SB4342E00
Nov. 2008

Power Train

Transmission - 3 Speed 3WG94 Disassembly & Assembly

D50S-5, D60S-5, D70S-5
; PB-00301~UP, P9-00501~UP, RZ-00001~UP, RW-00001~UP
D80S-5, D90S-5
; PA-00701~UP, S1-00001~UP

Important Safety Information

Most accidents involving product operation, maintenance and repair are caused by failure to observe basic safety rules or precautions. An accident can often be avoided by recognizing potentially hazardous situations before an accident occurs. A person must be alert to potential hazards. This person should also have the necessary training, skills and tools to perform these functions properly.

Read and understand all safety precautions and warnings before operating or performing lubrication, maintenance and repair on this product.

Basic safety precautions are listed in the “Safety” section of the Service or Technical Manual. Additional safety precautions are listed in the “Safety” section of the owner/operation/maintenance publication. Specific safety warnings for all these publications are provided in the description of operations where hazards exist. WARNING labels have also been put on the product to provide instructions and to identify specific hazards. If these hazard warnings are not heeded, bodily injury or death could occur to you or other persons. Warnings in this publication and on the product labels are identified by the following symbol.

⚠ WARNING

Improper operation, lubrication, maintenance or repair of this product can be dangerous and could result in injury or death.
Do not operate or perform any lubrication, maintenance or repair on this product, until you have read and understood the operation, lubrication, maintenance and repair information.

Operations that may cause product damage are identified by NOTICE labels on the product and in this publication.

DOOSAN cannot anticipate every possible circumstance that might involve a potential hazard. The warnings in this publication and on the product are therefore not all inclusive. If a tool, procedure, work method or operating technique not specifically recommended by DOOSAN is used, you must satisfy yourself that it is safe for you and others. You should also ensure that the product will not be damaged or made unsafe by the operation, lubrication, maintenance or repair procedures you choose.

The information, specifications, and illustrations in this publication are on the basis of information available at the time it was written. The specifications, torques, pressures, measurements, adjustments, illustrations, and other items can change at any time. These changes can affect the service given to the product. Obtain the complete and most current information before starting any job. DOOSAN dealers have the most current information available.

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Systems Operation

Disassembly

Reassembly

Systems Operation

General

The Service Manual covers all work required for disassembly and the relating reassembly.

When repairing the transmission, ensure utmost cleanliness and that the work is done in a professional manner.

Dismantle the unit only if any damaged parts must be replaced. After removing screws or nuts, loosen lids and housing parts, which were installed with seals, by slight hammer blows with a plastic hammer. Use suitable pulling devices for removing parts being tightly installed on the shafts, such as bearings, bearing rings and similar.

Carry out disassembly and reassembly work on a clean working place. Use special tools which have been developed for this purpose. Prior to reinstallation of the parts, clean contact faces of housings and lids from residues of seals. Remove any burrs or similar irregularities with an oil stone. Clean housings and end covers, in particular corners and angles, with a suitable detergent. Damaged or heavily worn parts must be replaced, with an expert assessing whether parts subject to normal wear during operation, such as bearings, thrust washers etc. will be reinstalled.

Parts such as seal rings, locking plates, split pins etc. must generally be replaced. Radial seal rings with worn or broken sealing lip must also be replaced. In particular, ensure that no chips or other foreign bodies remain in the housing. Check the lube oil holes and grooves regarding unhindered passage.

Oil according to the relating List of Lubricants shall be applied to all bearings prior to their installation.

NOTE : Only a heating furnace or an electric drier is permitted to be used for heating up parts such as bearings, housings, etc.!
Parts fitted in heated state must be readjusted after cooling down to ensure a perfect contact.

CAUTION

When assembling the unit, exactly observe the tightening torques and setting data indicated in the manual.

Tighten screws and nuts according to the enclosed standard table, unless otherwise specified.

The use of fluid seals or Molykote is not permitted for the control part in transmissions . due to a possible malfunction.

Never wash disks having organic friction linings (e.g. paper disks -adverse effect on lining adhesion).

Only dry cleaning is permitted (leather cloth).

⚠ DANGER

When using detergents, observe the manufacturer's instructions regarding their handling.

Structure of the Service Manual

The structure of this repair manual reflects the sequence of the work steps for completely disassembling the dismantled unit.

Important information on industrial safety

As a basic principle, the workshop carrying out the repair or maintenance of ZF units shall be fully responsible for industrial safety.

The observance of all valid safety regulations and legal requirements is a prerequisite for avoiding any damage to persons and products during maintenance and repair work.
Repair workshops must familiarize themselves with these regulations prior to starting any work.

A suitably trained and skilled staff is required for a proper repair of these ZF products.

The repair workshop shall be responsible for the training.

The following safety references are used in this manual:

CAUTION

This symbol serves as a reference to special working procedures, methods, information, use of auxiliaries etc... indicated in this repair manual.

DANGER

This symbol identifies situations in which lacking care may lead to personal injury or damage to the product.

NOTE : Thoroughly study this manual before starting any tests or repair work.

NOTE : Figures, drawings and parts in this manual do not always represent the original; they show the working procedure.

Since the figures, drawings and parts are not shown to scale, do not draw any conclusions on size and weight (not even within one and the same illustration).
Carry out work according to the legend.

NOTE : After repair work and tests, the expert staff must verify that the product is perfectly functioning again.

Denomination Of Standard Dimensions

Unit	Symbol	New	Old	Conversion	Note
Density	M	kg (Kilogramm)	kg		
Force	F	N (Newton)	Kp	1 kp = 9.81 N	
Work	A	J (Joule)	Kpm	0.102kpm = 1J =1Nm	
Power	P	KW (Kilowatt)	HP (DIN)	1 HP = 0.7355 KW 1 KW = 1.36 HP	
Torque	T	Nm (Newtonmeter)	Kpm	1 kpm = 9.81 Nm	T (Nm) = F (N) · r (m)
Moment (Force)	M	Nm (Newtonmeter)	Kpm	1 kpm = 9.81 Nm	M (Nm) = F (N) · r (m)
Pressure (Over-)	pü	Bar	Atu	1.02 atü = 1.02 kp/㎠ = 1 bar = 750 torr	
Speed	N	min -1 rpm tr/min			

Conversion Table

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/㎠)	=	14.233 psi (pound force per square inch lbf/in2)
0.070 bar (0.071 kp/㎠)	=	1 psi (lbf/in2)
1 Liter	=	0.264 Gallon (Imp.)
4.456 Liter	=	1 Gallon (Imp.)
1 Liter	=	0.220 Gallon (US)
3.785 Liter	=	1 Gallon (US)
1609344 m	=	1 Mile (land mile)
0° C (Celsius)	=	+ 32° F (Fahrenheit)
0 ° C (Celsius)	=	273.15 Kelvin

Tightening Torques For Screws (in Nm)

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

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

Metric ISO standard thread DIN 13, page 13

<Unit : N·m>

Dimension	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

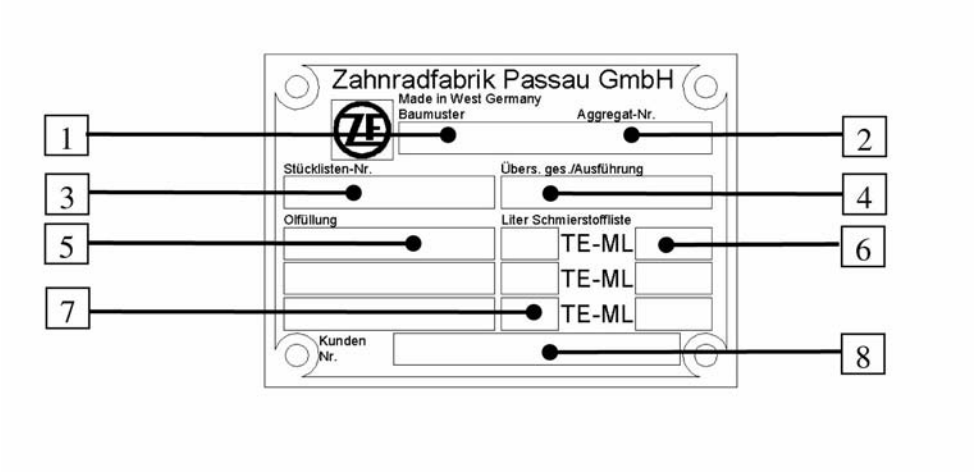
Metric ISO fine thread DIN 13, page 13

<Unit : N·m>

Dimension	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

Labeling Of Identification Plate

1 = Transmission type
2 = Transmission number
3 = ZF parts list number
4 = Total transmission ratio
5 = Oil filling (oil specification)
6 = ZF List of Lubricants
7 = Oil fill quantity
8 = Customer number



Information On Spare Parts Ordering:

Please indicate the following information when ordering genuine ZF spare parts:

1. = Transmission type
2. = Unit number
3. = ZF parts list number

You will find this information on the identification plate!

4. = Make and type of spare part
5. = Denomination of spare part
6. = Spare part number
7. = Shipping mode

Please indicate all the a.m. details to avoid any mistakes in the delivery of the ordered spare parts!

Configuration

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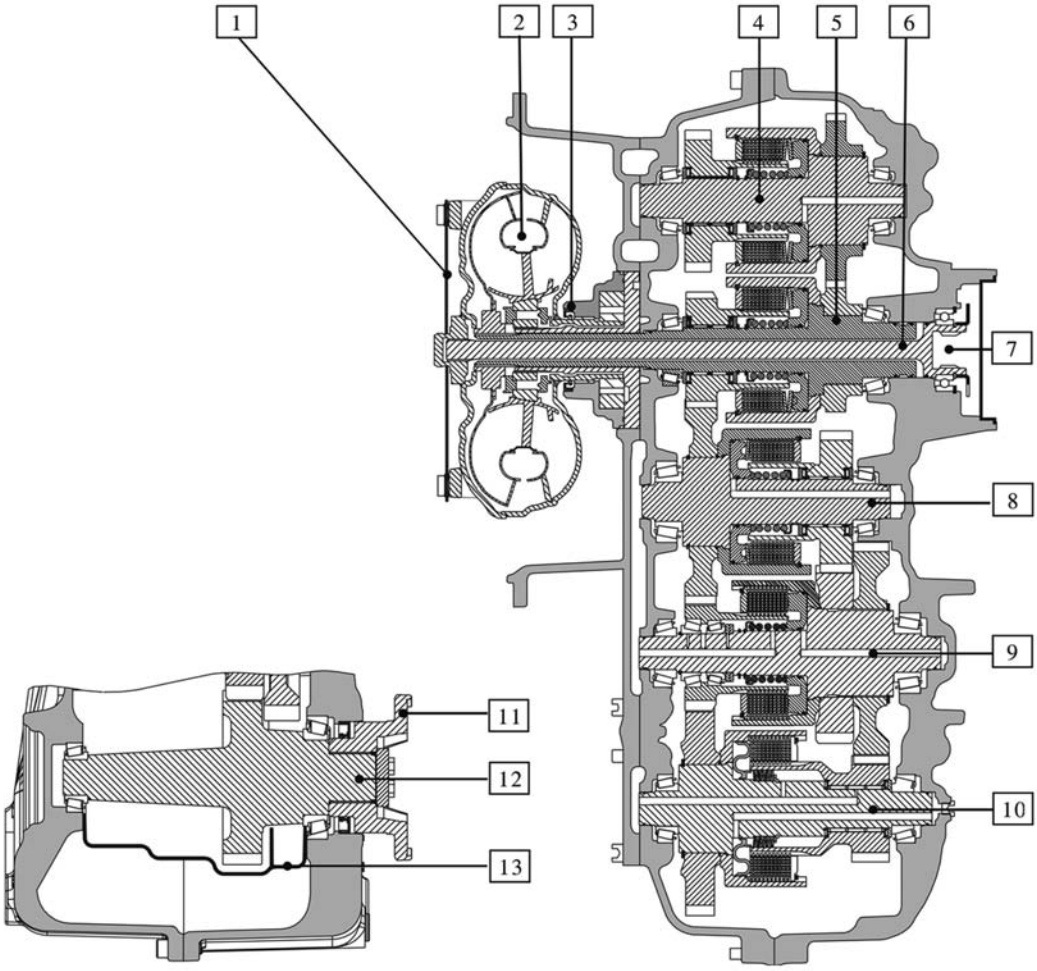
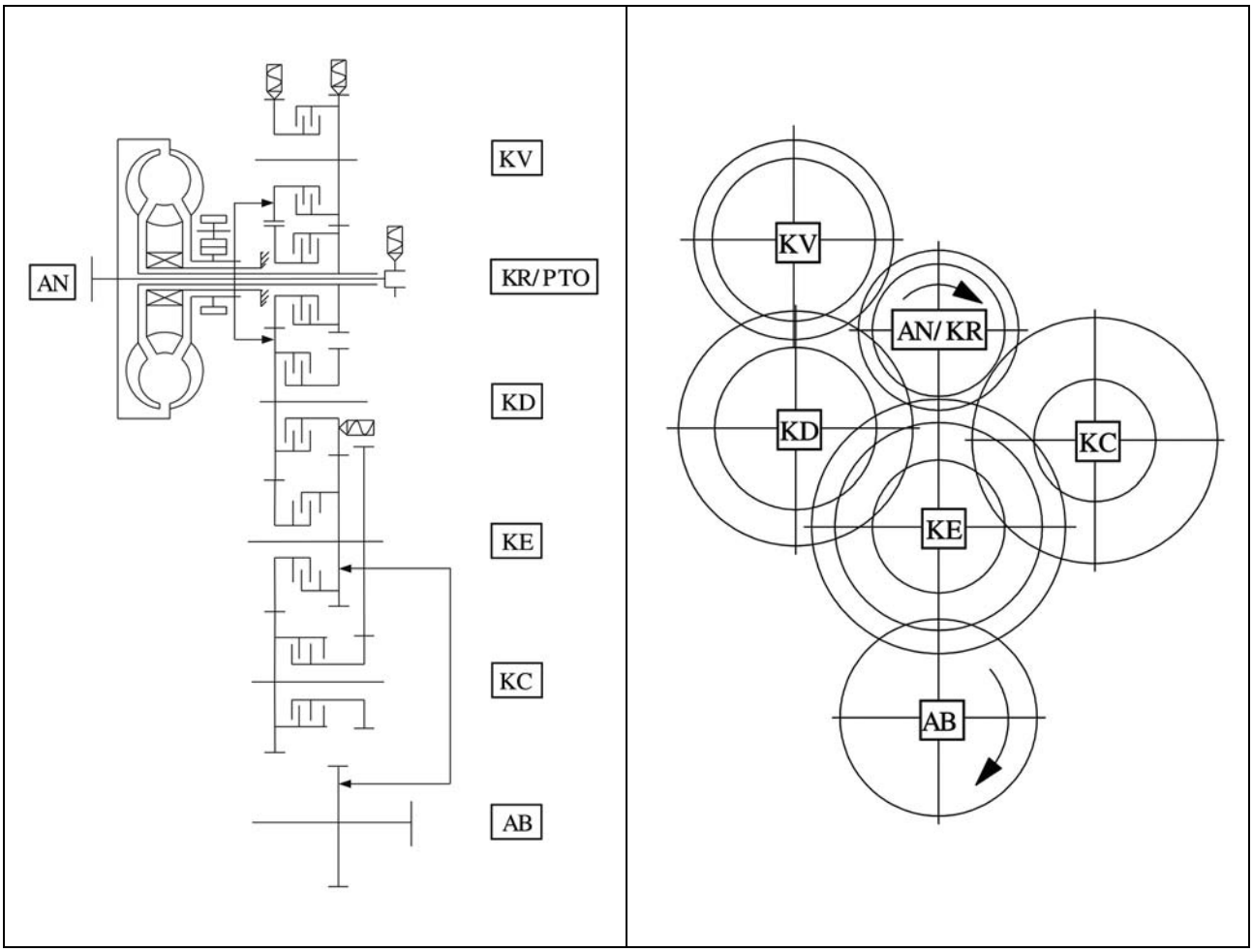
1 = Flex plate for direct mount
2 = Converter
3 = Transmission pump
4 = Clutch shaft „KV“
5 = Input shaft / clutch shaft „KR“
6 = Central shaft / input shaft PTO
7 = Connection, PTO; coaxial, engine-dependent
8 = Clutch shaft „KD“
9 = Clutch shaft „KE“
10 = Clutch shaft „KC“
11 = Output flange
12 = Output shaft
13 = Screen sheet



