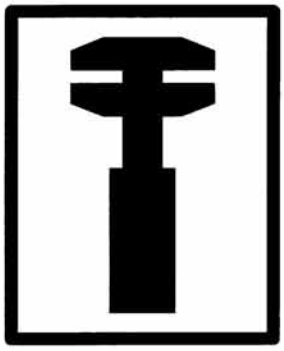

Order-No. 5871 805 002 E

P-3300/5300/6300

ZF Passau GmbH
Donaustr. 25 - 71
D- 94 034 Passau

24.04.97

REDUPLAN TRANSMISSION

P-3300/5300/6300

INFORMATIONS CONCERNING THE REPAIR INSTRUCTIONS

In these Repair Instructions are treated the Disassembly and Reassembly of various Versions.
Differing steps of other possible Versions can be easily indentified by qualified specialists.
In addition to this, see also the Perspective Illustrations of the corresponding Spare-Parts List!

ZF Passau GmbH
Donaustr. 25 - 71
D-94 034 Passau

Abt.: ASTDM / Section : ASTDM

Ausgabe / Edition : 1995/03

PREFACE

This documentation has been developed for the skilled Serviceman, trained by the Zahnradfabrik Passau for the Repair and Maintenance operations on ZF-Units.

Treated is a ZF-Serial product according to the design stage of the date of Edition.

However, due to further technical developments of the product, the repair of the unit at your disposal could require differents steps as well as other adjustment and testing specifications.

Therefore, we recommend to commit your ZF-Product to Masters and to Service-men, whose practical and theoretical training is constantly completed to the actual situation in our Training School.

The Service Stations, established by the Zahnradfabrik Friedrichshafen all over the world, offer you:

1. Constantly trained personnel

2. Prescribed installations, e.g. Special Tools

3. Genuine ZF-Spare Parts according to the latest phase of development

Here, all operations are carried out for you with utmost care and realibity.

Repair operations carried out by ZF-Service Stations, are covered additionally within the terms of the actual contractual conditions, by the ZF-Warranty.

Damages caused by inappropriate or inexpert work, carried out by personnel foreign to ZF, and after-expenditures eventually arising from it, are excluded from this contractual responsibility.

This applies also in case of a renouncement of Genuine ZF-Spare Parts.

Zahnradfabrik Passau GmbH

Service Department

GENERAL WORKING INSTRUCTIONS

During all operations, pay attention to cleanliness and skilled working.
Therefore, Transmissions, removed from the vehicle, must be cleaned prior to open them.

We assume that the Special Tools, specified by ZF, will be used.

The Special Tools have a 10-digit Subject-No. and are availabe from ZF-Passau.

After the disassembly, all components must be cleaned, especially corners, cavities and recesses of housing and covers.

The old sealing compound must be carefully removed.

Check lubricating holes, grooves and pipes for free passage. They must be free of residues, foreign material or protective compounds.

The latter refers expecially to new parts.

Parts which have been inevitably damaged in a disassembly operation, must be generally replaced by new ones, e.g. : rotary seal rings, O-Rings, U-Section rings, cap boots, protective caps etc..

Components such as roller bearings, thrust washers, synchronizing parts etc. which are subject to normal wear in automotive operation, must be checked by the skilled Serviceman.
He will decide if the parts can be reused.

For the heating of bearings etc., hot plates, rod heaters or heating furnaces must be used.

Never heat parts directly with the flame. An auxiliary solution would be to immerse the bearing in a vessel filled with oil, which is then heated with the flame.
In this way, damage to the bearings could be avoided.

Ball bearings, covers, flanges and parts like that must be heated to about 90^{o} to 100^{o} C.

Hot-mounted parts must be reset after cooling in order to assure a proper contact.

Before pressing shafts, bearings etc. in position, both parts must be lubricated.

During the reassembly, all specified adjustment values, testing specifications and torque limits must be respected.

After the repair, ZF-Units are filled up with oil.

The procedure and the permitted oil qualities can be taken from the Operator's Manual, resp. from the Lubrication Instructions and the corresponding List of Lubricants.

The Lists of Lubricants are available at all ZF-Service Stations.

After the oil filling, the oil level plugs and oil drain plugs must be tightened to th specified torque limits.

IMPORTANT INSTRUCTIONS

CONCERNING THE LABOUR SAFETY

In principle, Repairers of ZF-Units are themselves responsible for the labour safety.

The observance of all valid Safety Regulations and Legal Rules is a precondition to prevent damage to individuals and products during the Maintenance and Repair operations.

Before starting the work, the Repairers have to make themselves familiar with these Regulatisons.

The proper Repair of these ZF-Products requires especially trained personnel.

The Repairer himself is obliged to provide for the training.

BEZEICHNUNG DER GESETZLICHEN EINHEITEN
DENOMINATION OF STANDARD DIMENSIONS
DENOMINATION DES DIMENSIONSSTANDARDISEES

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 Uniteo	Formelzeichen	neu New Nouveau	alt old Vieu	Umrechnung Conversion Conversion	Bemerkungen Note Nota
Masse Mass Mass	m	kg (Kilogramm)	kg		
Kraft Force Force	F	N (Neweton)	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 pkm = 9,81 Nm	T (Nm) = F (N)*r(m)
Kraftmoment Moment (Force) Moment (Force)	M	Nm (Newtonmeter)	kpm	1 pkm = 9,81 Nm	M (Nm) = F (N)*l(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 ibf 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 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

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

Coefficient of friction: μ total = 0,12 for screws and nuts without aftertreatments as well as for phosphates nuts. Tighten by hand!
Torque limits, of not exspecially, 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 Tread DIN 13, Page 13

Abmessung	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

LIST OF SPECIAL TOOLS FOR THE DISASSEMBLY AND REASSEMBLY: P-3300

Explanations to the identicated ITEMS SEE COLUMNS DISASSEMBLY AND REASSEMBLY:
e.g.: 1/74 = TABLE NO./ITEM NO.
3/1 FIGURE = SECTION/current FIG. NO.

DISASSEMBLY	REASSEMBLY	Designation and application of the Special Tool (S)	NO. OF Special Tool
	Fig. 29	Driver #	5870 048 105
		to insert the sealing element - 0750 112 001 - into the final drive housing.	
	Fig. 31	Pressure sleeve #	5870 506 071
		to press the output flange into the complete gearbox housing.	
	Fig. 50	Stamping die #	5870 405 008
		to caulk the bearing shafts - 4108 302 050 - in the planetary carrier. Combined with:	
		Magnetic blocks #	5870 450 003
	Fig. 53	Adjusting screw M10 (set of 2)	5870 204 007
		as mounting aids for the installation of the drive case at the bearing cage.	
	Fig. 57	Sleeve #	5870 506 015
		to drive the shaft seal - 0634 300 610 - into the bearing cage.	
		# Very important special tools !	

Note for (*): To be used only together with handle, Special Tool 5870 260 002

LIST OF SPECIAL TOOLS FOR THE DISASSEMBLY AND REASSEMBLY: P-3300

Explanations to the identicated ITEMS SEE COLUMNS DISASSEMBLY AND REASSEMBLY:
e.g.: 1/74 = TABLE NO./ITEM NO.
3/1 FIGURE = SECTION/current FIG. NO.

DISASSEMBLY	REASSEMBLY	Designation and application of the Special Tool (S)	NO. OF Special Tool
Fig. 1		Assembly car compl. with tilting device	5870 350 000
		to take up gearboxes. Universal use. Combined with:	
		Mounting device	5870 350 051
Fig. 3		Set of eye bolts	5870 204 002
		for different lifting operations.	
Fig. 12	Fig. 41	Expanding claw #	5870 281 016
		to lift out and in the planetary carrier from the bearing cage.	
Fig. 15	Fig. 34	Hook spanner #	5870 401 095
		to loosen and tighten the slotted nut - 0737 502 016 - from the output flange.	
Fig. 17		Pressure piece #	5870 450 023
		to back off the output flange from the gearbox housing.	
		To be used together with:	
Fig. 18		Thrust plate #	5870 450 024
Fig. 20		Pry bar (set of 2)	5870 345 036
		to back off shaft seals and housing components. Universal use.	
Fig. 23		Disassembly and reassembly device #	5870 080 015
		to press the roller bearing - 0750 117 320 - out of the housing bore. Combined with:	
		Draw-in set #	5870 000 071
	Fig. 25	Draw-in set #	5870 000 071
		to pull in, resp. press the roller bearing - 0750 117 320 - into the housing bore.	

