



The installation of the shaft sealing ring is described on page 2/11/Fig. 37!



Fig. 15

Line up drive flange and temporarily fix it with a grooved nut.

Unfix hex. bolts and separate the complete drive unit from the axle drive housing.

Then, remove drive flange again.

(S) Lifting appliance

5870 281 044



Fig. 16

Press drive pinion off the bearing bush.



Fig. 17

Withdraw inner bearing ring off the drive pinion.

(S) Grip

5873 002 049

(S) Basic tool

5873 002 001



Fig. 18

Remove retaining ring.



Fig. 19

Withdraw roller bearing.

(S) 3 Leg puller

5870 971 002

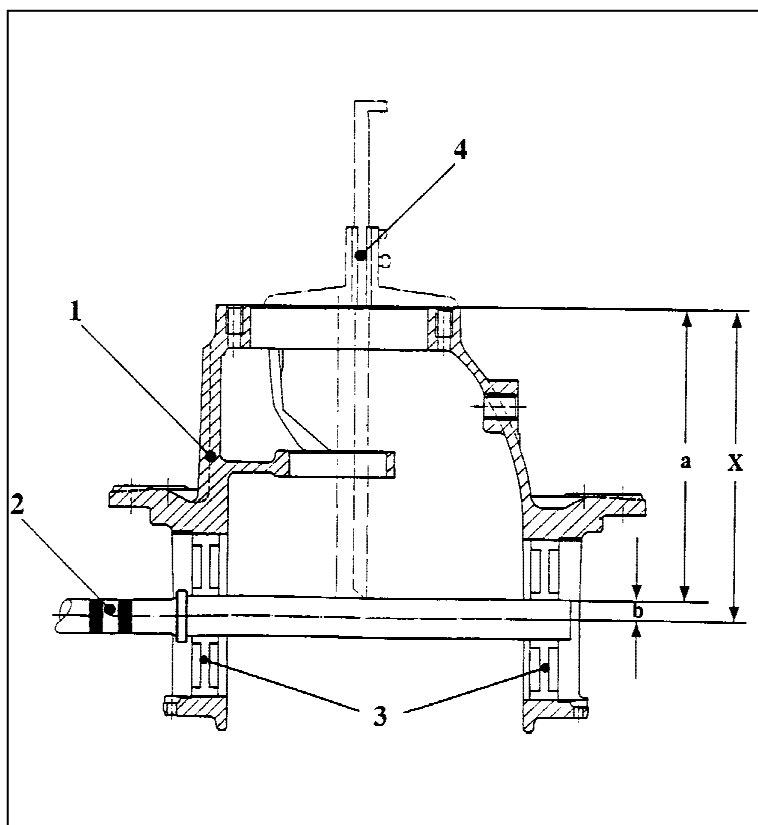


Fig. 20

2.2 INSTALLATION

Reference:

If crown wheel or drive pinion are damaged, both parts must be commonly renewed. Always ensure that the pair number is identical!

2.2.1 DRIVE PINION

Contact pattern – set crown wheel set, see Fig. 20 up to calculation example A₃

To sketch:

- | | |
|-------------------------|--------------|
| 1 = Axle drive housing | |
| 2 = Measuring shaft | 5870 500 001 |
| 3 = Adapter | 5870 500 015 |
| 4 = Digital depth gauge | 5870 200 114 |



Fig. 21

Temporarily fix both bearing yokes with hex. bolts. Insert fitting pieces (3) into the bearing bores and introduce the measuring shaft (2), also see Fig. 20.



Fig. 22

Turn axle drive housing by 180°..

Determine measure 'a' from the flange surface up to the measuring shaft.

Measure 'a' e.g. 294,00 mm

Calculation example A₁:

Measure 'a'	294,00 mm
Measure 'b' (1/2 Ø measuring shaft)	+ 15,00 mm
<u>Results in measure X (Housing measure)</u>	<u>= 309,00 mm</u>



Fig. 23

The adjacent illustration shows the pinion bearing unit.