Transmission schematics **Gear schematics**



Legend:

KV = Forward clutch
AN/KR = Input /Reverse clutch
KC = 1st gear clutch
KD = 2nd gear clutch
KE = 3rd gear clutch
AB = Output

Measuring Points And Connections

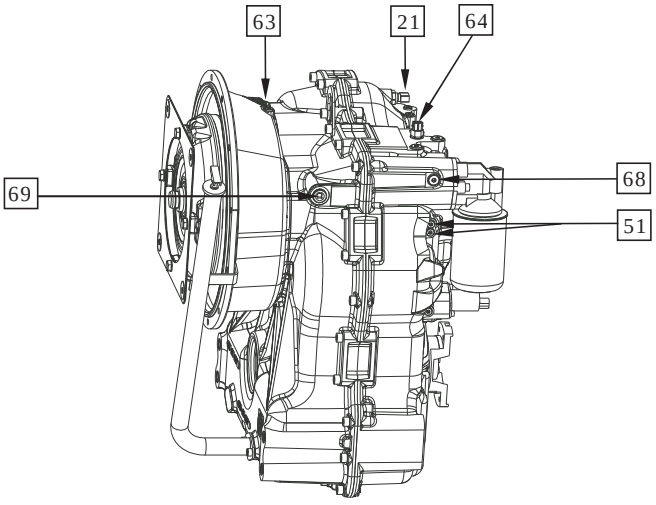
3 WG-94 EC

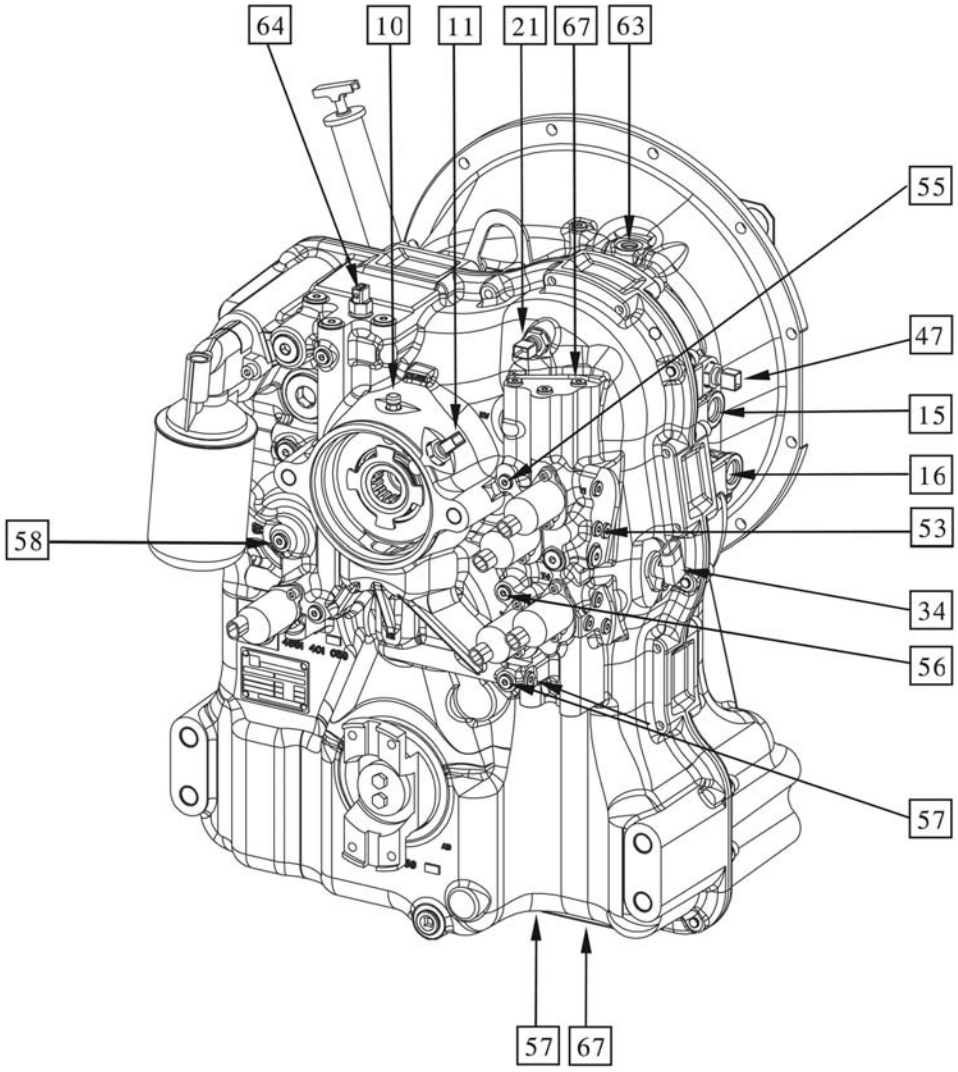
Take measurements when the transmission has reached operating temperature (approx. 80° - 90° C)!

No.		Denomination of item			Connection
		Measuring points for pressure oil and temperature:			
51	=	Before the converter - opening pressure		11+2 bar	M10x1
53	=	Reverse clutch	KR	16+3 bar	M10x1
55	=	Forward clutch	KV	16+3 bar	M10x1
56	=	Clutch	KD	16+3 bar	M10x1
57	=	Clutch	KE	16+3 bar	M10x1
58	=	Clutch	KC	16+3 bar	M10x1
63	=	Temperature after the converter 100° C; short-term 120° C			M14x1.5
64	=	Temperature sensor			M12x1,5
67	=	System pressure		16+3 bar	M10x1

		Valves and connections:	
10	=	Breather	10x1
15	=	Connection to wards heat exchanger	7/8“ 14 UNF
16	=	Connection from heat exchanger	7/8“ 14 UNF
68	=	Connection after ZF filter	9/16-18 UNF-2B
69	=	Connection before ZF filter	7/8“ 14 UN 2A
70	=	Converter safety valve (WSV)	
71	=	Main pressure valve (HDV)	

		Inductive transmitters and speed sensor:		
11	=	Inductive transmitter	n Engine	M18x1,5
21	=	Inductive transmitter	n Turbine	M18x1,5
34	=	Speed sensor	n Output	----------
47	=	Inductive transmitter	n Central gear train	M18x1,5




64
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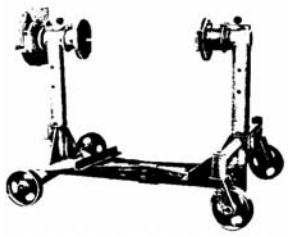
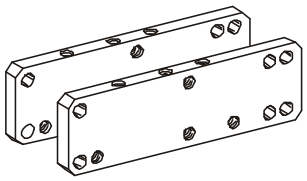
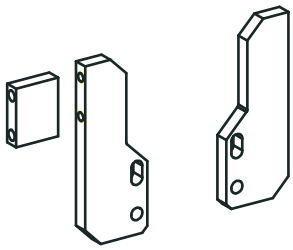
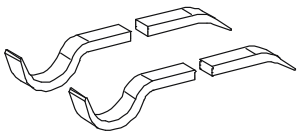
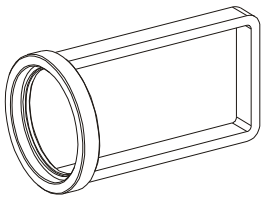
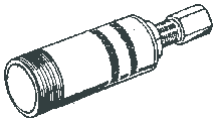
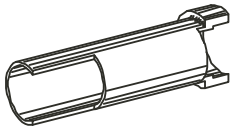
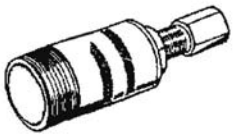
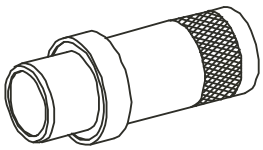
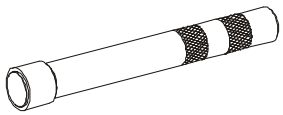
Special Tools For Disassembly And Reassembly

Cons. No.	Figure	Denomination Order No.	Qty	Chapter/Fig.
1		**Assembly truck assy** with tilting device **5870 350 000**	1	1/2
2		**Holding fixtures** **5870 350 063**	1	1/2
3		**Clamping angles** **5870 350 124**	1	1/2
4		**Belt wrench** **5870 105 005**	1	1/5
5		**Assembly lever** **5870 350 036**	1	6/2

Cons. No.	Figure	Denomination Order No.	Qty	Chapter/Fig.
6		**Assembly aid** **5870 345 114**	1	7.1/10 _ 8.3/9 7.2/9 _ 8.4/7 7.3/9 _ 8.4/9 7.4/10 _ 8.5/5 8.1/6 8.1/8 8.2/6 8.2/8 8.3/7
7		**Grab sleeve** **5873 001 026**	1	7.1/15
8		**Basic tool** **5873 001 000**	1	7.1/15 7.3/14 7.4/2 7.4/15
9		**Grab sleeve** **5873 000 029**	1	7.2/14 7.3/2 7.5/12 7.6/1
10		**Basic tool** **5873 000 000**	1	7.2/14 7.3/2

Cons. No.	Figure	Denomination Order No.	Qty	Chapter/Fig.
11		**Rapid grip** **5873 011 011**	1	7.3/4 7.4/15
12		**Grab sleeve** **5873 001 036**		7.4/2
13		**Assembly aid** **5870 506 128**		7.5/8 8.5/8
14		**Basic tool** **5873 000 001**		7.6/1
15		**Grab sleeve** **5873 002 035**	1	7.6/2

Cons. No.	Figure	Denomination Order No.	Qty	Chapter/Fig.
16		**Rapid grip** **5873 012 011**		7.6/2
17		**Basic tool** **5873 002 000**		7.6/2
18		**Driver tool** **5870 048 219**		9/2
19		**Adjusting screws** **5870 204 007 (M10)**		9/8
20		**Adjusting screws** **5870 204 011 (M8)**		9/11

Cons. No.	Figure	Denomination Order No.	Qty	Chapter/Fig.
21		**Drift** **5870 705 012**		11/1

Disassembly

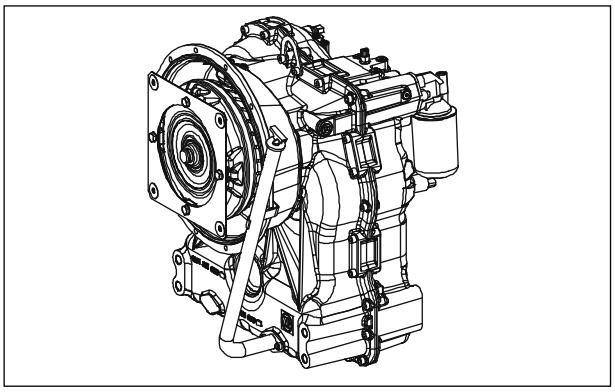


Figure 1

Transmission 3 WG-94 EC

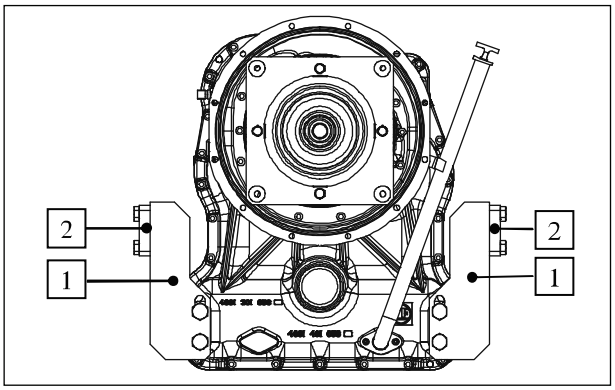


Figure 2

Attach transmission to the assembly truck by means of clamping angles (1) and holding fixtures (2).

(S) Assembly truck	5870 350 000
(S) Holding fixtures	5870 350 063
(S) Clamping angles	5870 350 124

Removal of filter

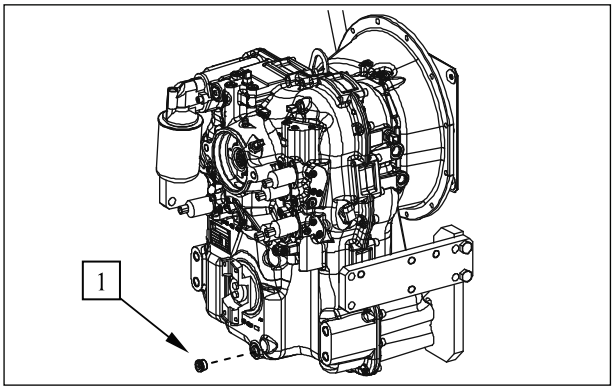


Figure 3

Drain oil prior to starting disassembly!

Remove screw plug (1).

Disposal of oil according to legal requirements!