Note for (*): To be used only together with handle, Special Tool 5870 260 002

LIST OF SPECIAL TOOLS FOR THE DISASSEMBLY AND REASSEMBLY: P-5300/6300

Explanations to the identicated ITEMS SEE COLUMNS DISASSEMBLY AND REASSEMBLY:
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DISASSEMBLY	REASSEMBLY	Designation and application of the Special Tool (S)	NO. OF Special Tool
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Fig. 3		Set of eye bolts	5870 204 002
		for different lifting operations.	
Fig. 12	Fig. 41	Expanding claw #	5870 281 016
		to lift out and in the planetary carrier from the bearing cage.	
Fig. 15	Fig. 34	Hook spanner #	5870 401 067
		to loosen and tighten the slotted nut - 0737 502 084 - from the output flange.	
Fig. 17		Pressure piece #	5870 450 023
		to back off the output flange from the gearbox housing. To be used together with:	
Fig. 18		Thrust plate #	5870 450 024
Fig. 20		Pry bar (set of 2)	5870 345 036
		to back off shaft seals and housing components. Universal use.	
Fig. 23		Disassembly and reassembly device #	5870 080 015
		to press the roller bearing - 0750 117 012 - out of the housing bore. Combined with:	
		Draw-in set #	5870 000 064
	Fig. 25	Draw-in set #	5870 000 064
		to pull in, resp. press the roller bearing - 0750 117 012 - into the housing bore.	

Note for (*): To be used only together with handle, Special Tool 5870 260 002

LIST OF SPECIAL TOOLS FOR THE DISASSEMBLY AND REASSEMBLY: P-5300

Explanations to the identicated ITEMS SEE COLUMNS DISASSEMBLY AND REASSEMBLY:
e.g.: 1/74 = TABLE NO./ITEM NO.
3/1 FIGURE = SECTION/current FIG. NO.

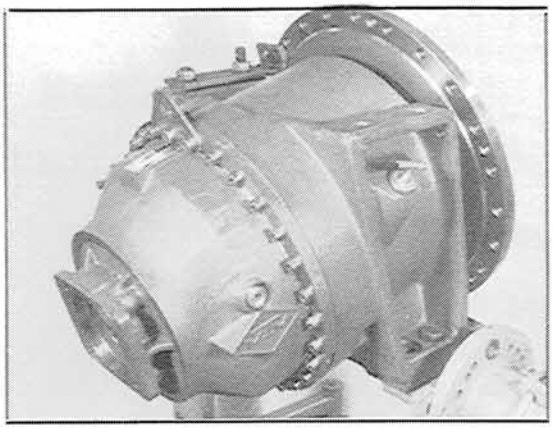
DISASSEMBLY	REASSEMBLY	Designation and application of the Special Tool (S)	NO. OF Special Tool
	Fig. 29	Driver #	5870 048 174
		to install the sealing element - 0750 112 169 - into the final drive housing.	
	Fig. 30	Round beater #	5870 320 017
		to install the screw plug - 0631 405 018 - into the bearing flange bore.	
	Fig. 31	Pressure sleeve #	5870 506 071
		to press the output flange into the complete gearbox housing.	
	Fig. 50	Stamping die #	5870 405 008
		to caulk the bearing shafts - 4108 302 062 - in the planetary carrier. Combined with:	
		Magnetic blocks #	5870 450 003
	Fig. 53	Adjusting screw M12 (set of 2)	5870 204 021
		as mounting aids for the installation of the drive case at the bearing cage.	
	Fig. 57	Sleeve #	5870 506 015
		to drive the shaft seal - 0634 300 610 - into the bearing cage.	
		# Very important special tools !	

Note for (*): To be used only together with handle, Special Tool 5870 260 002

REPAIR INSTRUCTIONS P-3300/5300/6300

Adjacent illustration shows the total view of the Reduplan-Gearbox.

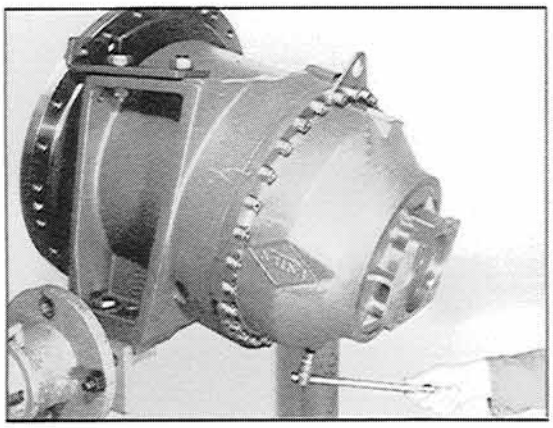
(S) assembly car compl.	5870 350 000
(S) mounting device	5870 350 051



1

DISASSEMBLY:

Loosen screw plug and drain oil.



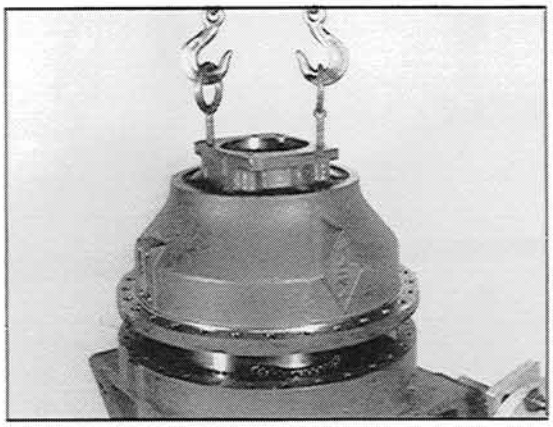
2

Drive case:

Loosen all socket head screws and separate drive case from bearing case.

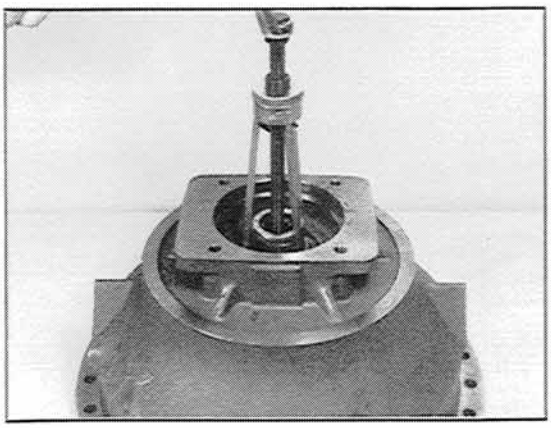
Note: mark installation position !

(S) set of eye bolts 5870 204 002

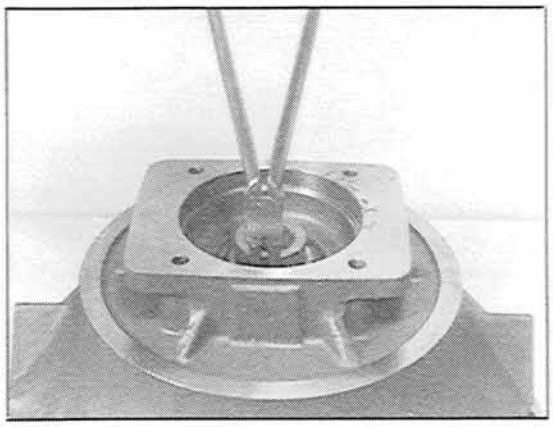


3

Pull shaft seal out of the case bore, using internal puller.

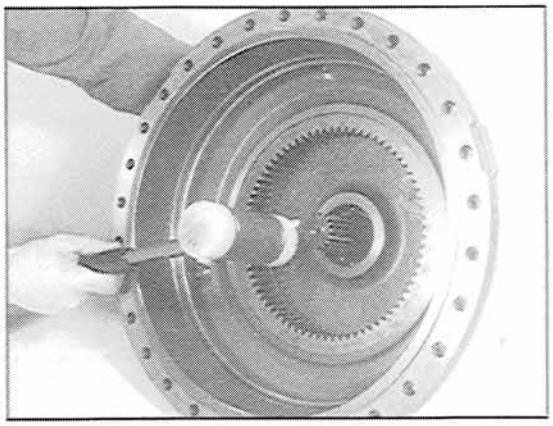


4



5

Squeeze out circlip and remove it together with spacing washer.