The pinion bearing shaft has already been pre-assembled or preset and can only be obtained as complete part!
The renewal of the tapered roller bearings (without bearing bush) is not admissible!
The sealing element can be replaced – procedure as per Fig. 13 and 14 (Disassembly) or Fig. 37. (Installation)!
Leave transport guard (arrow) in the bearing until the drive pinion is mounted (Fig. 31).



Fig. 24

Place bearing bush over the pressing bush with the sealing element showing downwards.

(S) Pressing bush 5870 506 143



To ensure the correct installation of the pinion bearing unit, the use of the pressing bush is indispensable.



Fig. 25

Pre-stress tapered roller bearing, permanently turning the bearing bush, with 10 KN (1 ton) (Fig. 25) and determine measure 'c' from the front surface/inner bearing ring up to the flange surface (Fig. 26).

Measure 'c' e.g. 80,05 mm

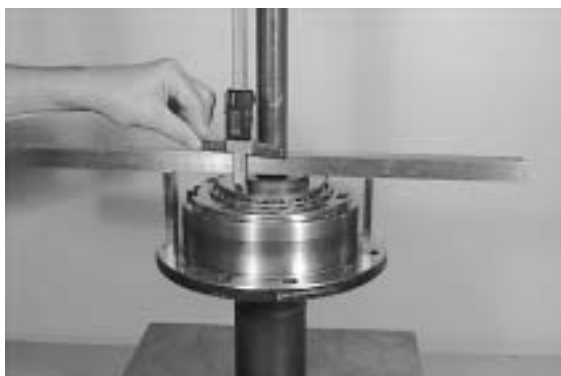


Fig. 26

(S) Measuring ledge 5870 200 108
 (S) Block gauge 5870 200 066
 (S) Digital depth gauge 5870 200 114

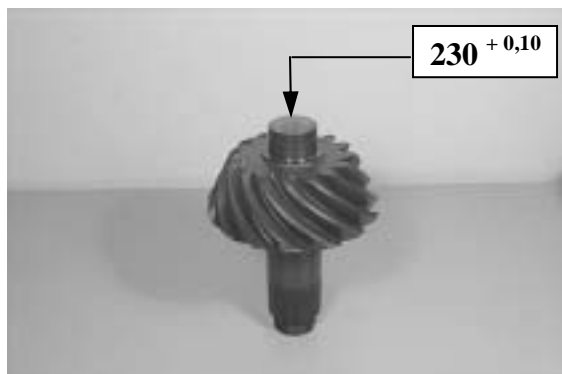


Fig. 27

Read measure 'd' (pinion measure).
Measure 'd' e.g.. (230 +0,10 mm) 230,10 mm

Calculation example A₂:

Measure 'c'	80,05 mm
Measure 'd'	+ 230,10 mm
<u>results in measure Y (install. measure)</u>	<u>= 310,15 mm</u>

Calculation example A₃:

Measure Y	310,15 mm
Measure X	- 309,00 mm
<u>results in shim(s)</u>	<u>s = 1,15 mm</u>

The shim is installed at Fig. 34.



Fig. 28

Place thrust washer (arrow) and bring roller bearing into contact.

Observe installation position of the thrust washer – radius showing downwards.



Fig. 29

Fix roller bearing with retaining ring.

(S) External pliers set 5870 900 015



Fig. 30

Place bearing bush over the pressing bush with the sealing element showing downward and press transport guard off the bearing.



To avoid damage to the sealing element, leave pinion bearing unit on the pressing bush (transport guard is temporarily left in the pressing bush)!

(S) Pressing bush

5870 506 143



Fig. 31

Insert drive pinion into the bearing bush and press it in until it is in tight contact permanently turning the bearing bush.



Fig. 32

Press screening plate over the drive flange until it is in tight contact.

(S) Support

5870 056 014



Fig. 33

Line up drive flange and temporarily fix it with a grooved nut.



Fig. 34

Mount two adjusting bolts and line up shim(s) e.g. 's' = 1,15 mm (see calculation example A₃/page 2/9).

Ensure overlapping of the oil bores, see arrows!
Wet shim(s) on either side with sealing agent (Loctite, type-no. 574)!