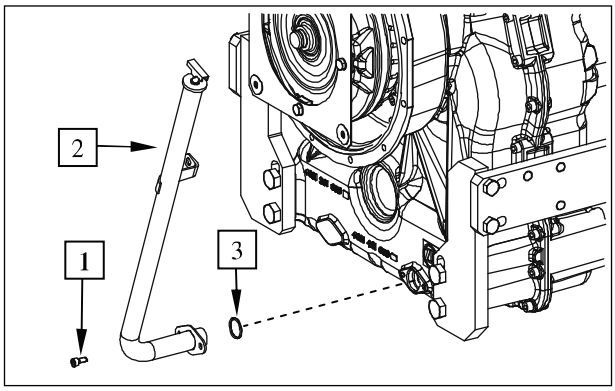


Figure 4

Loosen the cylindrical screws (1) and remove the oil filler tube with the oil dipstick (2).

Remove the O-ring (3) from the oil filler tube.

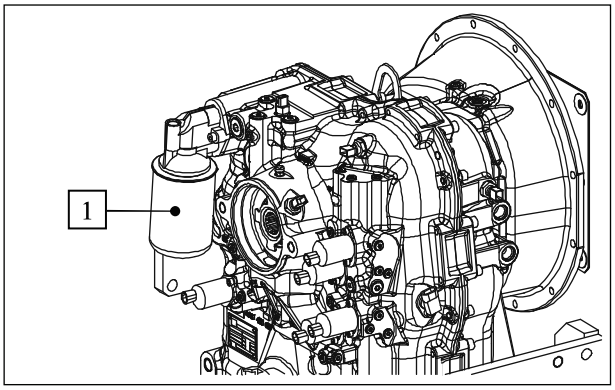


Figure 5

Separate the ZF fine filter (1) from the filter head by means of belt wrench.

(S) Belt wrench 5870 105 005

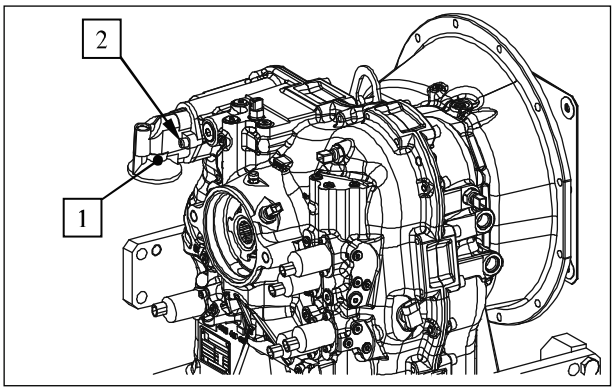


Figure 6

Loosen the cylindrical screws (2) and separate the filter head (1) from the transmission housing.

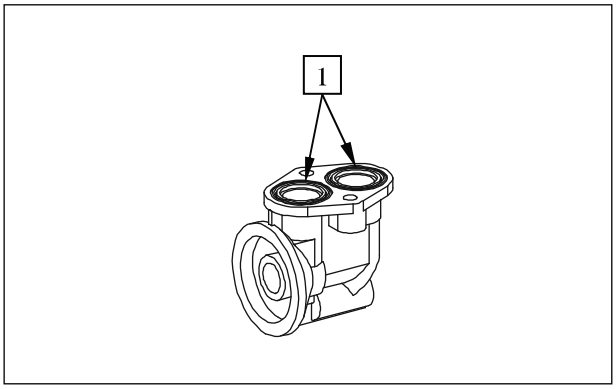


Figure 7

Remove both O-rings (1) out of the annular groove of the filter head.

DISASSEMBLY pressure controller (proportional valves), inductive sensor, speed sensor (Hall sensor), temperature sensor, breather and screw plugs

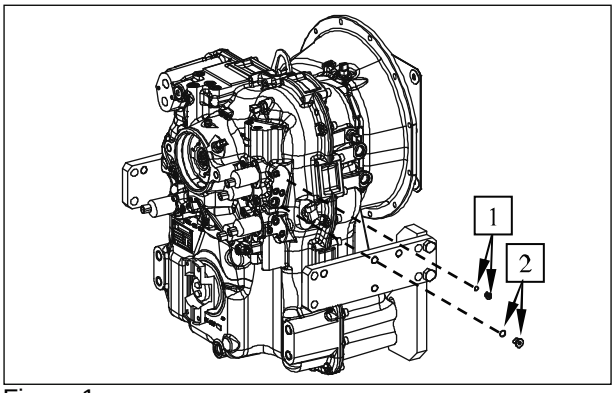


Figure 1

Remove all screw plugs with O-ring (1 and 2).

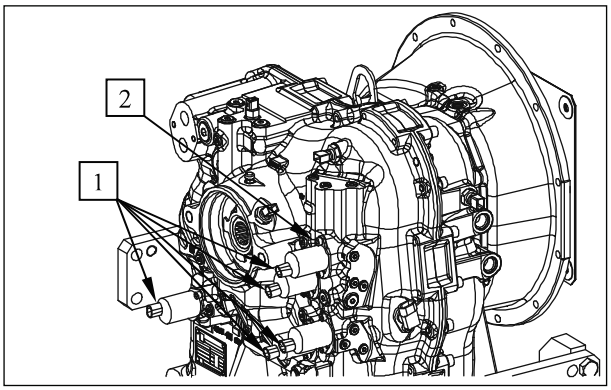


Figure 2

Loosen cylindrical screws (1) and remove pressure controller . proportional valves - (2).

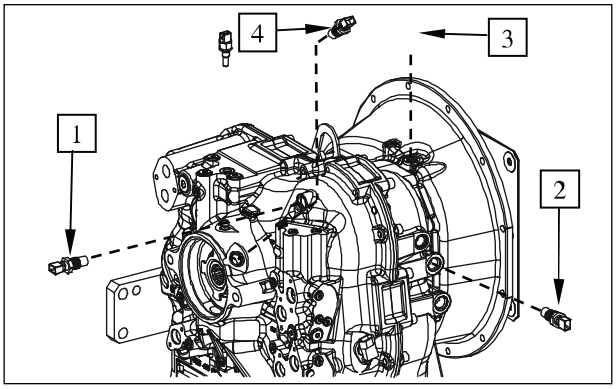


Figure 3

Remove positioned parts.

1 = Inductive sensor - n turbine
2 = Inductive sensor - n central gear chain
3 = Temperature sensor, measuring point .63“ after converter
4 = Inductive sensor

Remove O-rings!

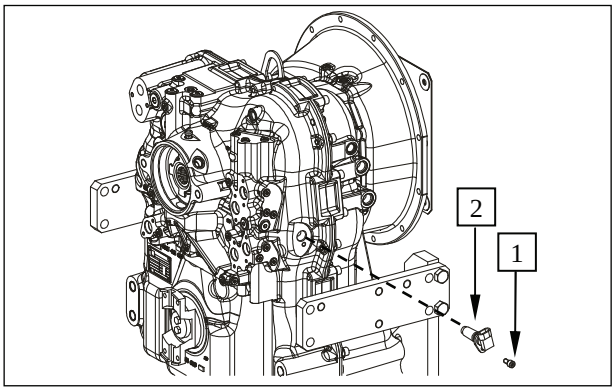


Figure 4

Loosen cylindrical screw (1) and remove speed sensor (2).

2 = Speed sensor - n output (Hall sensor)

Remove O-rings!

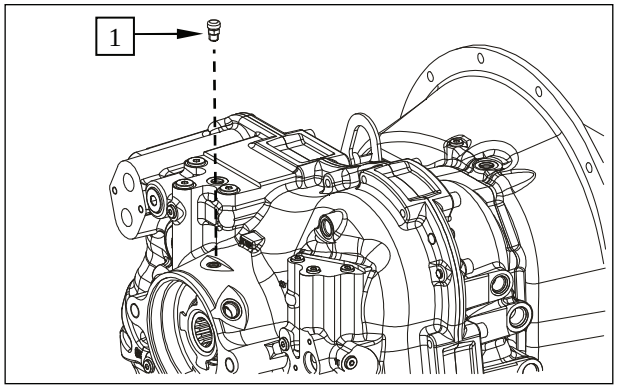


Figure 5

Remove breather (1).

Disassembly converter and central shaft (PTO shaft)

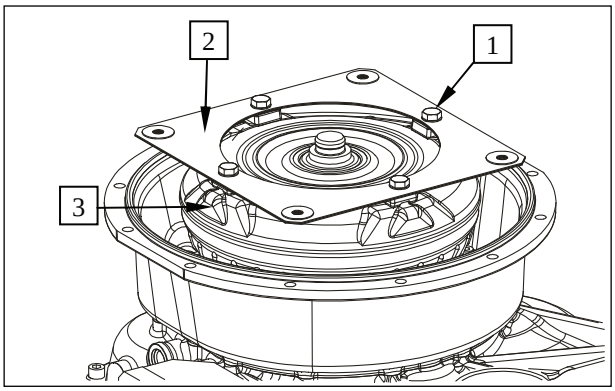


Figure 1

Loosen cylindrical screws (1) and separate the flexplate (2) from the converter (3).

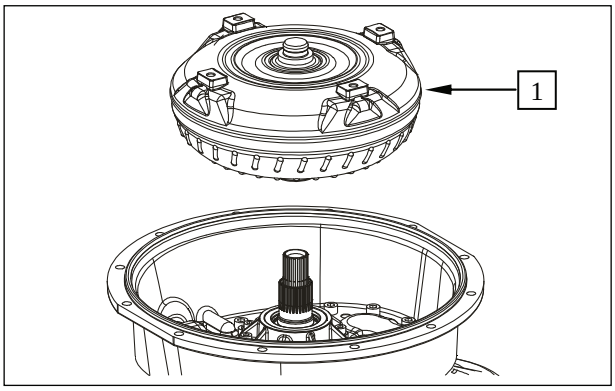


Figure 2

Pull off converter (1) by hand.

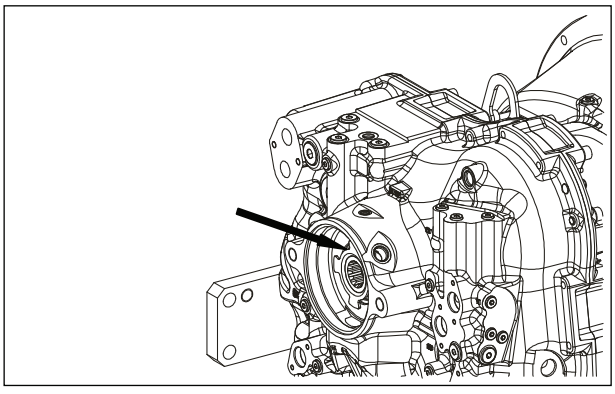


Figure 3

Disengage the retaining ring (see arrow).

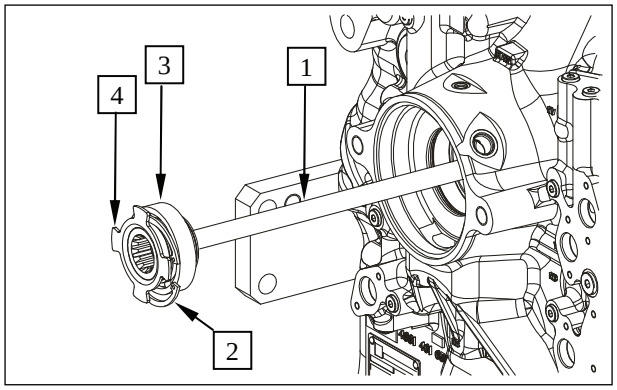


Figure 4

Pull the central shaft assy out of the housing hole.

1 = Central shaft
2 = Retaining ring
3 = Ball bearing
4 = Toothed disk

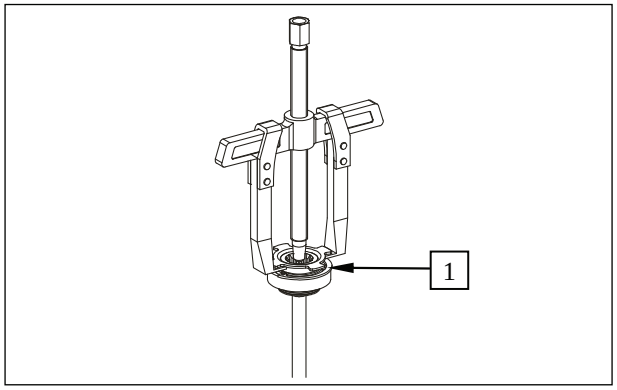


Figure 5

Pull the toothed disk (1) from the central shaft.

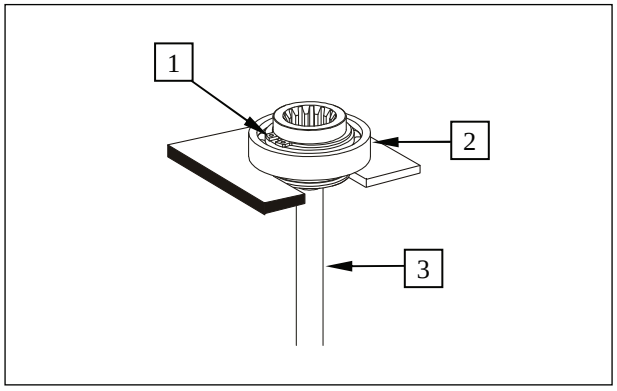


Figure 6

Remove the retaining ring (1).
Press the ball bearing (2) from the central shaft (3).

Disassembly of output flange

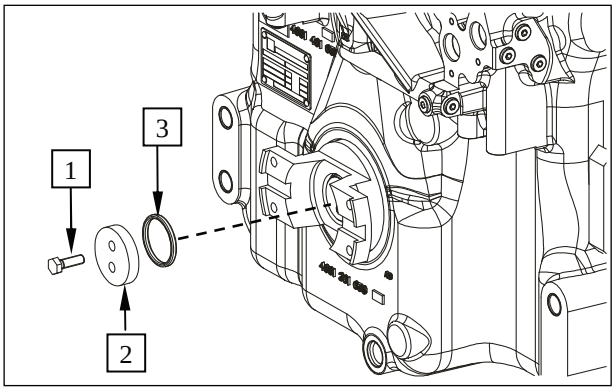


Figure 1

Loosen the hexagon screws (1) and remove disk and O-ring (2 and 3).

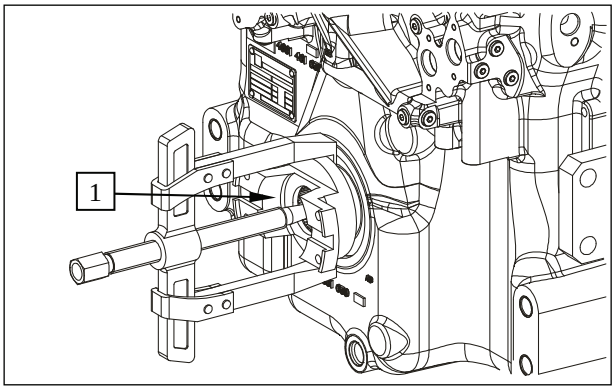


Figure 2

Pull output flange (1) off the output shaft by means of two-armed puller.