6

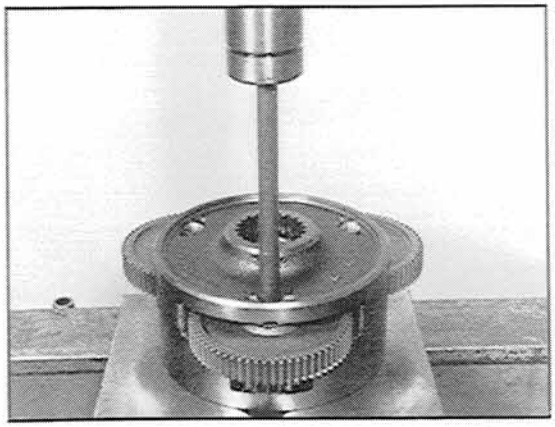
Drive drive shaft out of the housing bore.

If required, squeeze out circlip, remove disk and press ball bearing from the drive shaft.

7

Planetary carrier I:

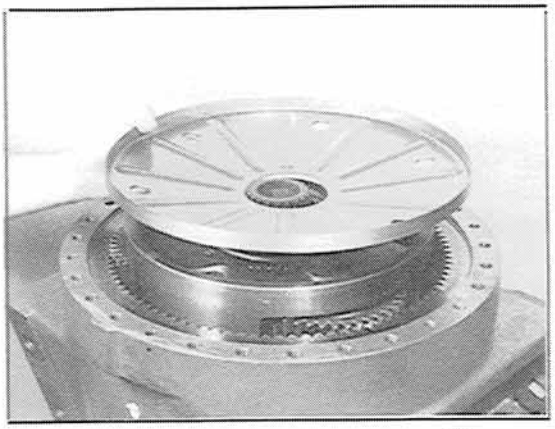
Remove planetary carrier.



8

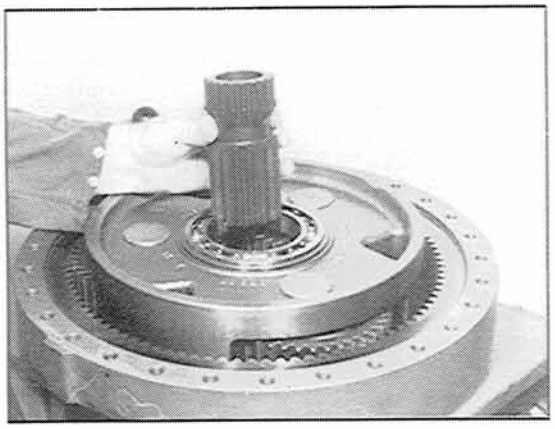
Press out planetary shafts and remove planetary gears together with components.

Remove bearing cap.



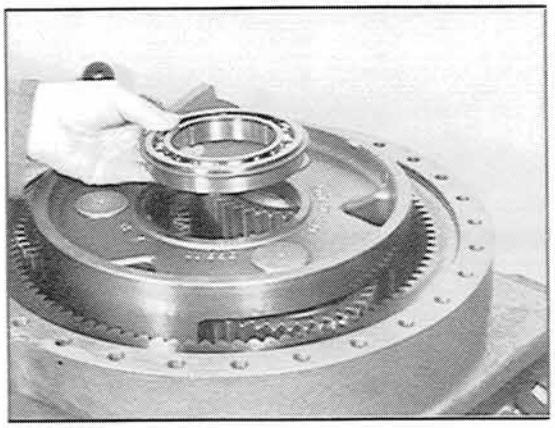
9

Remove sun gear shaft.



10

Remove ball bearing.



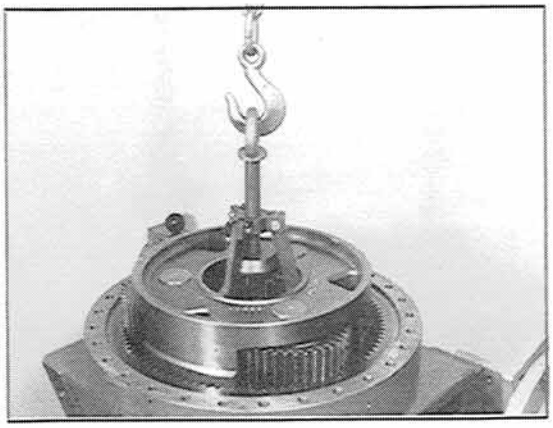
11

Planetary carrier II:

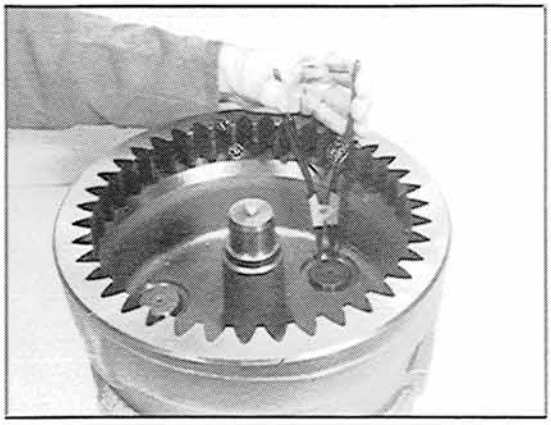
Lift planetary carrier out of the bearing cage, using expanding claw.

(S) Expanding claw 5870 281 016
Version - 3 Planetary gears

(S) Expanding claw 5870 281 048
Version - 4 Planetary gears



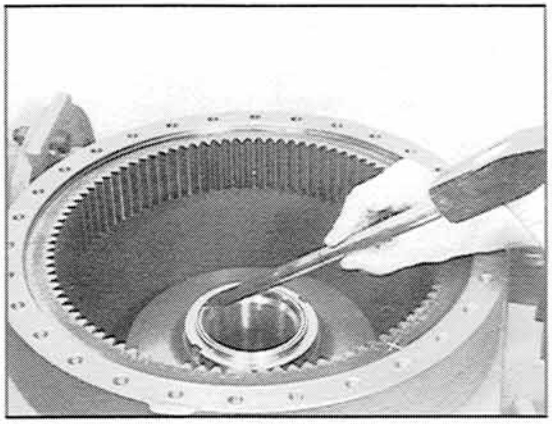
12



13

Squeeze out circlip and drive out planetary shafts.

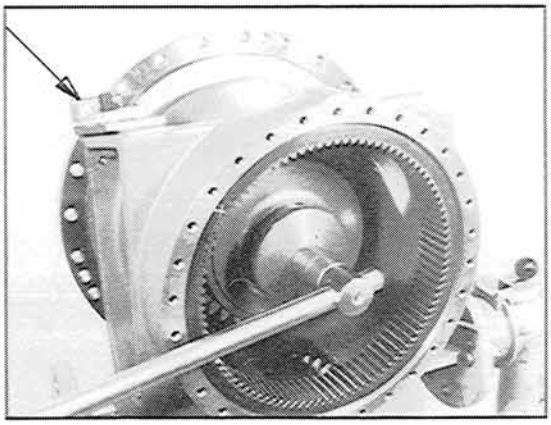
Remove released planetary gears together with components.



14

Final drive:

Unlock slotted nut.



15

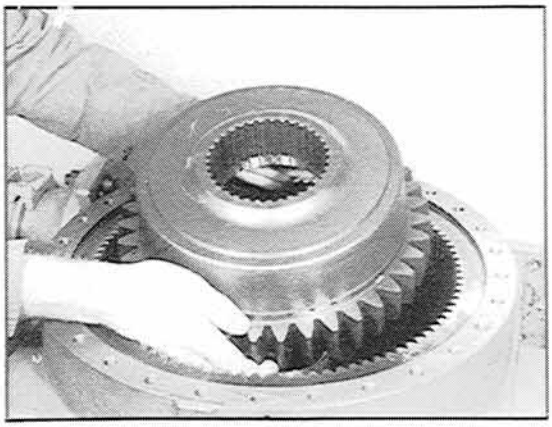
Fix output flange by means of fixing yoke - see arrow - and loosen slotted nut.

P-3300

(S) slotted nut	5870 401 095

P-5300/6300

(S) slotted nut	5870 401 067

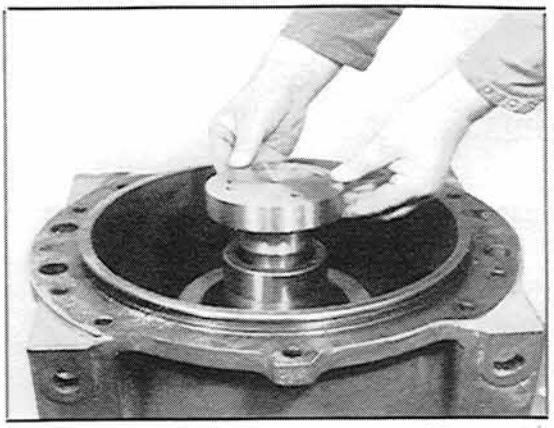


16

Pull clutch sleeve from bearing flange.