(S) Adjusting bolts 5870 204 023

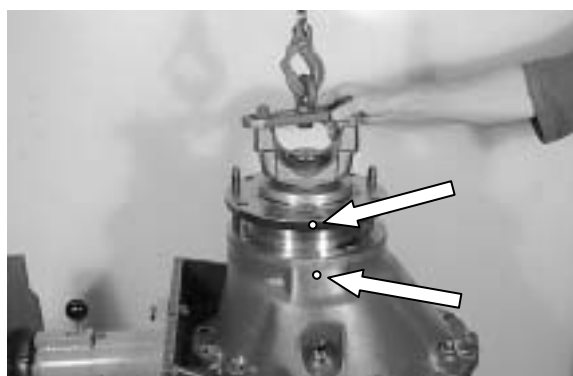


Fig. 35

Insert pinion unit with lifting appliance until it is in tight contact.

Observe radial installation position, see marking (arrows)!

(S)Lifting appliance 5870 281 044



Fig. 36

Fasten pinion unit with hex. bolts.

Tightening torque (M16/8.8) $M_A = 195 \text{ Nm}$



Fig. 37

If required, mount sealing element (shaft sealing ring and bushing)

When using the specified support, the exact installation position will result!
If a new pinion bearing unit was installed, the sealing element is already mounted!

(S) Support 5870 048 238




Fig. 38

Line up drive flange.

Wet contact surface of the grooved nut with sealing agent (Loctite, type-no. 574).

Tighten grooved nut.

Tightening torque $M_A = 1500 \text{ Nm}$

 **During tightening, repeatedly turn through drive pinion in both directions!**

(S) Grooved nut wrench

5870 401 114

(S) Clamping fork

5870 204 002



The grooved nut is secured after having determined the contact pattern (fig. 58)!



Fig. 39

2.2.2 Differential

Heat up bevel gear and bring it into contact with the flanged surface of the differential case.

 **Ensure radial installation position!**



Fig. 40

Fix differential case with press and fasten it with retaining bolts.

Tightening torque $M_A = 410 \text{ Nm}$

Only the use of new retaining bolts is admissible!





Fig. 41

Mount thrust washer.



Fig. 42

Install axle bevel gear.



Fig. 43

Place complete differential spider.


 **Observe radial installation position of the thrust washer – torsional stop in horizontal position, see arrow!**



Fig. 44

Place axle bevel gear..



Fig. 45

Glue thrust washer with grease into the differential case.

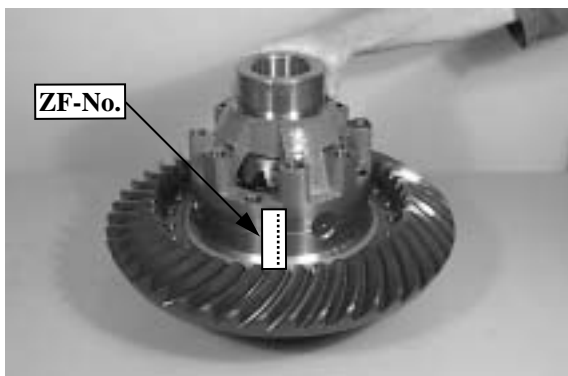


Fig. 46

Place differential case half.

 **Ensure radial installation position, see ZF-no.!**

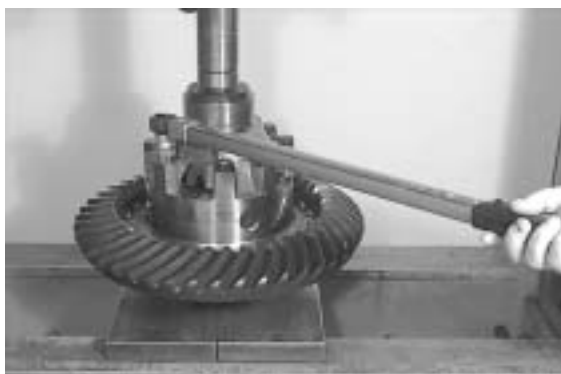


Fig. 47

Fix differential with press and tighten hex. bolts.