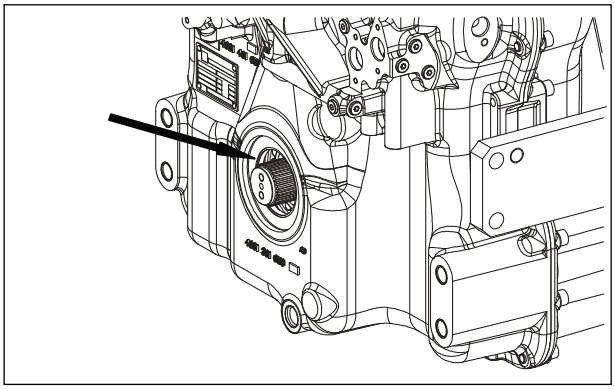


Figure 3

Remove shaft seal (see arrow) from the housing hole by means of assembly lever.

Disassembly of main pressure valve and converter safety valve

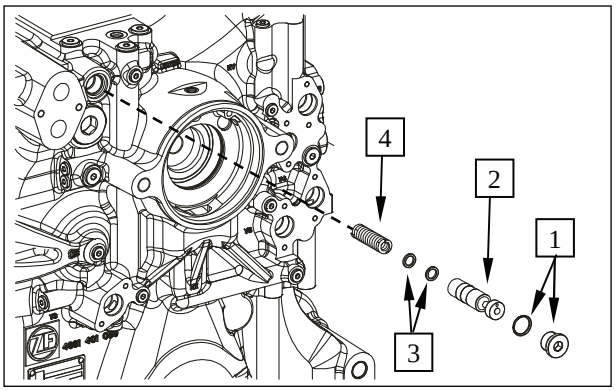


Figure 1

Loosen screw plug (1) and remove main pressure valve (control pressure valve):

Main pressure valve consists of:

1 = Screw plug with O-ring
2 = Piston
3 = Spacer rings
4 = Compression spring

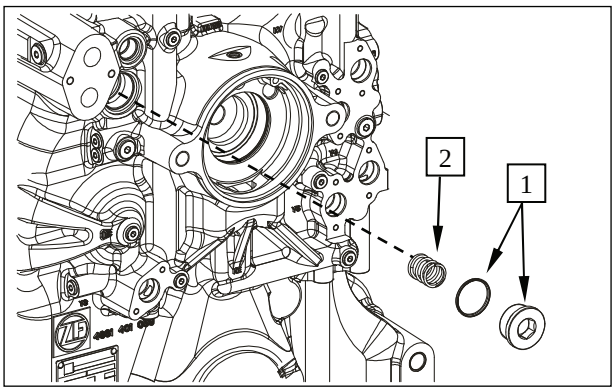


Figure 2

Loosen screw plug (1) and remove converter safety valve.

Converter safety valve consists of:

1 = Screw plug with O-ring
2 = Pressure valves
- = Valve assy is installed in the housing . not visible - (functional check of valve see Figure 3).

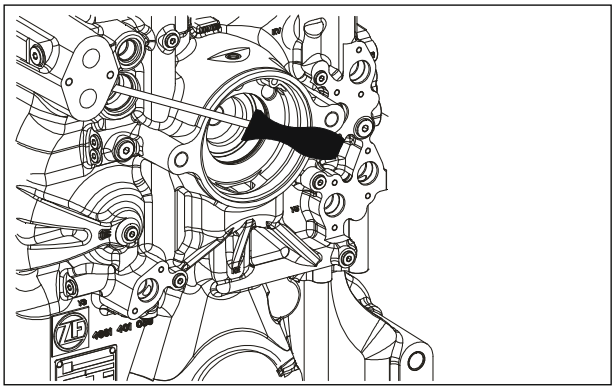


Figure 3

Functional check of valve.

Use a screwdriver to check the movability of the ball in the valve.

If the valve is o.k., it does not need to be removed.

Removal of clutches and Disassembly of oil pressure pump

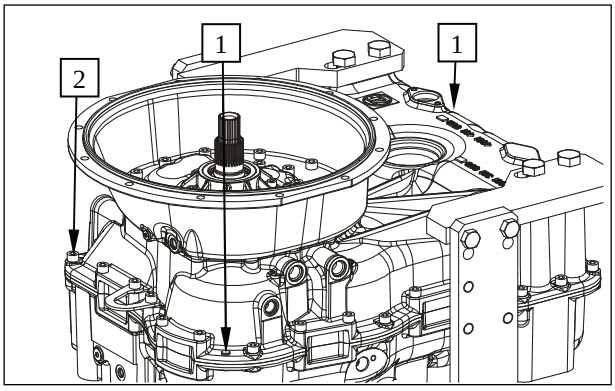


Figure 1

Force out cylindrical pins (1).

Loosen bolted connection (2) of housing front and rear part.

Make sure to leave 2 cylindrical screws crosswise in the bolted connection (2)! Transmission rear part is not fixed to the clamping angle and could get loose when turning!

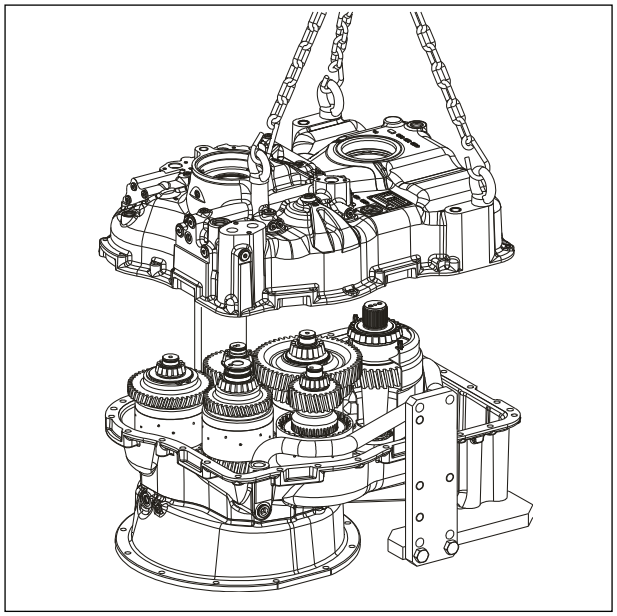


Figure 2

Rotate transmission housing 180°, loosen the last 2 cylindrical screws from the bolted connection housing front and rear part and separate housing rear part by means of lifting device.

Support by means of assembly lever!

(S) Assembly lever 5870 345 036

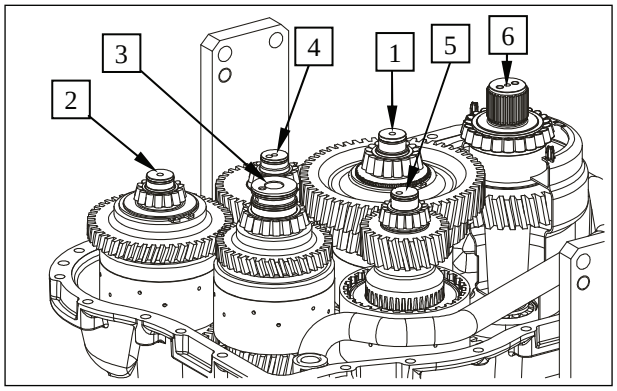


Figure 3

Lift the clutches out of the housing in the following sequence:

1 = Clutch KE (Clutch . 3rd gear)
2 = Clutch KV (Clutch - forward)
3 = Clutch KR (Clutch . reverse and input)
4 = Clutch KD (Clutch . 2nd gear)
5 = Clutch KC (Clutch . 1st gear)
6 = Output with screen sheet

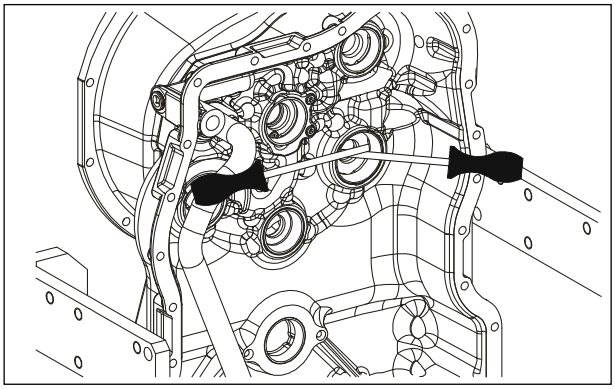


Figure 4

Use assembly lever to remove all bearing outer rings from the housing front part.

If, contrary to the ZF recommendation, the tapered roller bearings of clutches and output are not replaced, it is imperative to ensure the previous pairing (bearing outer ring/bearing inner ring).

Bearing outer ring and bearing inner ring must be marked!

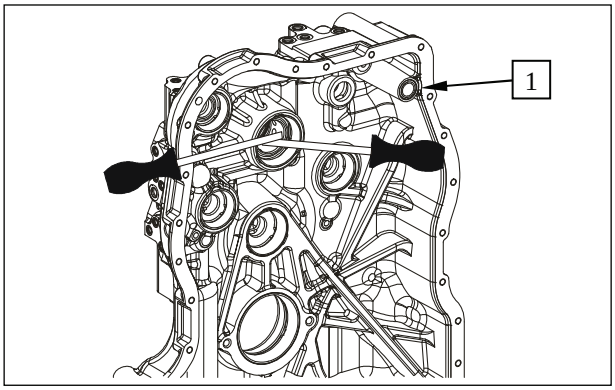


Figure 5

Use assembly lever to remove all bearing outer rings from the housing rear part.

If, contrary to the ZF recommendation, the tapered roller bearings of clutches and output are not replaced, it is imperative to ensure the previous pairing (bearing outer ring/bearing inner ring).

Bearing outer ring and bearing inner ring must be marked!

Remove O-ring (1).

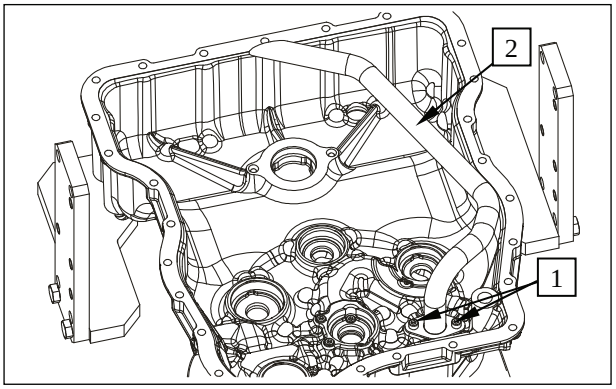


Figure 6

Loosen cylindrical screws (1) and remove suction tube (2).

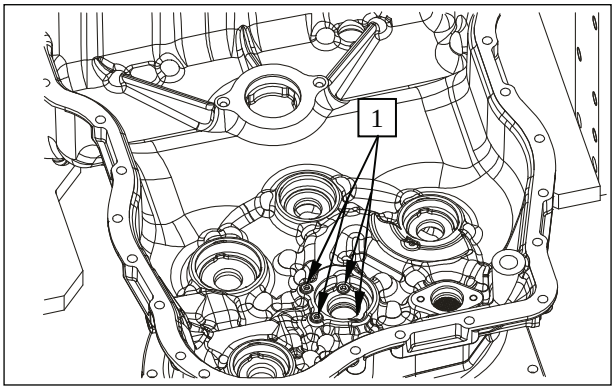


Figure 7

Loosen cylindrical screws (1).

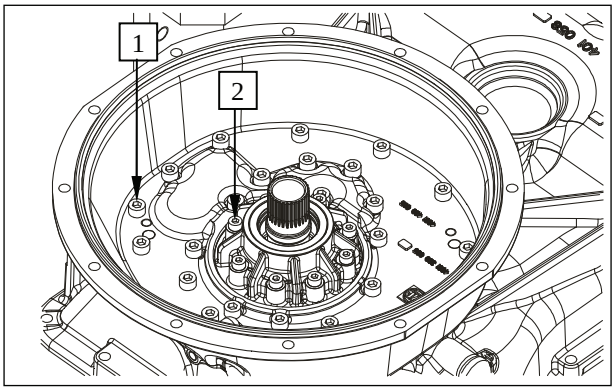


Figure 8

Loosen bolted connection between converter bellhousing/transmission housing (1) and pressure oil pump/transmission housing (2).

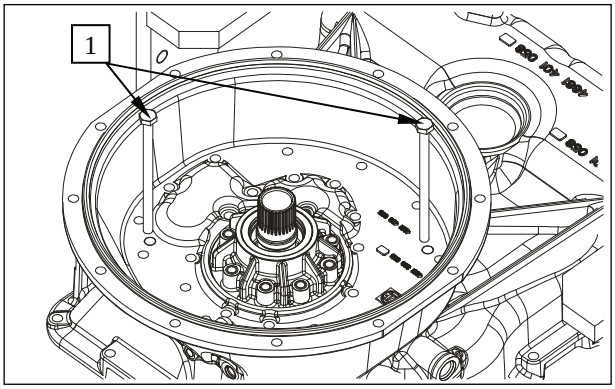


Figure 9

Press converter bellhousing off the housing equally by means of hexagon screws M10 (1).

Difficult disassembly due to fixing by cylindrical pins!

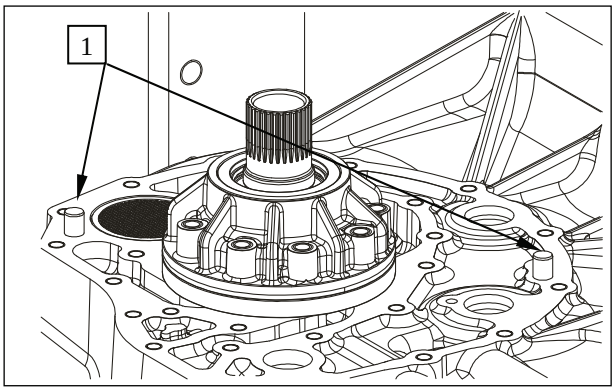


Figure 10

If required, remove both cylindrical pins (1).

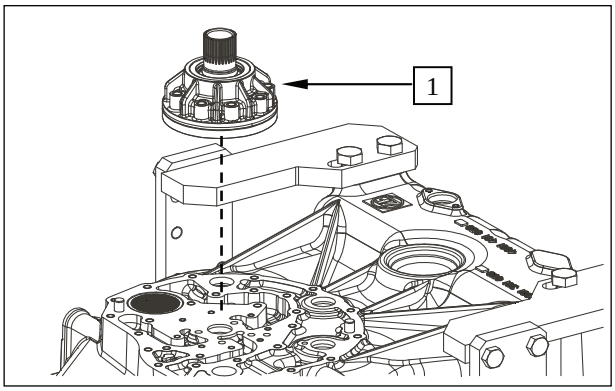


Figure 11

Remove oil pressure pump (1).