Insert pressure piece into the bearing flange bore.

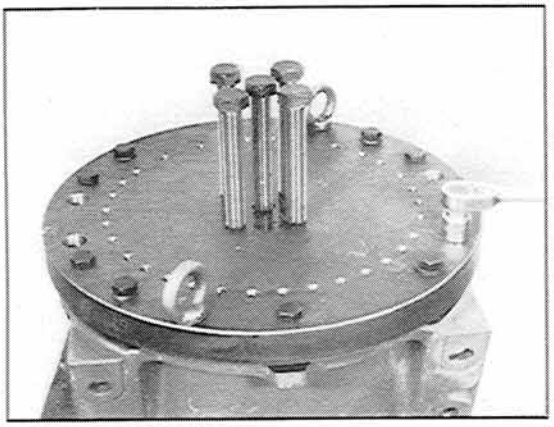
(S) pressure piece 5870 450 023



17

Fasten thrust plate at the bearing cage by means of hex. head screws.

(S) thrust plate 5870 450 024

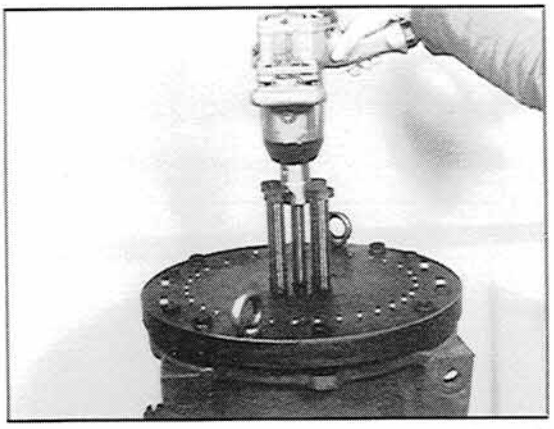


18

Press bearing flange out of the housing by tightening alternating the five hex. head screws.

Note: if a pneumatic screw driver is used, the bearing flange can be easier broken loose from the housing (roller bearing) !

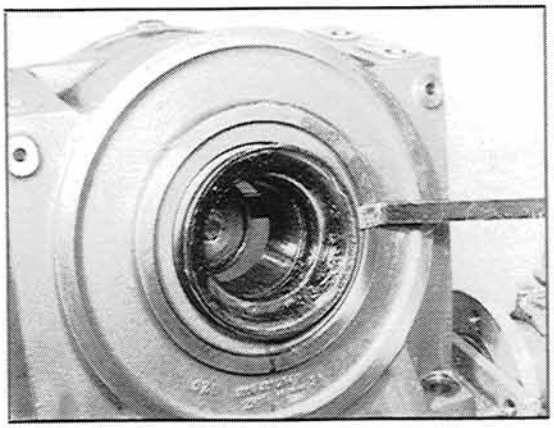
Facilitate the breaking loose by tapping and tightening by means of a ratchet!



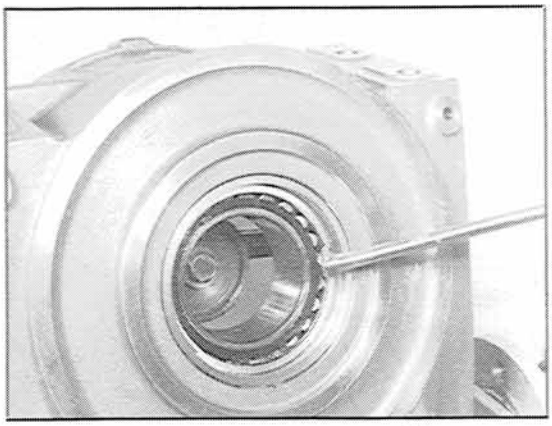
19

Remove gasket.

(S) pry bar 5870 345 036

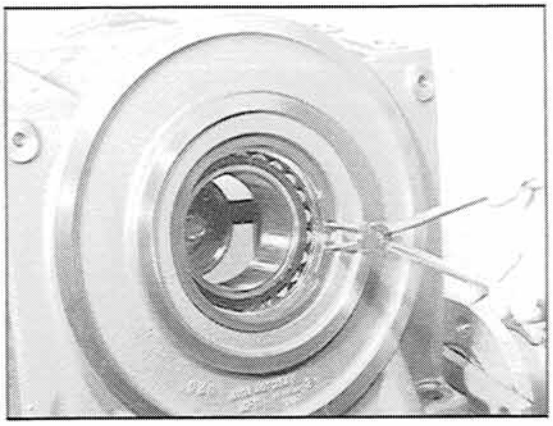


20



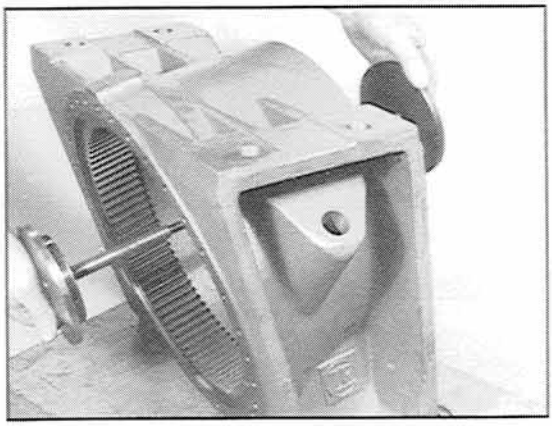
21

Lift ring - only installed with version P-5300 - out of the housing bore.



22

Squeeze out circlip.



23

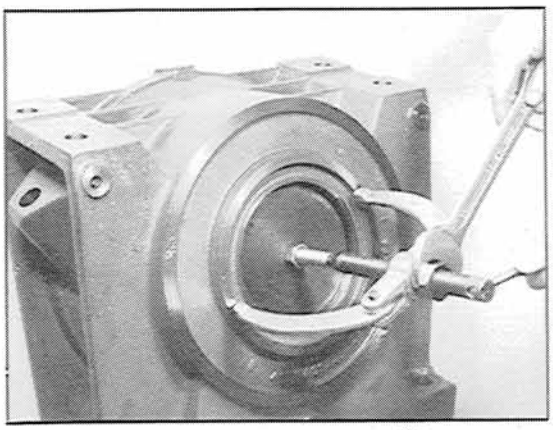
Pull roller bearing out of the bearing cage (fig.24), using special device (fig.23).

P-3300

(S)	disassembly and reassembly device	5870 080 015
(S)	draw-in set	5870 000 071

P-5300/6300

(S)	disassembly and reassembly device	5870 080 015
(S)	draw-in set	5870 000 064



24

REASSEMBLY:

Drive roller bearing in until contact is obtained, and fix it by means of circlip.

NOTE:

If necessary, heat the housing bore, resp. undercool the roller bearing!

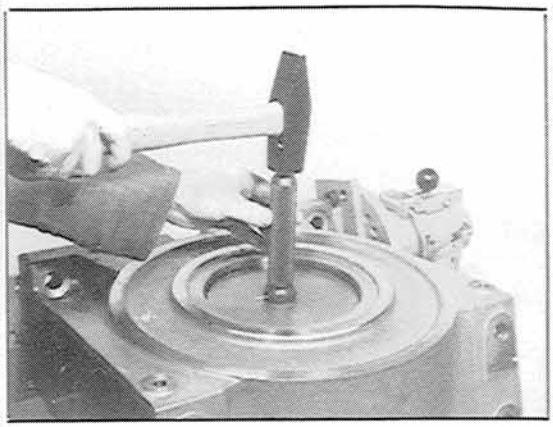
P-3300
(S) Puller device 5870 000 071

P-5300/6300
(S) Puller device 5870 000 064

Cover sealing seat with a spirit-water mixture (1 : 1).
Assemble ring until contact is obtained.

NOTE:

Ring is only inserted in teh Versions P-5300/ P-6300!
For the Version P-3300, this step in not applicable!



25

26

Grease cup seal externally and insert it into the driver.