Tightening torque (M16x1,5/10.9) $M_A = 300 \text{ Nm}$



Fig. 48

Press in inner bearing ring until it is in tight contact.
Analogously install the opposite inner bearing ring.



Fig. 49

Bring differential in the axle drive housing into position using a lifting appliance and mount both outer bearing rings.

(S) Gripper tongues

5870 281 013



Fig. 50

Mount both adjusting nuts.

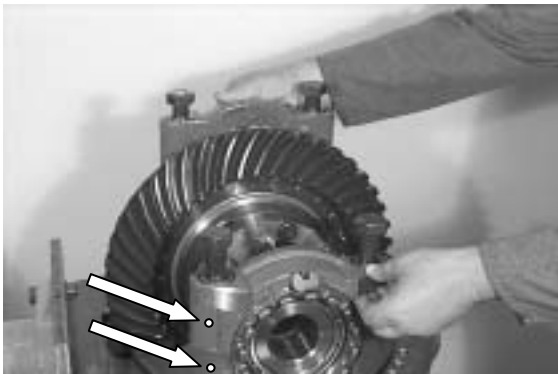


Fig. 51

Place both bearing yokes and temporarily fix them with hex. bolts (mount washers).

- ☞ Ensure installation position of the bearing yokes, see marking (arrows)!
- Wet threads of the hex. bolts with Loctite (type-no. 262) !
- Ensure exact overlapping of the threaded parts (drive housing, adjusting nut and bearing yoke)! Make sure the unhindered movement of the adjusting nuts!



Fig. 52

Turn axle drive housing by 90° and tighten hex. bolts.

Tightening torque (M24/10.9) $M_A = 900 \text{ Nm}$



Fig. 53

Tooth flank gap – bevel gear set = 0,27 ... 0,33 mm,
bearing roller moment – different. bearing T = 3,5 ... 4,5 Nm
and
set yoke measure = 387,95 -0,2 mm (Fig. 53 and 54):

Determine tooth flank gap by reciprocally setting the adjusting nuts (Fig. 53)..



Set adjusting nuts without applying force. The differential bearing must not yet be prestressed. It must, however, be without and gap! To ensure this, repeatedly turn through differential during the adjustment and relieve bearing by blows onto both bearing yokes (use plastic hammer).

Determine bearing roller moment and yoke measure by further tightening of the adjusting nut.



According to the experience made, by every further tightening of the two adjusting nuts by 1-2 grooves, the required bearing roller moment and the yoke measure result.

Check again yoke measure (Fig. 54) and tooth flank gap and tooth flank gap and correct, if necessary.



Fig. 54

- | | |
|--------------------|--------------|
| (S) Socket spanner | 5870 656 048 |
| (S) Plastic mallet | 5870 280 004 |
| (S) Magnetic post | 5870 200 055 |
| (S) Dial gauge | 5870 200 057 |
| (S) Micrometer | 5870 340 510 |



Fig. 55

Check contact patten (Fig. 55 and 56):

Wet some coasting flanks and working flanks of the crown wheel with marking ink.

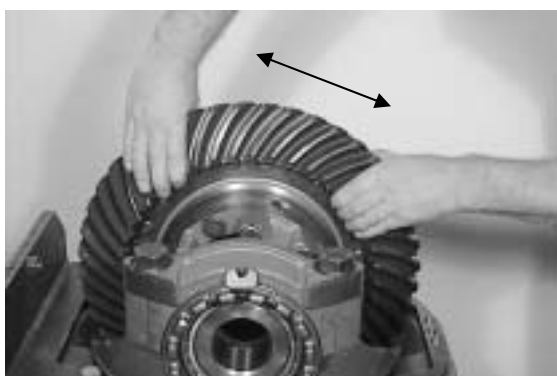


Fig. 56

Repeatedly roll crown wheel over the drive pinion in both directions.

Compare achieved contact pattern with contact pattern samples on pages 06 and 07!



If the contact pattern should deviate, a measuring mistake was made during determining the shim (page 2/7 ... 2/9) which must absolutely be corrected!