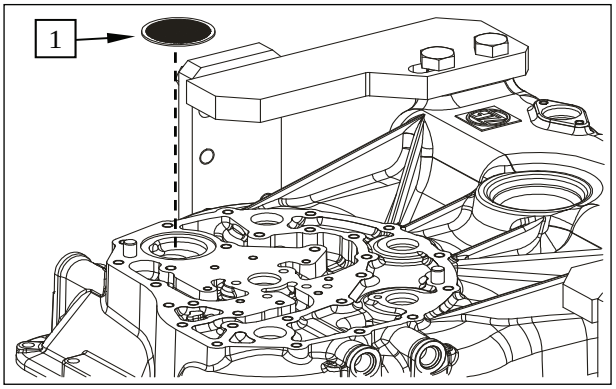


Figure 12

Remove filter (1).

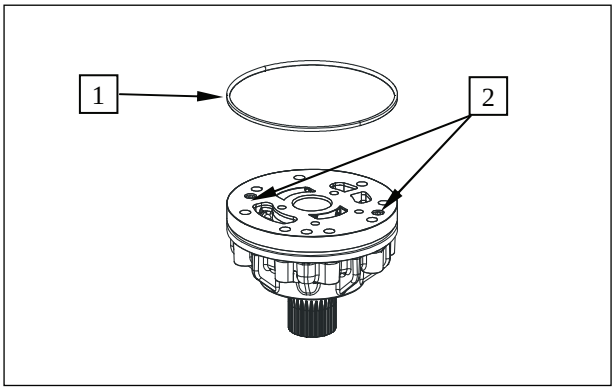


Figure 13

Remove O-ring (1).

Loosen cylindrical screws (2).

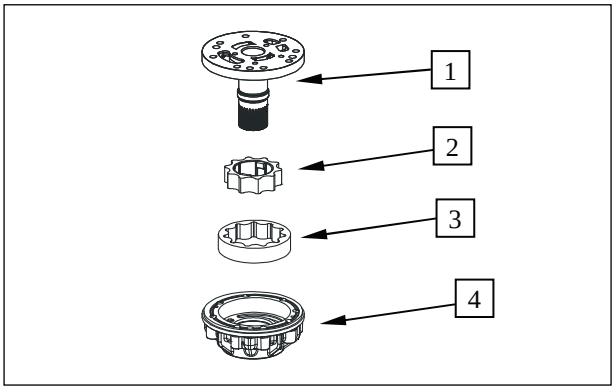


Figure 14

Check oil pressure pump :
In case of wear marks in the pump housing, stator hollow shaft or on the inner and outer rotor, the complete oil pressure pump is to be replaced.

1 = Stator hollow shaft
2 = Inner rotor
3 = Outer rotor
4 = Pump housing

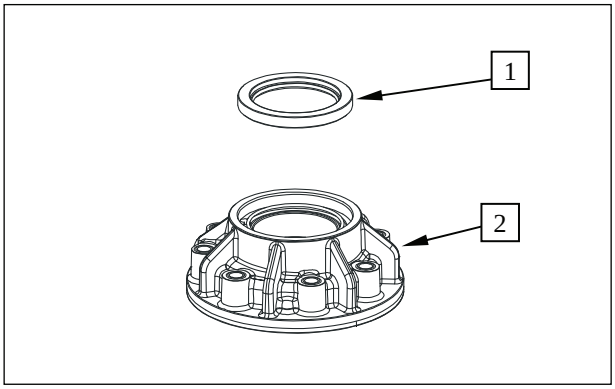


Figure 15

Remove shaft seal (1) from the pump housing (2).

Disassembly clutches

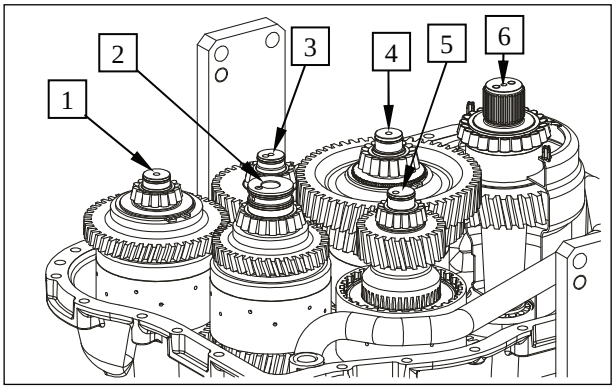


Figure 1

Legend:
1 = Clutch KV (Clutch - forward)
2 = Clutch KR (Clutch - reverse and input)
3 = Clutch KD (Clutch - 2nd gear)
4 = Clutch KE (Clutch - 3rd gear)
5 = Clutch KC (Clutch - 1st gear)
6 = Output

Clutch KR

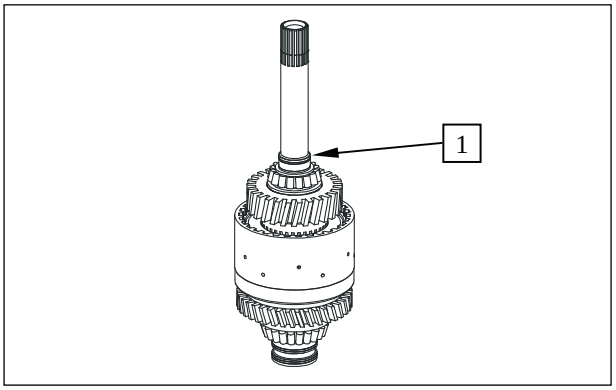


Figure 2

Disengage rectangular ring (1).

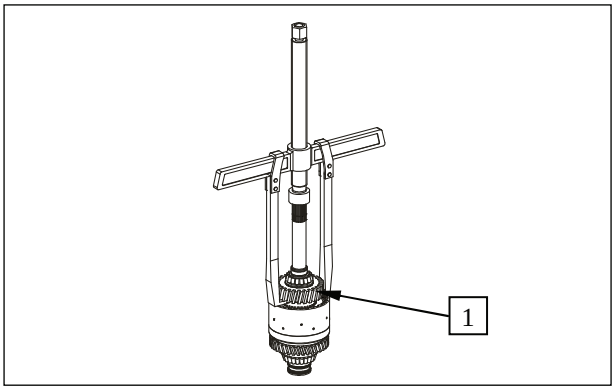


Figure 3

Pull off bearing inner ring with inner disk carrier (1).

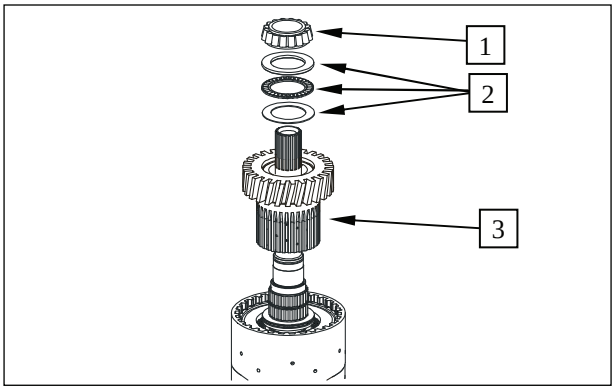


Figure 4

Remove bearing inner ring (1), axial bearing assy (2) and inner disk carrier (3).

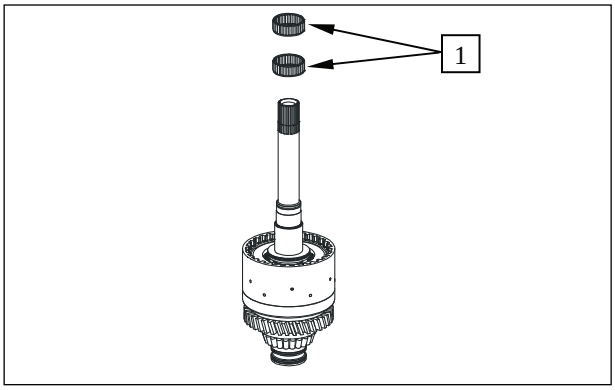


Figure 5

Remove needle cage (1).

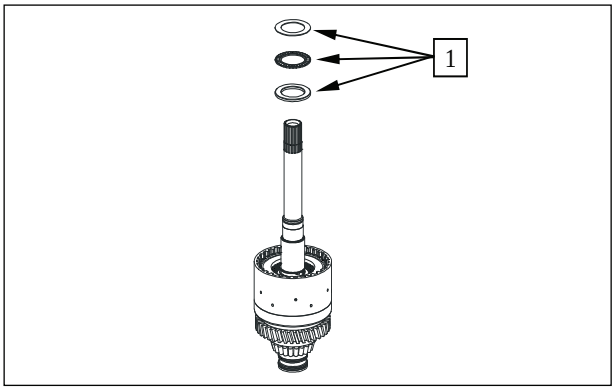


Figure 6

Remove axial bearing assy (1).

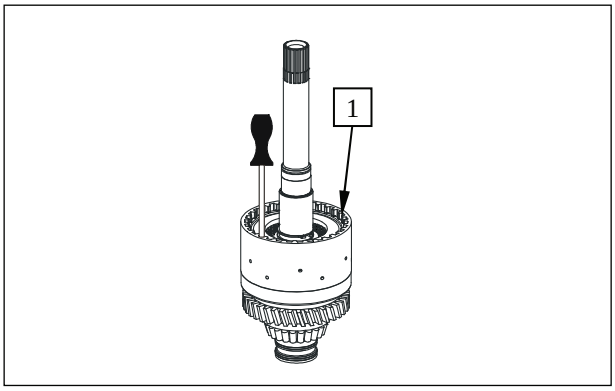


Figure 7

Disengage snap ring (1).

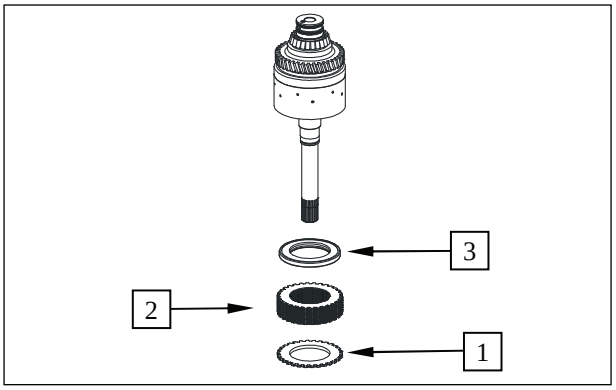


Figure 8

Remove end plate (1), disk package (2) and plate with cup springs (3) from the disk carrier.

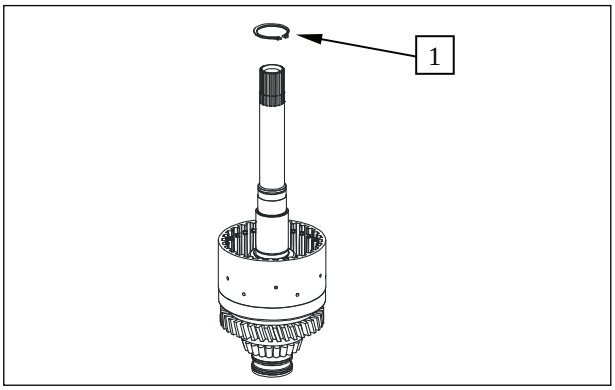


Figure 9

Remove retaining ring . contact position of axial bearing (1).

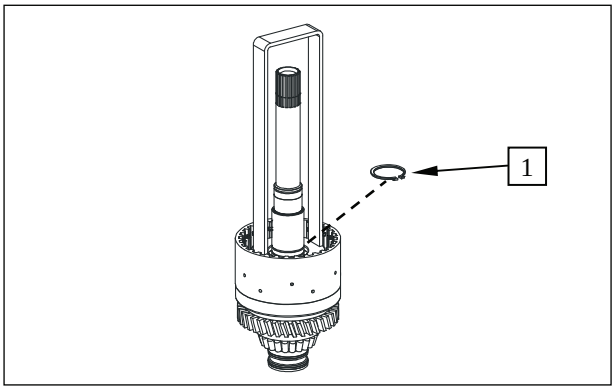


Figure 10

Preload compression spring and disengage retaining ring (1).

(S) Assembly aid 5870 345 114

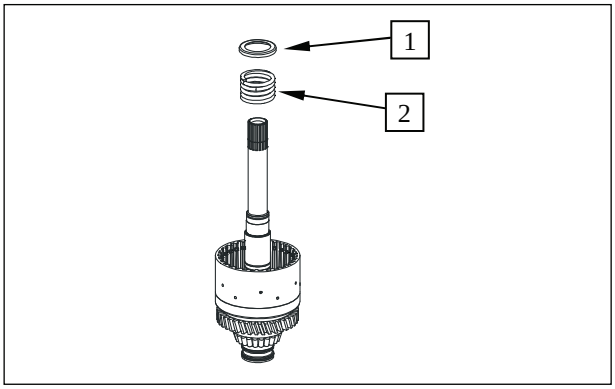


Figure 11

Remove cup spring (1) and compression spring (2).

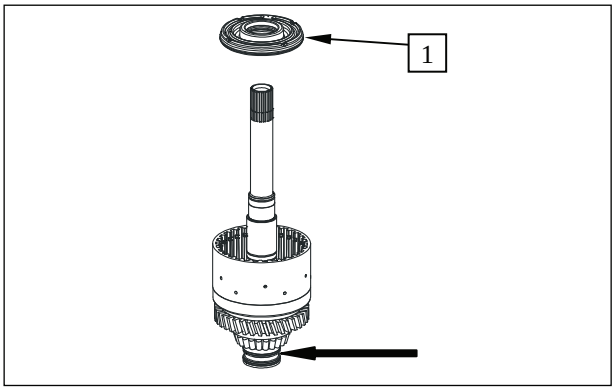


Figure 12

By means of compressed air (see arrow), press piston (1) off the shaft /disk carrier (see arrow) and remove it.

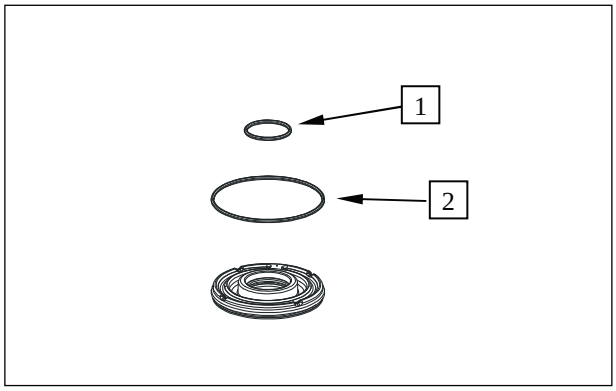


Figure 13

Remove both O-rings (1 and 2).