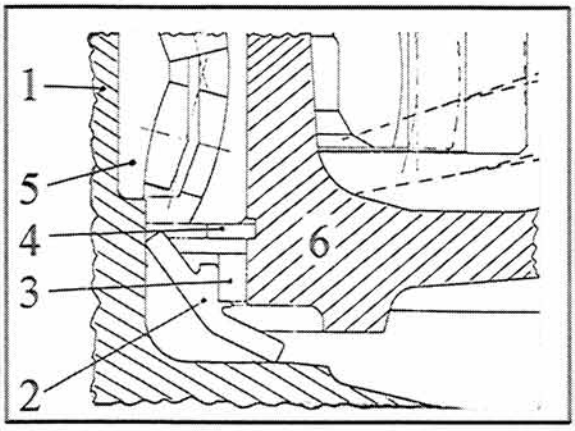
Cover contact surface of the ring (Arrow) with Loctite (Type-No. 586).

(S) Driver (P-3300) 5870 048 105
(S) Driver (P-5300/P-6300) 5870 048 174

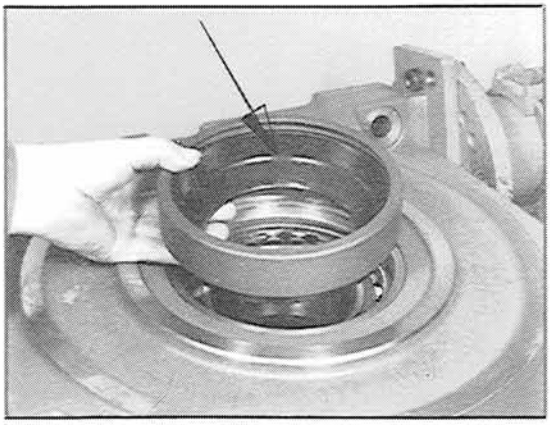
27

Ref. Draft:

1 = Bearing flange
2 = Cup seal
3 = Ring
4 = Circlip
5 = Roller bearing
6 = Bearing cage



28



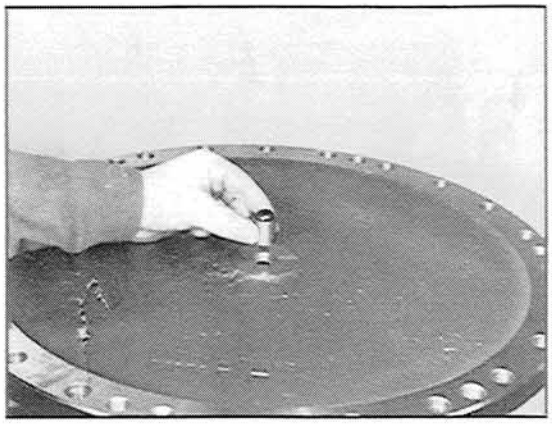
29

Insert pre-assembled cup seal flush-mounted into the bearing cage, using driver, see Draft No. 28/Page 7.

Note: fill cavity between gasket and bearing flange - see arrow - with grease !

P-3300
(S) Driver 5870 048 105

P-5300/6300
(S) Driver 5870 048 174

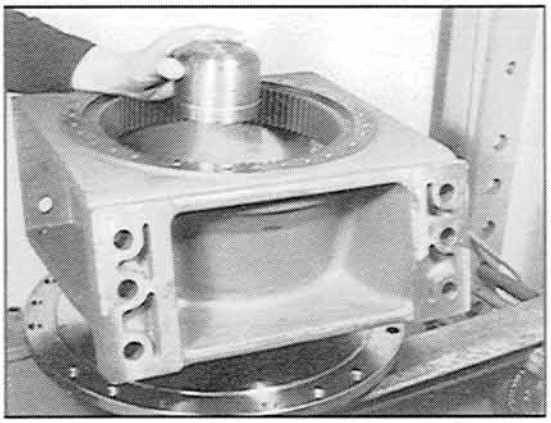


30

Insert screw plug (Fa. König) into the bearing flange bore until contact is obtained.

P-5300/6300

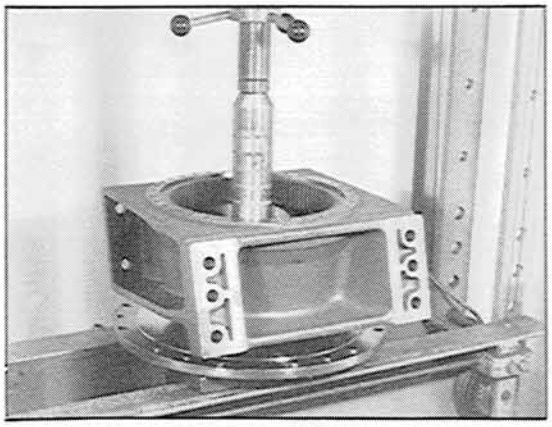
(S) round beater 5870 320 017



31

Place bearing cage upon the flange and install pressure sleeve.

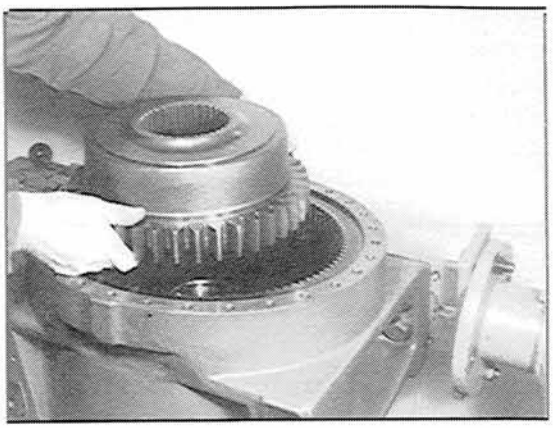
(S) pressure sleeve 5870 506 071



32

Press roller bearing, resp. bearing cage upon the bearing flange until contact is obtained.

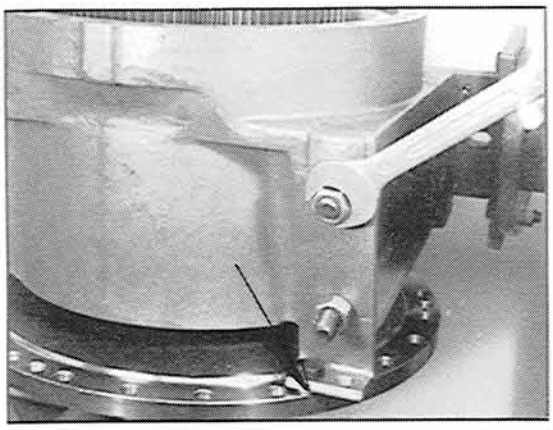
Place clutch sleeve over the splines of the bearing flange.



33

Fix output flange by means of yoke.

Note: insert washer (see arrow) !



34

Grease threads (Molycote G-rapid plus).

Install slotted nut, tighten and secure it (caulk).

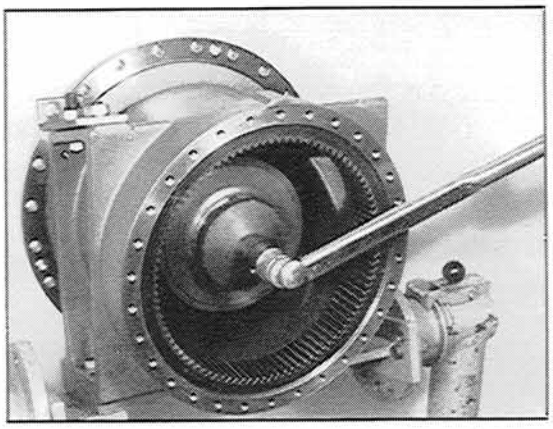
Torque limit	P-3300	610 Nm
Torque limit	P-5300/6300	700 Nm

P-3300

(S) hook spanner 5870 401 095

P-5300/6300

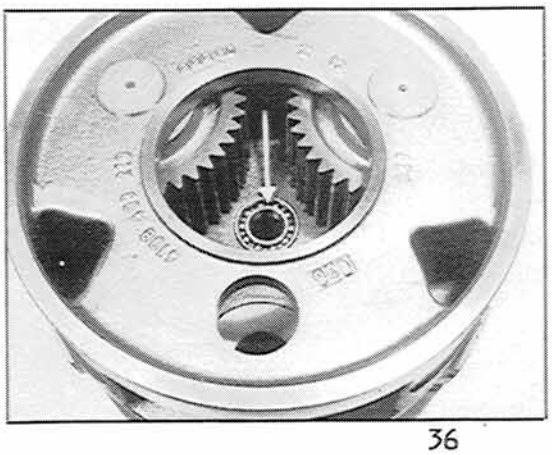
(S) hook spanner 5870 401 067



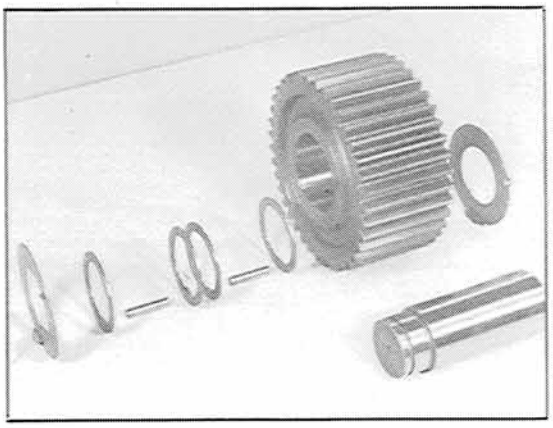
35

Planetary carrier II:

Insert ball bearing into the planetary carrier bore, see arrow !