Fig. 57

Fix both adjusting nuts with clamping pins.



Fig. 58

Secure grooved nut by two staking fixtures!

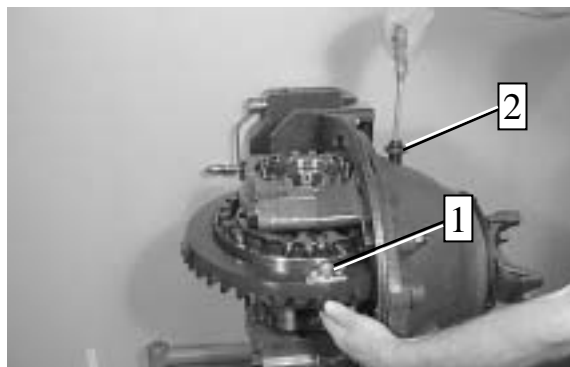


Fig. 59

Mount fulcrum pad (Fig. 59 and 60).

Place fulcrum pad (arrow 1) over the crown wheel rear and bring it into the installation position by turning the crown wheel.

Wet some thread flights of the adjusting bolt (arrow 2) with sealing agent (Loctite, type-no. 574) and temporarily fix fulcrum pad with the adjusting bolt.



Fig. 60

Set fulcrum pad and without gap and pressure

Bring fulcrum pad at the crown wheel rear into tight contact using the adjusting bolt. Then, turn back adjusting bolt only such far that the crown wheel permits free movement. Counter adjusting bolt with a hex. nut.

Tightening torque (6-Kt. Mutter) $M_A = 150 \text{ Nm}$

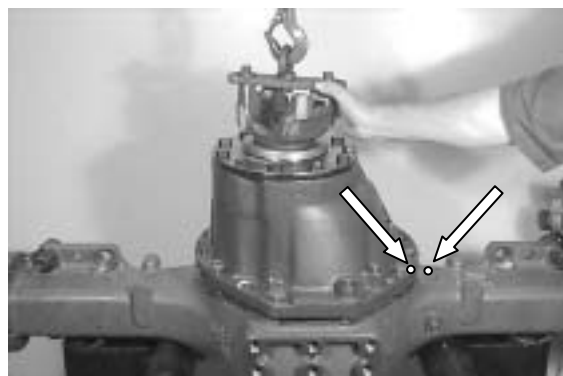


Fig. 61

Wet flange surface with sealing agent (Loctite, type-no. 574). Mount two adjusting bolts and introduce axle insert into the axle bridge until it is in tight contact. Use a lifting appliance.



Observe installation position of the axle insert, see the markings (arrows) applied during the disassembly!

Wet thread of the retaining bolt with sealing agent (Loctite, type-no. 574). Fasten axle insert with retaining bolts. Tightening torque (M16x1,5/12.9) $M_A = 385 \text{ Nm}$



Only the use of new retaining bolts is admissible!