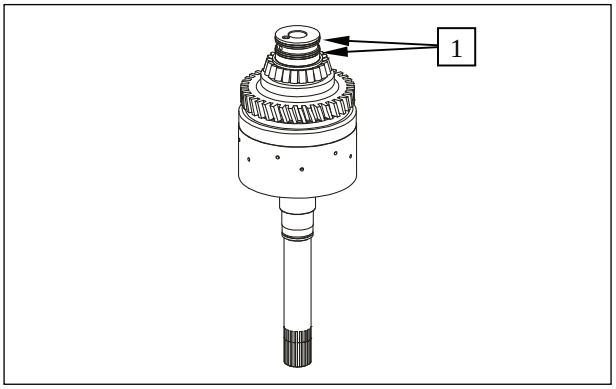


Figure 14

Disengage rectangular rings (1).

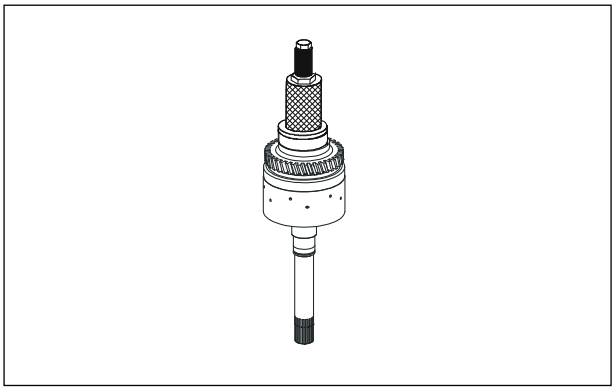


Figure 15

Pull tapered roller bearing (inner ring) off the shaft.

(S) Grab sleeve 5873 001 026
(S) Basic tool 5873 001 000

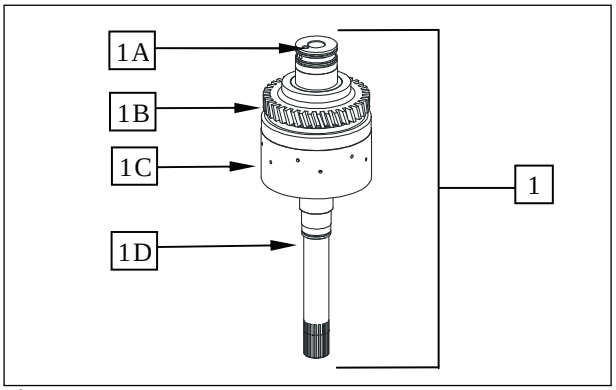


Figure 16

The clutch (1) cannot be disassembled!
It is supplied by the spare parts service only as a complete assy which consists of:

1A = Ball
1B = Helical gear
1C = Disk carrier
1D = Input shaft

Clutch KV

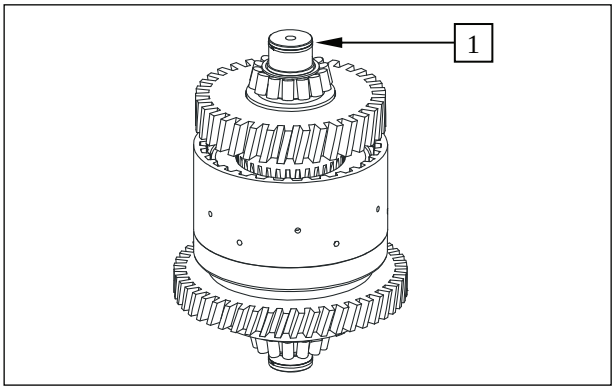


Figure 1

Snap out rectangular ring (1).

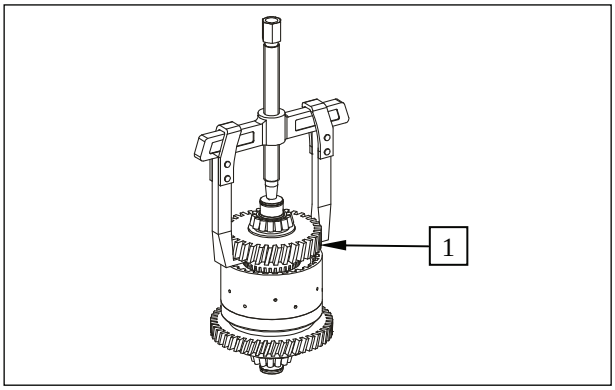


Figure 2

Pull off bearing inner ring with inner disk carrier (1).

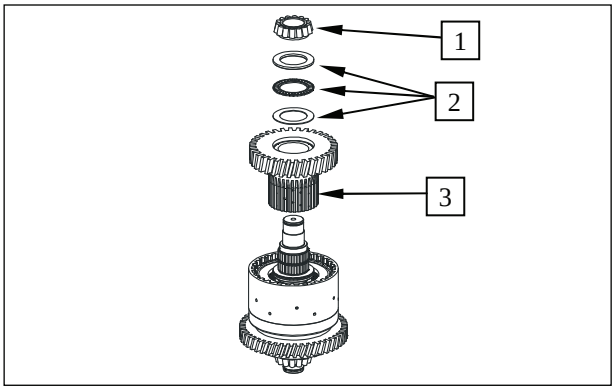


Figure 3

Remove bearing inner ring (1), axial bearing assy (2) and inner disk carrier (3).

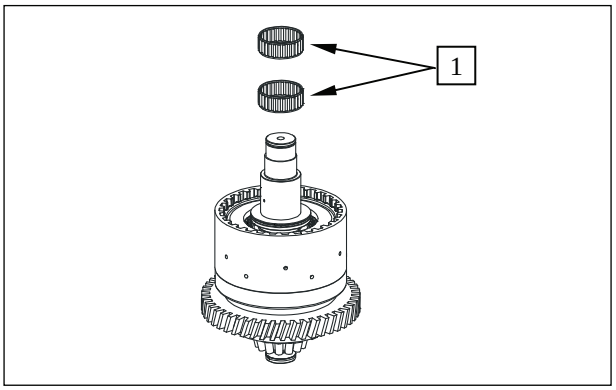


Figure 4

Remove needle cage (1).

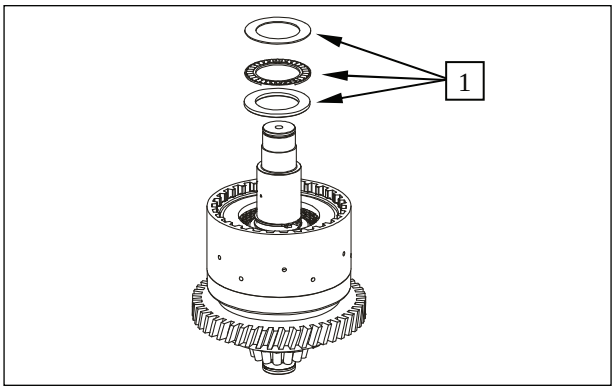


Figure 5

Remove axial bearing assy (1).

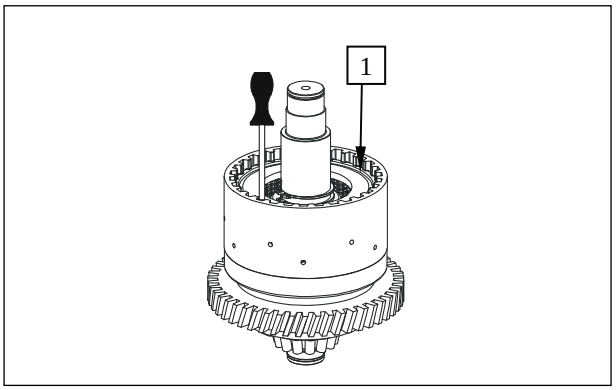


Figure 6

Remove snap ring (1).

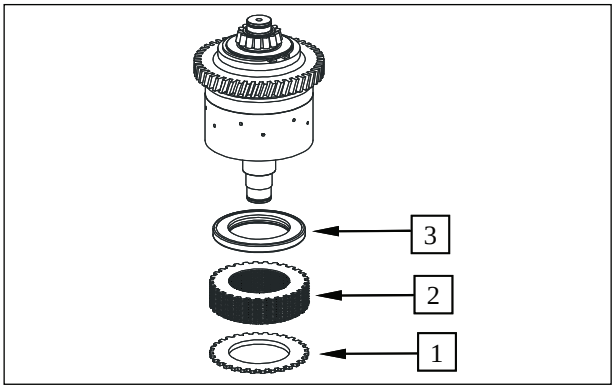


Figure 7

Remove end plate (1), disk package (2) and plate (3) from the disk carrier.

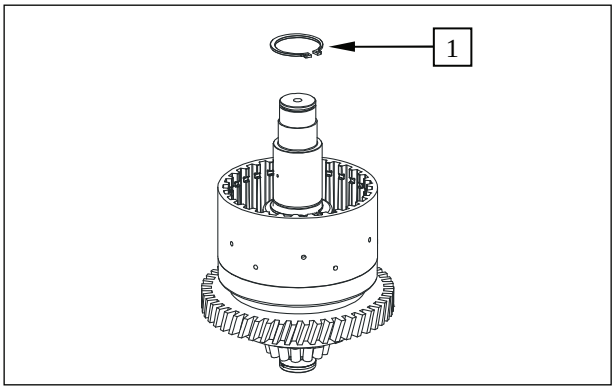


Figure 8

Remove retaining ring . contact position of axial bearing (1).

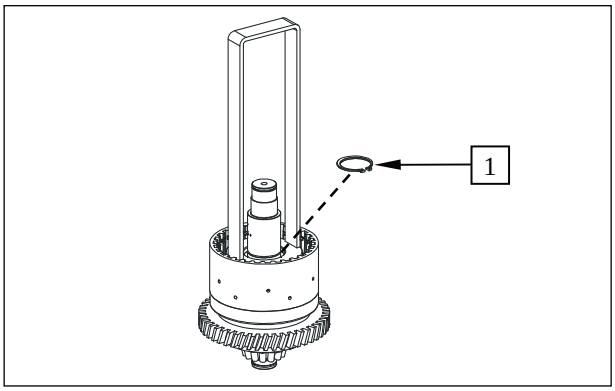


Figure 9

Preload compression spring and remove retaining ring (1).

(S) Assembly aid 5870 345 114

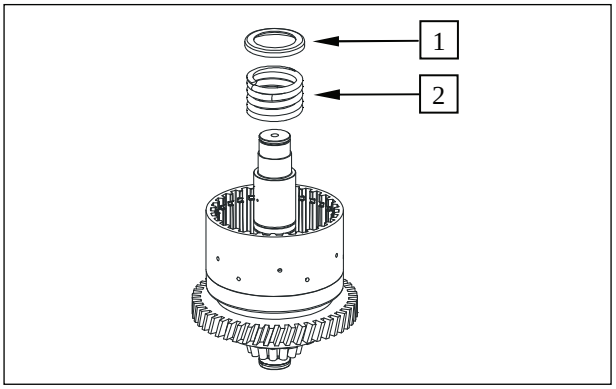


Figure 10

Remove cup spring (1) and compression spring (2).

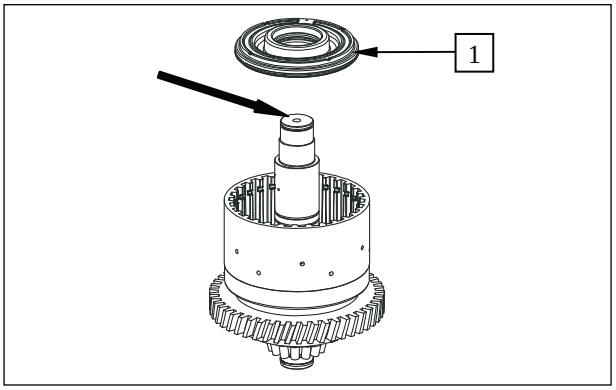


Figure 11

By means of compressed air (see arrow), press piston (1) off the shaft/disk carrier and remove it.

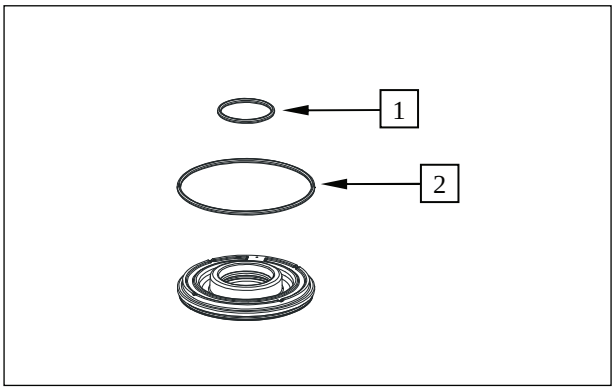


Figure 12

Remove both O-rings (1 and 2).

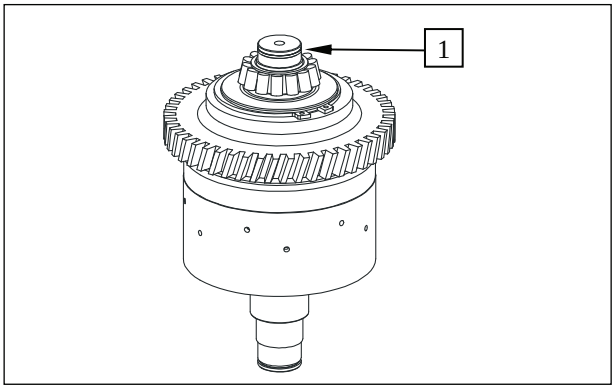


Figure 13

Snap out rectangular ring (1).

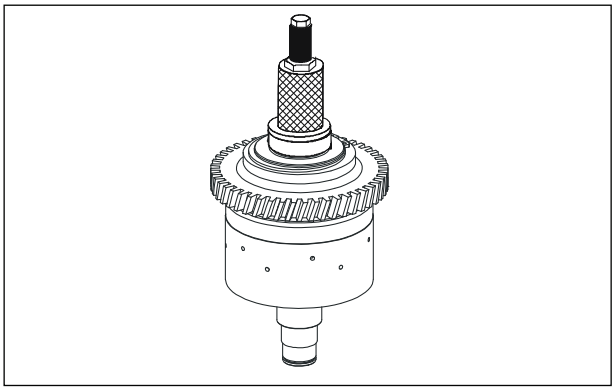


Figure 14

Pull tapered roller bearing (inner ring) off the shaft.