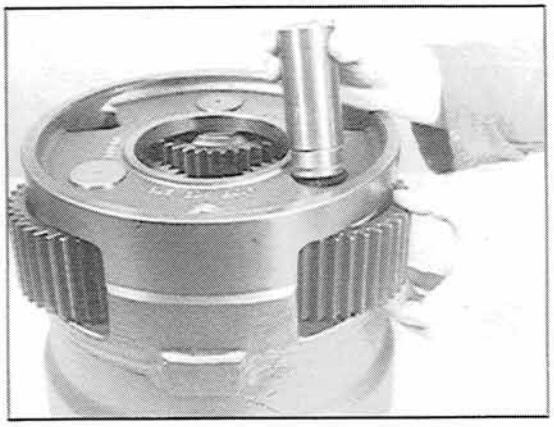


36



37

Adjacent illustration shows the arrangement of the components in the planetary gear.

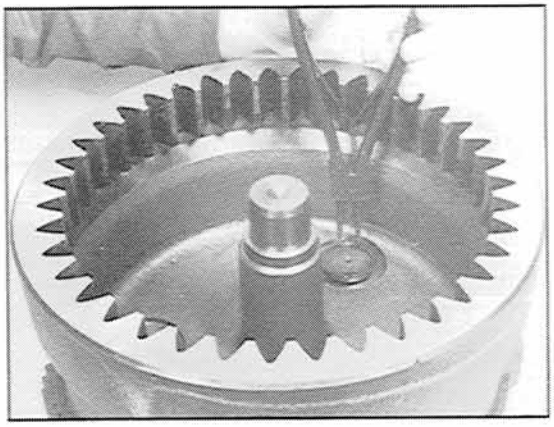


38

Make thrust washers - pay attention to the installation position - adhere with grease.

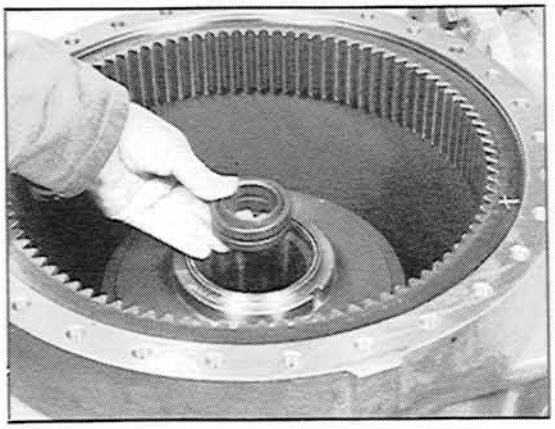
Insert pre-assembled planetary gear, align it together with thrust washers and fix by means of planetary shafts.

Note: check free travel of the thrust washers !



39

Fix planetary shafts by engaging the circlips.



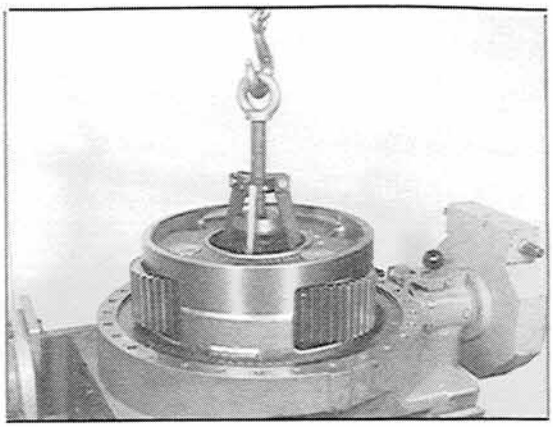
40

Insert universal bearing into the bearing flange bore until contact is obtained.

Lift planetary carrier out of the bearing cage, using expanding claw.

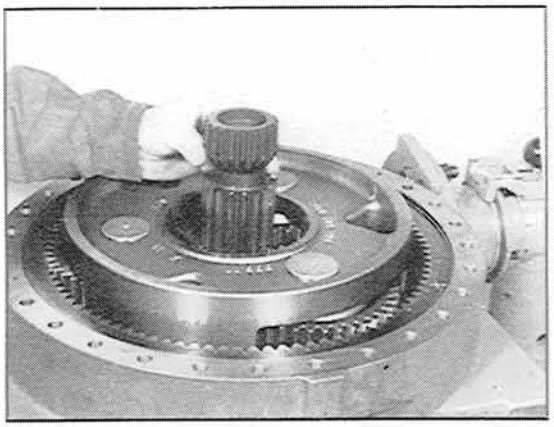
(S) Expanding claw 5870 281 016
Version - 3 Planetary gears

(S) Expanding claw 5870 281 048
Version - 4 Planetary gears



41

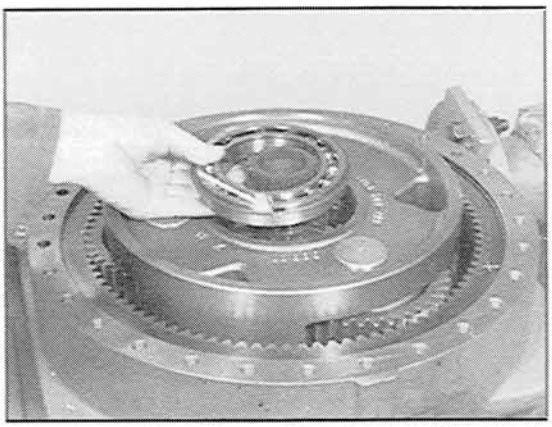
Insert sun gear shaft.



42

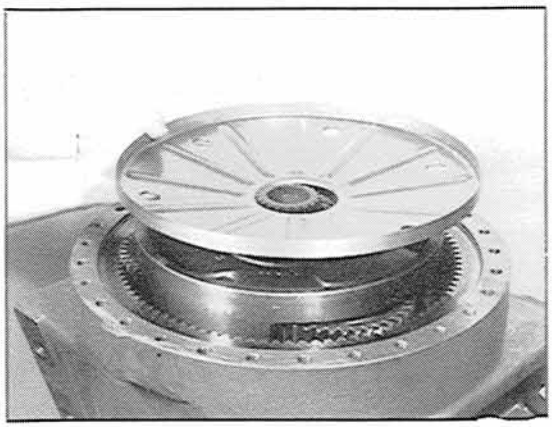
Engage snap ring into the annular groove of the ball bearing, see arrow.

Install ball bearing firmly against shoulder.

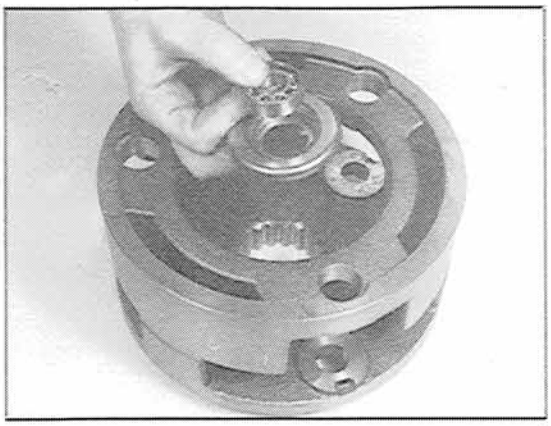


43

Insert bearing cap firmly against shoulder.