(S) Adjusting bolts	5870 204 040
(S) Lifting yoke	5870 281 044

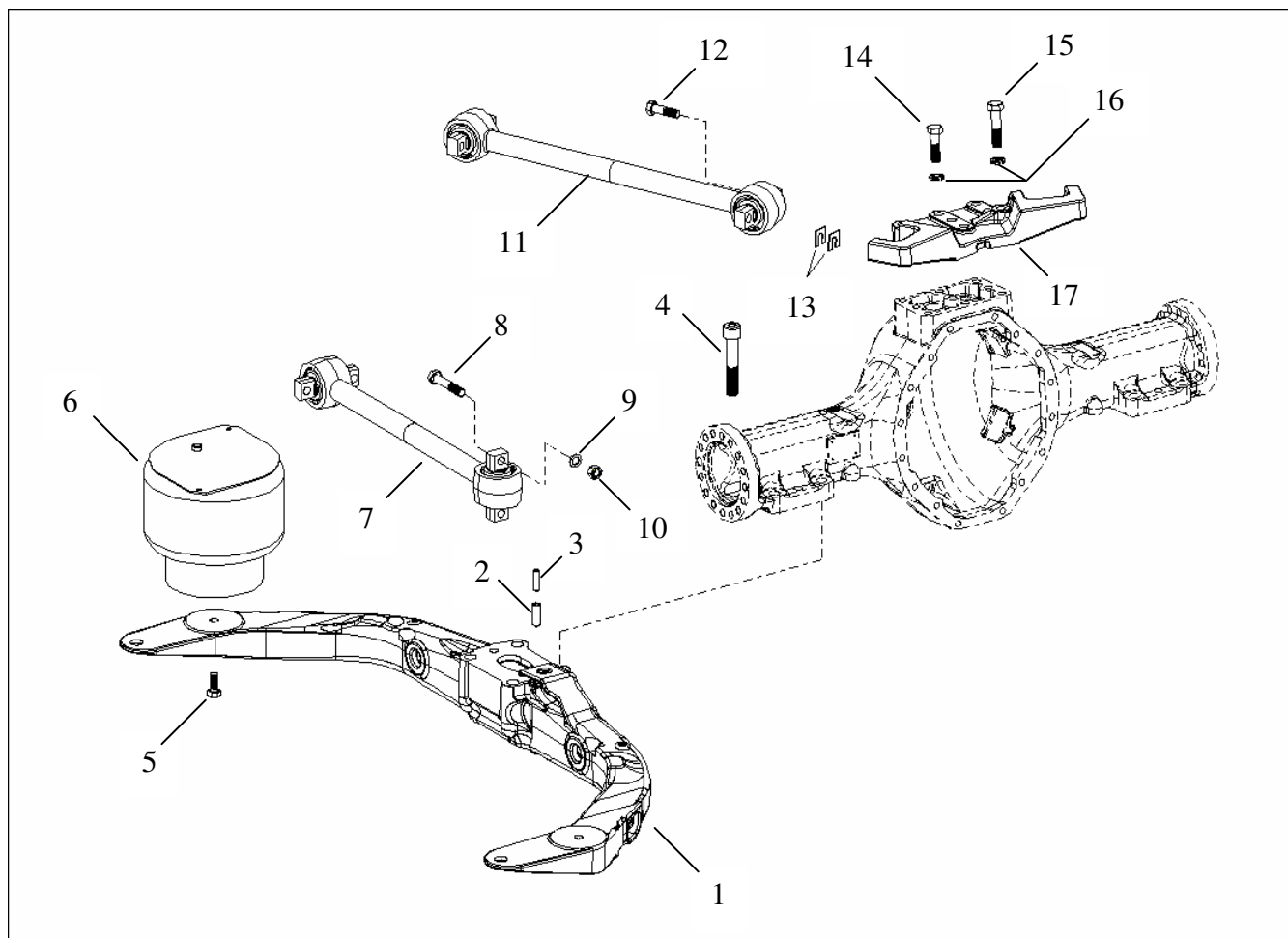
Then, mount flange shaft (also see page 1/12).

3. SUSPENSION

Mount individual parts according to the following perspective representation and table.



Differences regarding execution are possible ! Observe the respective spare parts list !



Item	Designation	Tightening torque M_A = in Nm	Retaining element
1	Suspension arm		
2	Clamping pin		
3	Clamping pin		
4	Socket head screw (M27x2/10.9)	$M_A = 1200 \text{ Nm}$	Loctite-No. 262
5	Hex. bolt	$M_A = 70 \text{ Nm}$	Loctite-No. 243
6	Pneumatic spring		
7	Trailing link		
8	Hex. bolt (M18x1,5/10.9)	$M_A = 440 \text{ Nm}$	
9	Washer		
10	Hex. nut (M18x1,5/10)	$M_A = 440 \text{ Nm}$	
11	Trailing link		
12	Hex. bolt (M18x1,5/10.9)	$M_A = 440 \text{ Nm}$	
13	Spacer plate		
14	Hex. bolt (M20x1,5/10.9)	$M_A = 620 \text{ Nm}$	Loctite-No. 262
15	Hex. bolt (M20x1,5/10.9)	$M_A = 620 \text{ Nm}$	Loctite-No. 262
16	Washer		
17	Bracket		