(S) Grab sleeve	5873 000 029
(S) Basic tool	5873 000 000

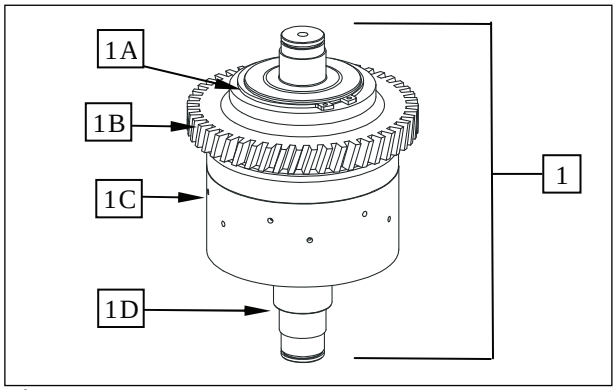


Figure 15

The clutch (1) cannot be disassembled!
It is supplied by the spare parts service only as a complete assy which consists of:

1A = Retaining ring
1B = Helical gear
1C = Disk carrier
1D = Shaft

Clutch KD

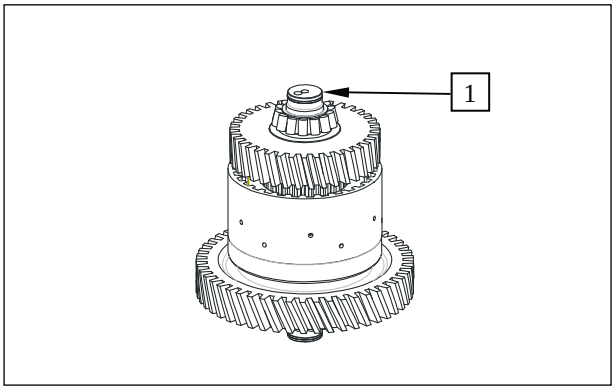


Figure 1

Snap out rectangular ring (1).

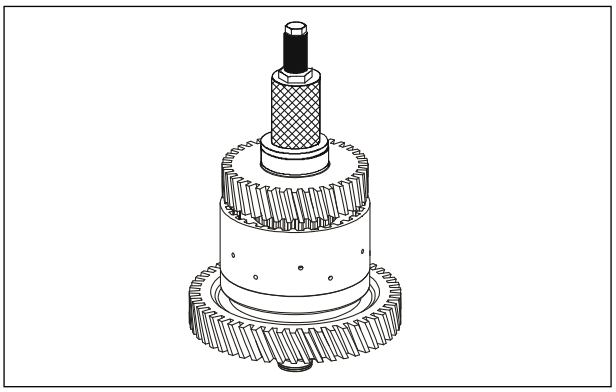


Figure 2

Pull tapered roller bearing (inner ring) off the shaft.

(S) Grab sleeve 5873 000 029
(S) Basic tool 5873 000 000

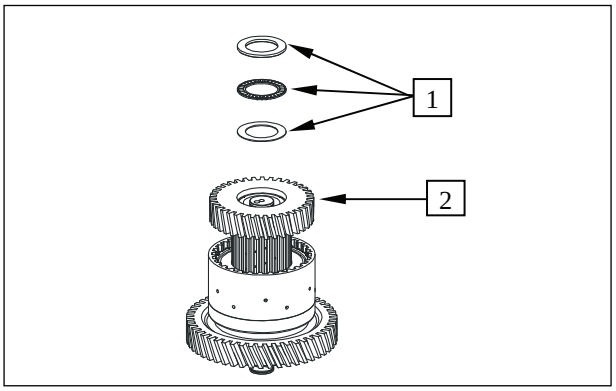


Figure 3

Remove axial bearing assy (1) and inner disk carrier.

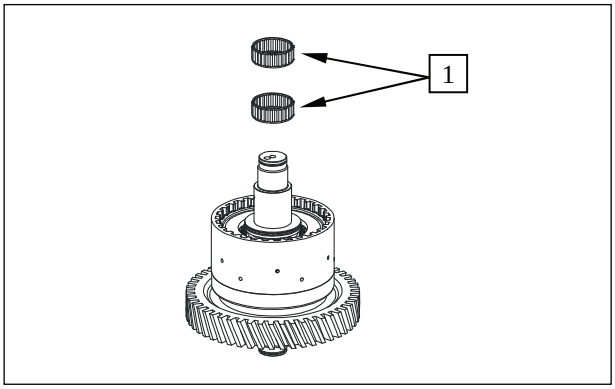


Figure 4

Remove needle cage (1).

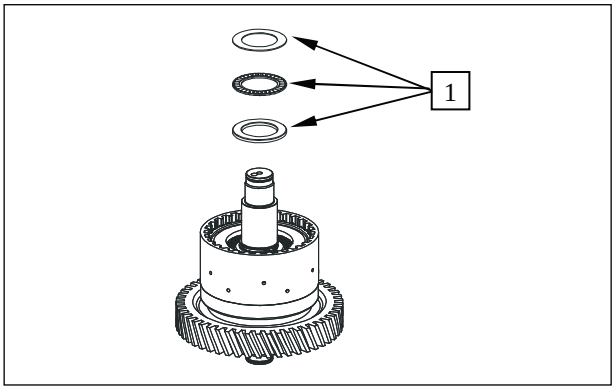


Figure 5

Remove axial bearing assy (1).

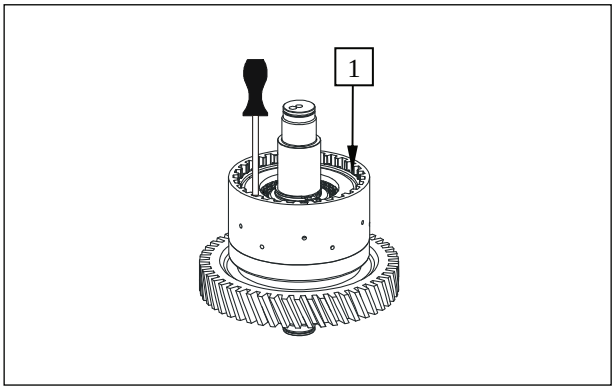


Figure 6

Remove snap ring (1).

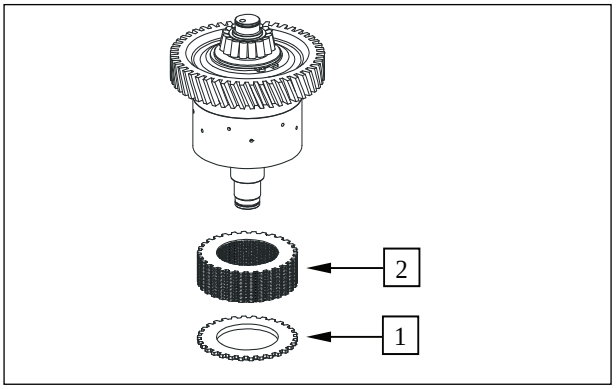


Figure 7

Remove end plate (1) and disk package (2) from the disk carrier.

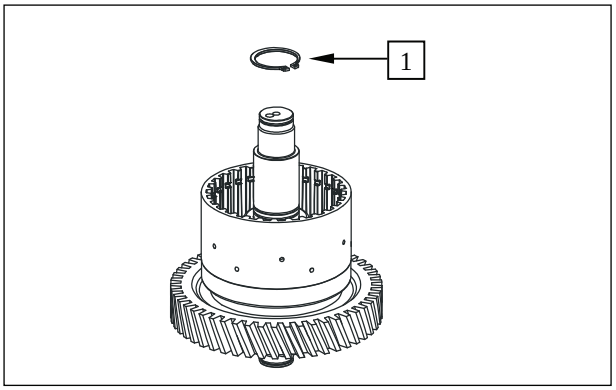


Figure 8

Remove retaining ring - contact position of axial bearing (1).

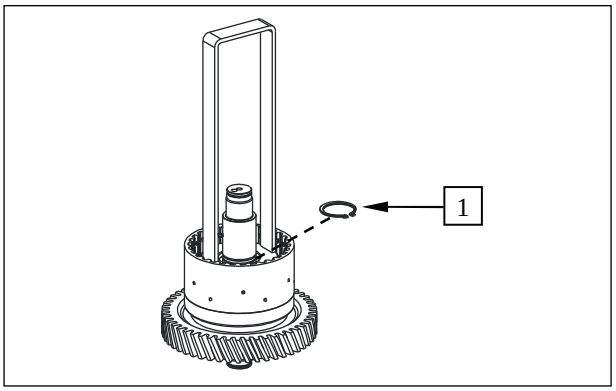


Figure 9

Preload compression spring and remove snap ring (1).
(S) Assembly aid 5870 345 114

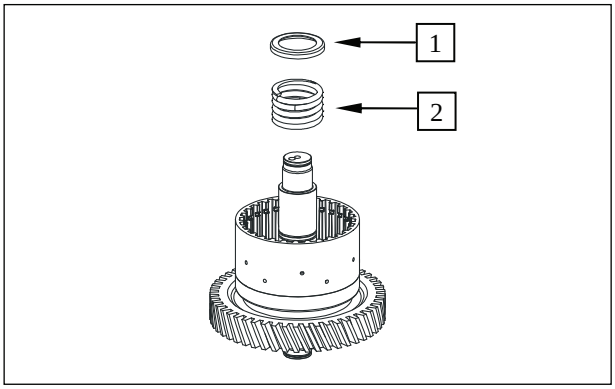


Figure 10

Remove spring cup (1) and compression spring (2).

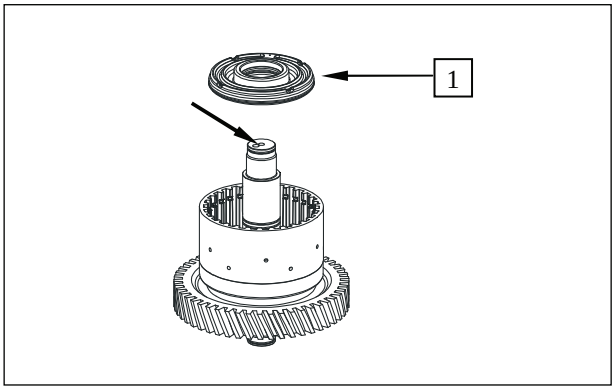


Figure 11

By means of compressed air (see arrow), press piston (1) off the shaft/disk carrier and remove it.

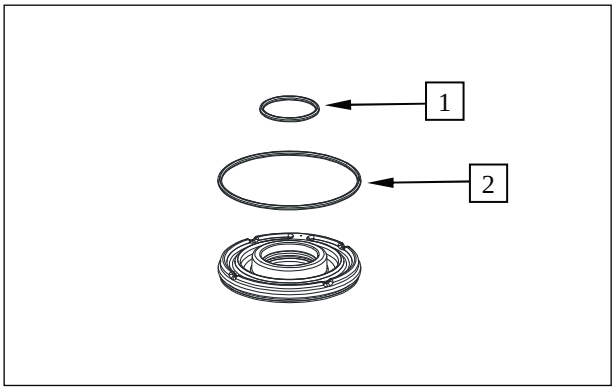


Figure 12

Remove both O-rings (1 and 2).

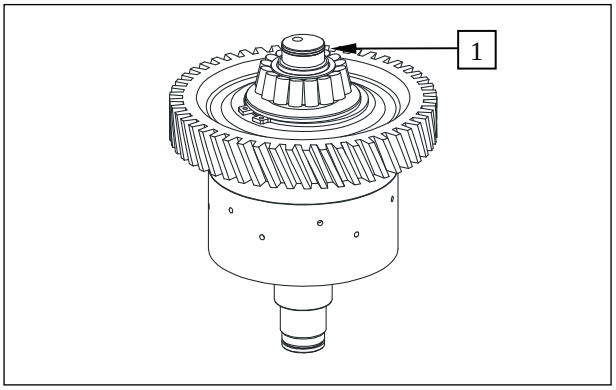


Figure 13

Snap out rectangular ring (1).

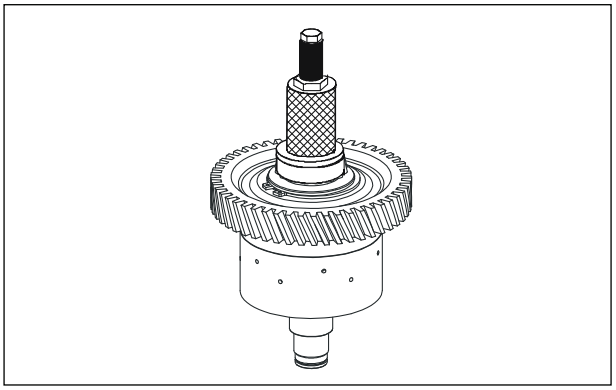


Figure 14

Pull tapered roller bearing (inner ring) off the shaft.

(S) Rapid grip 5873 011 011
(S) Extractor set 5870 026 100

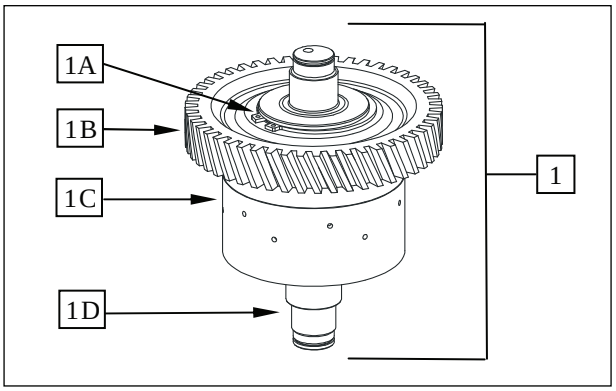


Figure 15

The clutch (1) cannot be disassembled!
It is supplied by the spare parts service only as a complete assy which consists of:

1A = Retaining ring
1B = Helical gear
1C = Disk carrier
1D = Shaft

Clutch KE

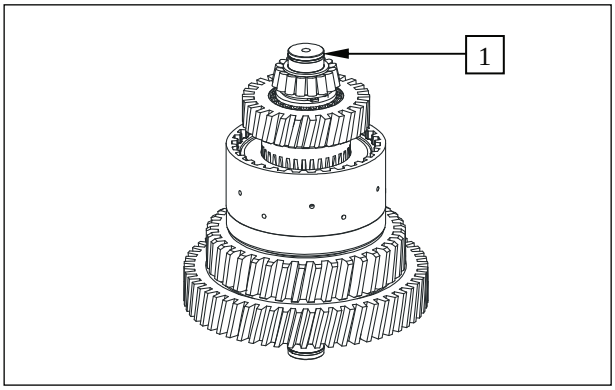


Figure 1

Snap out rectangular ring (1).

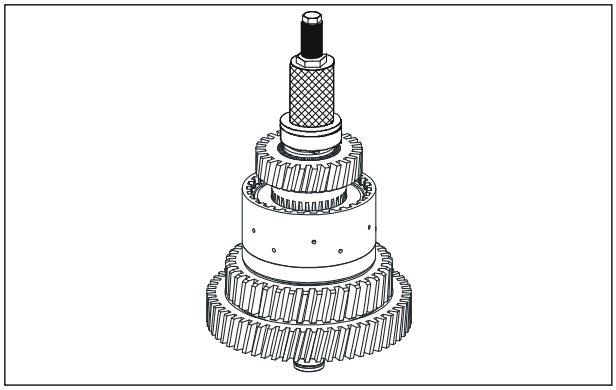


Figure 2

Pull tapered roller bearing (inner ring) off the shaft.