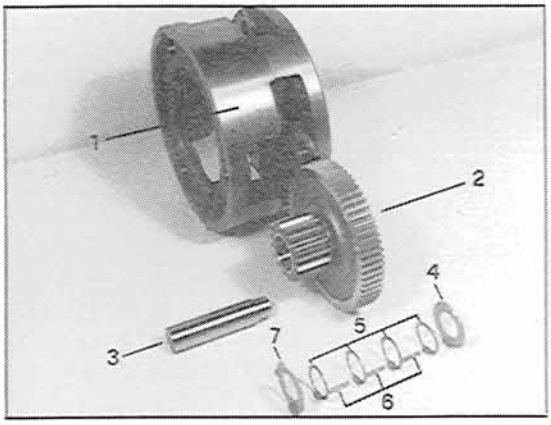
44



45

Planetary carrier I:

Insert backing plate and place ball bearing upon it.



46

Adjacent figure shows the arrangement of the components in the planetary gear.

1 = Planetary carrier

2 = Planetary gear

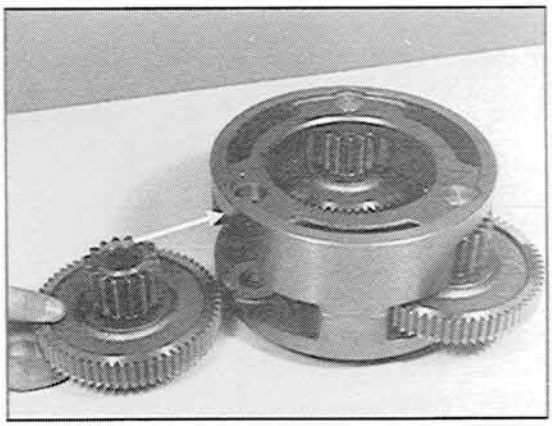
3 = Planetary shaft

4 = Thrust washer

5 = Spacing washer

6 = Needle roller

7 = Thrust washer (with chamfered outer diameter)

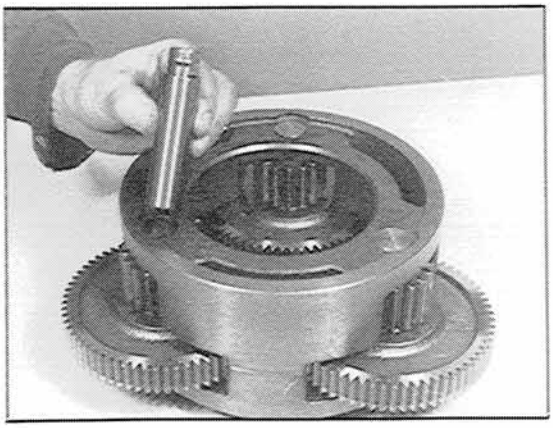


47

Complete planetary gear (use grease).

Make adhere with grease upper thrust washer (with chamfered diameter showing towards outside, see arrow) and lower thrust washer.

Insert planetary gear.



48

Align planetary gear and thrust washers by means of planetary shaft - with big diameter ahead.

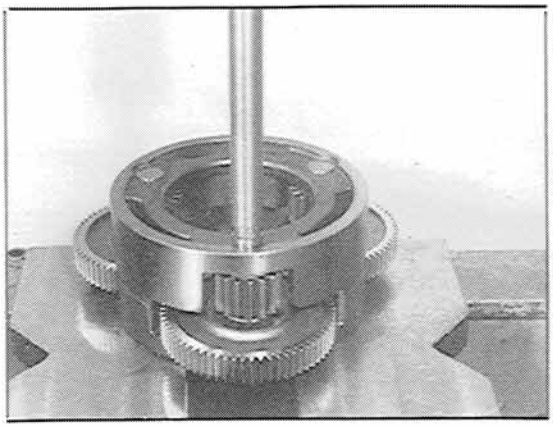
Afterwards, remove planetary shaft again.

Note: the centric alignment of the lower thrust washer is secured only if the planetary shaft has obtained contact with the lower plane surface of the planetary carrier !

Press planetary shaft - with small diameter ahead - firmly against shoulder.

Note: pay attention that the lower thrust washer is not squeezed, resp. the shaft has contact at the planetary carrier !

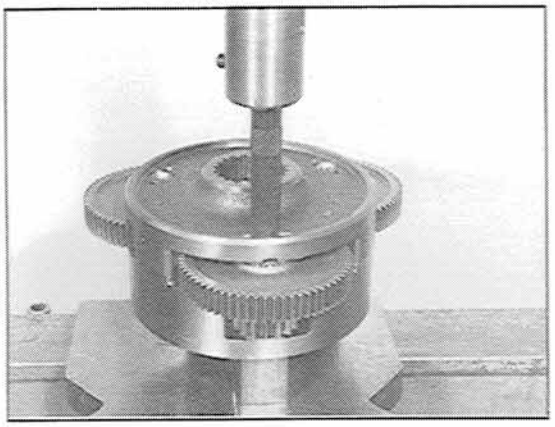
Check free floating of the lower thrust washer !



49

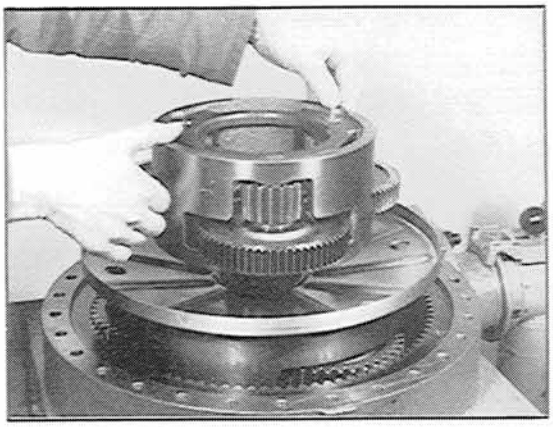
Back up planetary shaft and fix it axially by pressing (widening) of the diameter (20 mm).

(S) round beater	5870 405 008
(S) magnetic blocks	5870 450 003



50

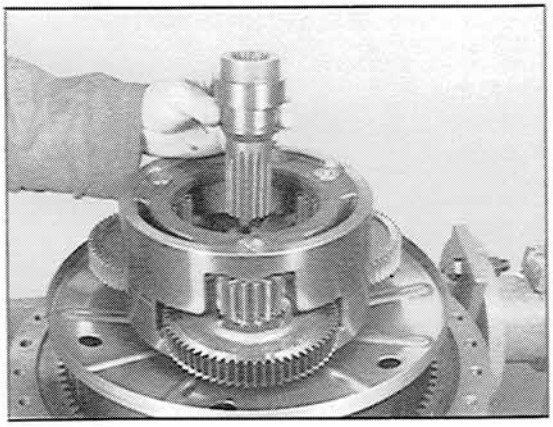
Place planetary carrier upon sun gear shaft.



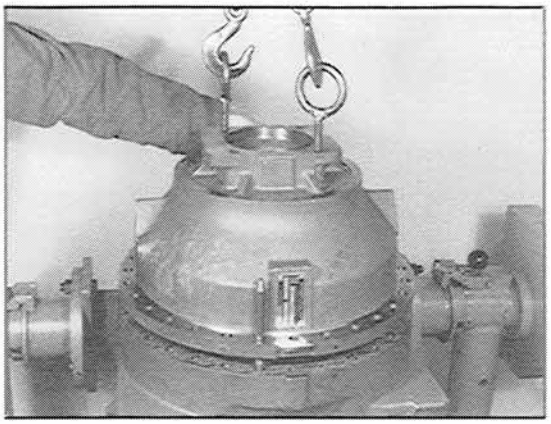
51

Assemble drive shaft.

Note: this will facilitate the reassembly of the drive case !



52



53

Screw in two adjusting screws and reinstall gasket.

Place drive case against bearing case - pay attention to the installation position - until contact is obtained.

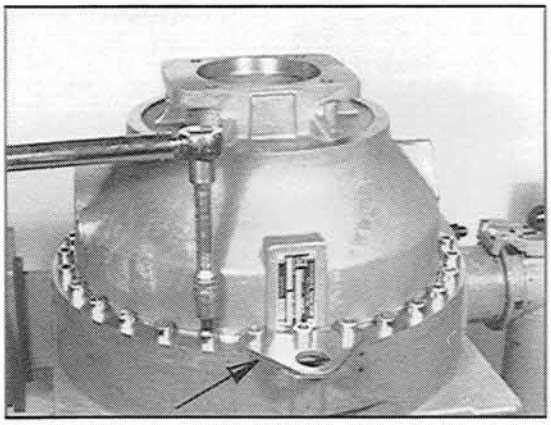
P-3300

(S) adjusting screw 5870 204 007

P-5300/6300

(S) adjusting screw 5870 204 021

Note: if required, turn drive shaft so that an overlapping of the splines (planetary gears/internal gear) is obtained, resp. the drive case has got contact with the bearing case !
Afterwards, remove drive shaft again!



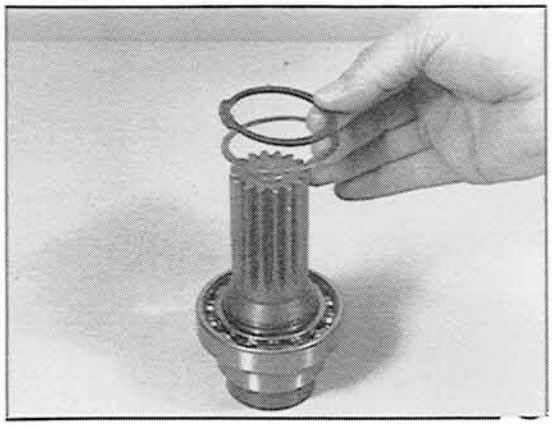
54

Fasten drive case by means of socket head screws.

Note: when fixing the sheet metal bracket pay attention to the installation position, see arrow.

Use screws M10 x 40 (P-3300) resp. M12 x 45 (P-5300) !

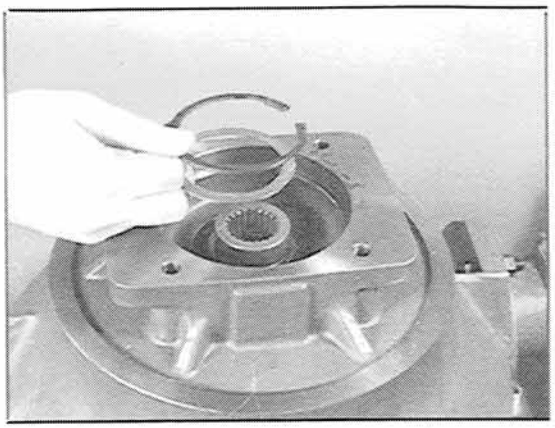
Torque limit	M10/8.8	(P-3300)	44 Nm
Torque limit	M12/8.8	(P-5300)	78 Nm
Torque limit	M12/8.8	(P-6300)	78 Nm



55

Press the ball bearing upon the drive shaft collar until contact is obtained and fix it by means of shim and circlip.

Insert the drive shaft until contact is obtained and fix it by means of adjusting washer and circlip.

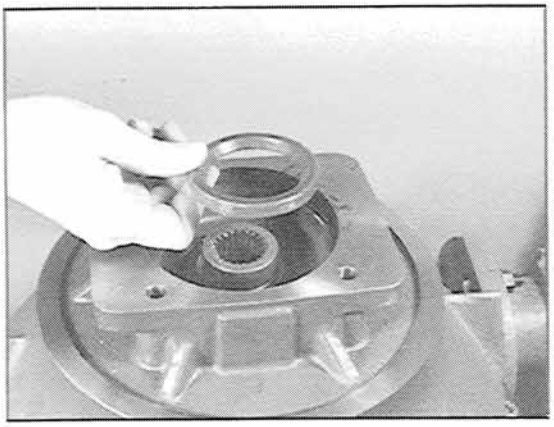


56

Drive shaft seal firmly against shoulder.

Note: use sealing compound !

(S) sleeve 5870 506 015

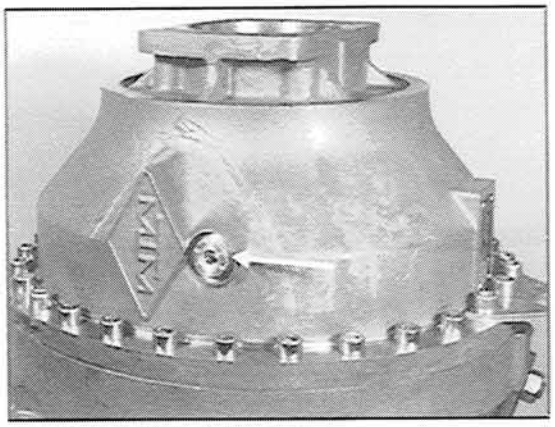


57

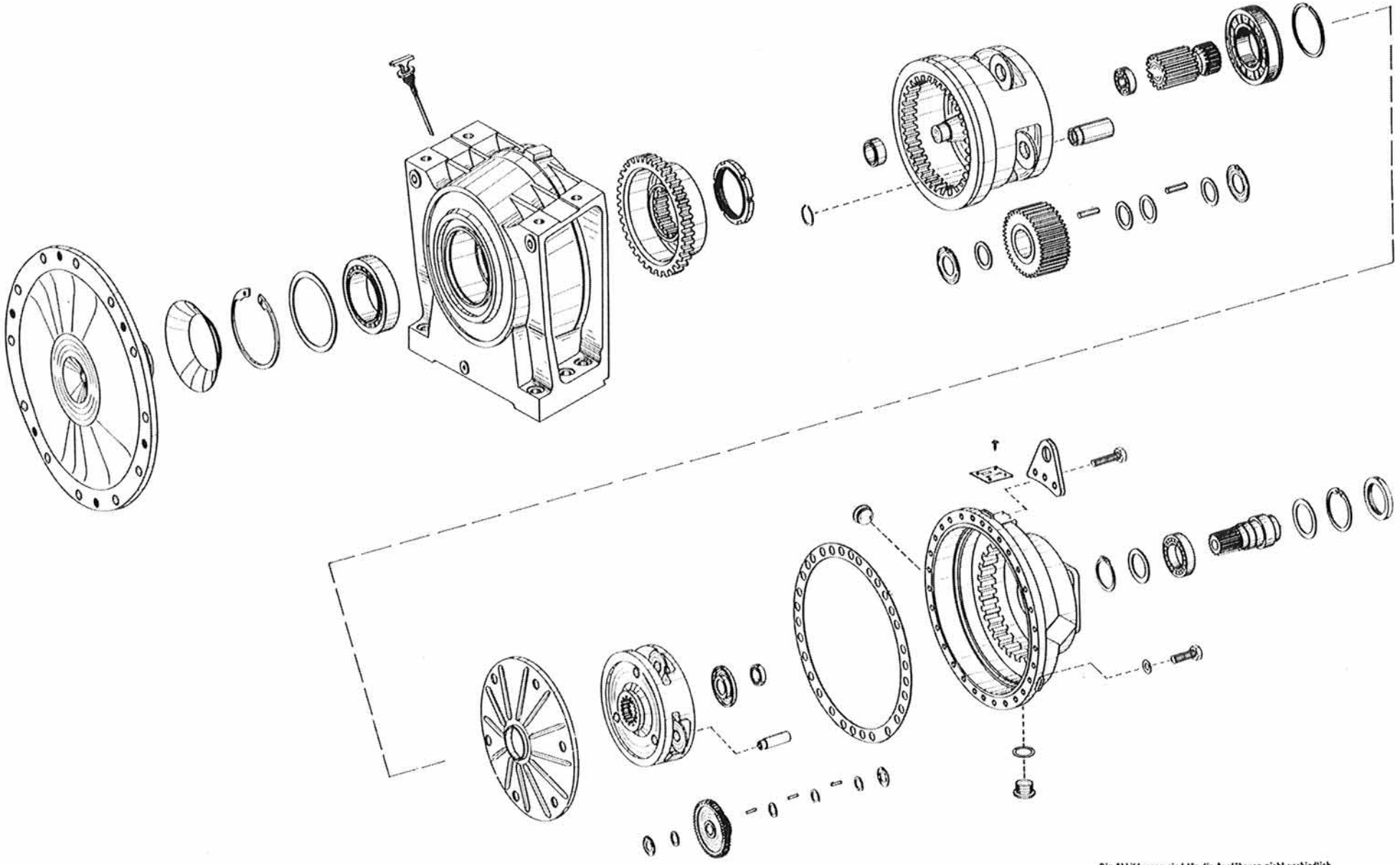
Install oil level eye, see arrow.

Note: Before putting transmission into operation please fill up lubricant according to ZF-list of lubricants MIL-L 2105 B!

Capacity: P-3300 about 7,5 l
Capacity: P-5300 about 11,5 l
Capacity: P-6300 about 11,5 l



58



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Illustrations are not binding for the design
Les figures ne sont pas engageantes pour la version