(S) Grab sleeve	5873 000 029
(S) Basic tool	5873 001 000

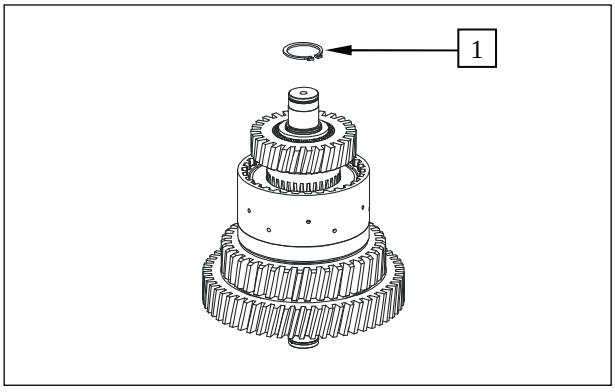


Figure 3

Remove retaining ring (1).

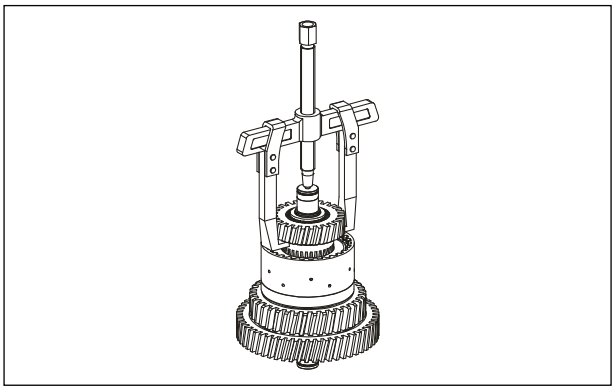


Figure 4

Remove bearing inner ring (1) and inner disk carrier (2).

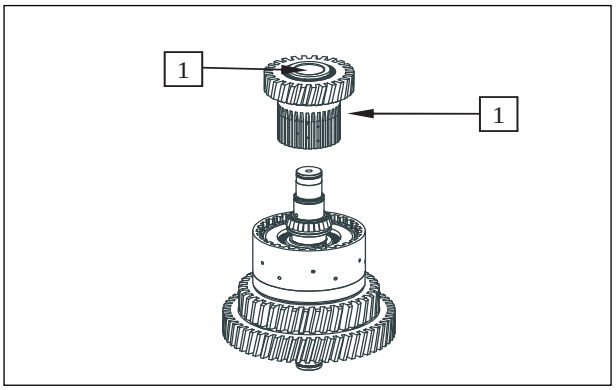


Figure 5

Remove tapered roller bearing (1) and inner disk carrier (2).

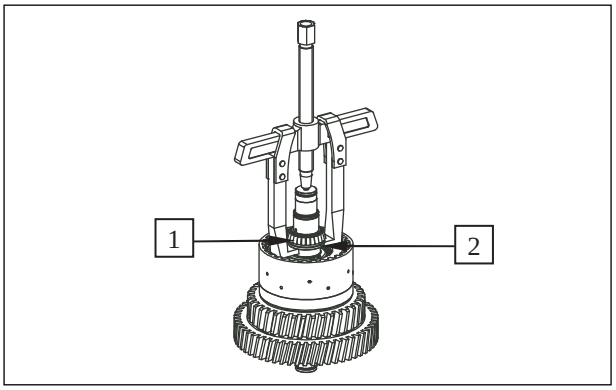


Figure 6

Pull off bearing inner ring (1) and running disk (2).

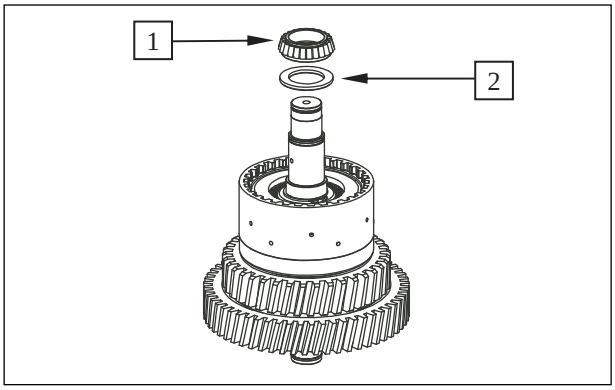


Figure 7

Remove bearing inner ring (1) and running disk (2).

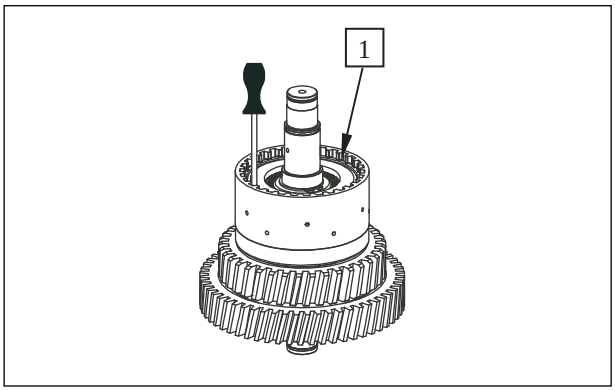


Figure 8

Disengage snap ring (1).

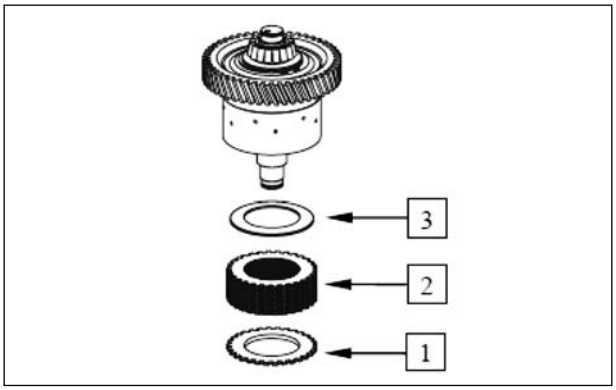


Figure 9

Remove end plate (1), disk package (2) and cup spring (3) from the disk carrier.

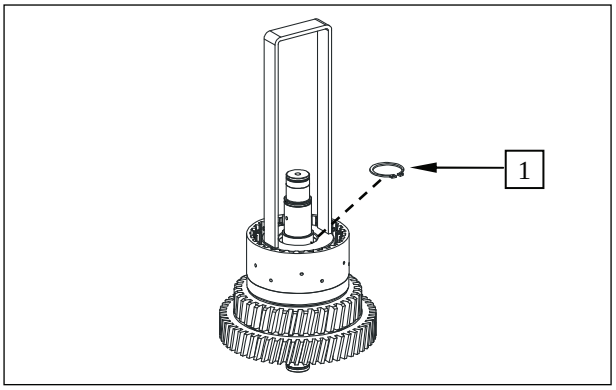


Figure 10

Preload compression spring and remove snap ring (1).
(S) Assembly aid 5870 345 114

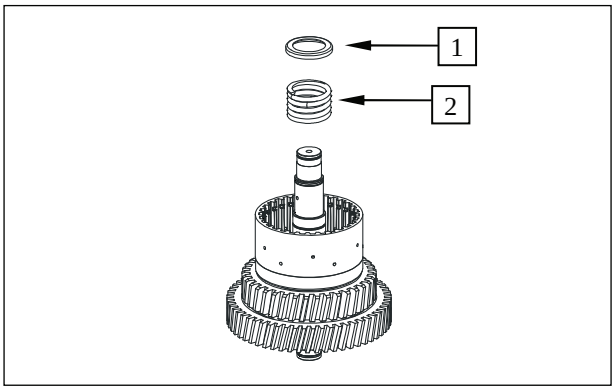


Figure 11

Remove spring cup (1) and compression spring (2).

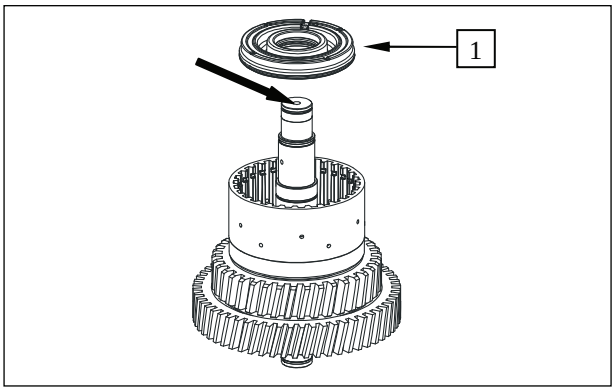


Figure 12

By means of compressed air (see arrow), press piston (1) off the shaft/disk carrier and remove it.

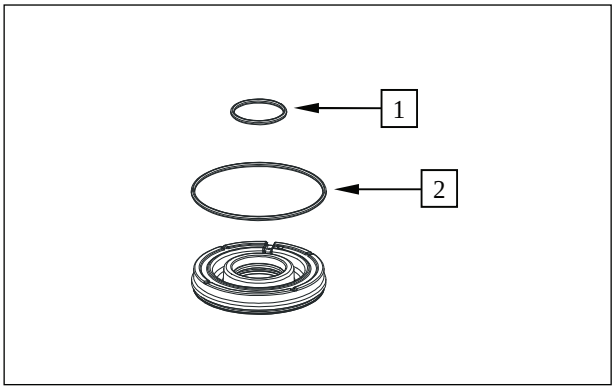


Figure 13

Remove both O-rings (1 and 2).

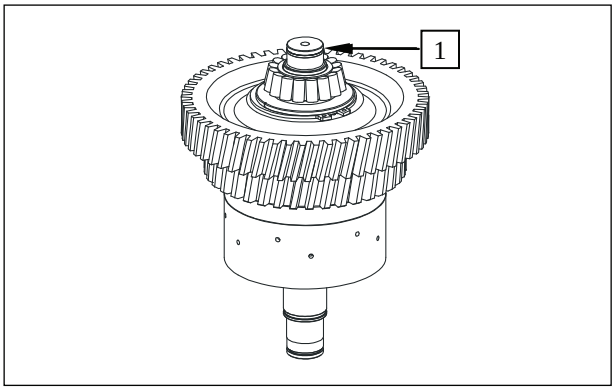


Figure 14

Snap out rectangular ring (1).

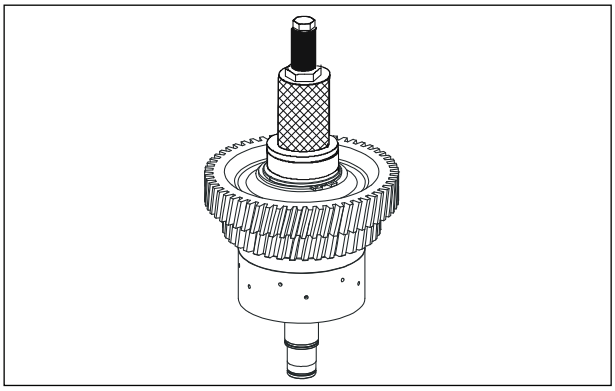


Figure 15

Pull tapered roller bearing (inner ring) off the shaft.

(S) Rapid grip	5873 011 011
(S) Basic tool	5873 001 000

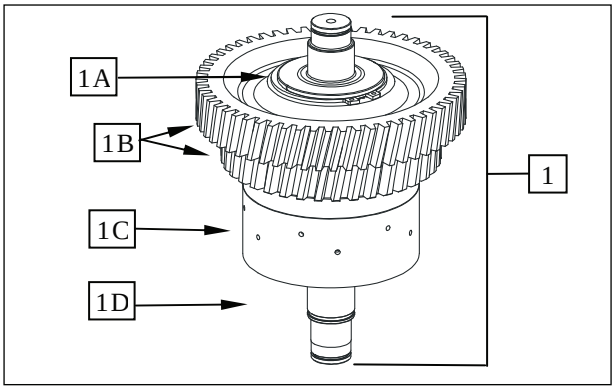


Figure 16

The clutch (1) cannot be disassembled!
It is supplied by the spare parts service only as a complete assy which consists of:

1A = Retaining ring
1B = Helical gears
1C = Disk carrier
1D = Shaft

Clutch KC

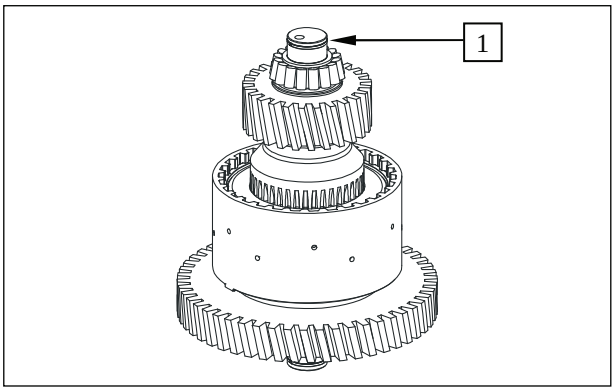


Figure 1

Snap out rectangular ring (1).

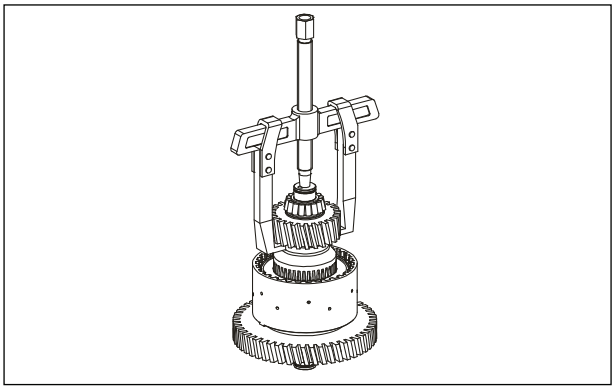


Figure 2

Pull off bearing inner ring with inner disk carrier (1).

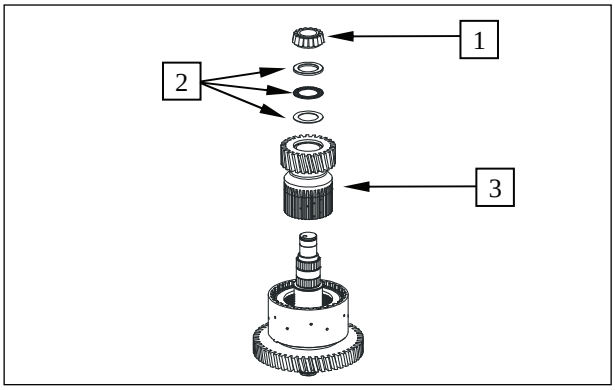


Figure 3

Remove bearing inner ring (1), axial bearing assy (2) and inner disk carrier (3).

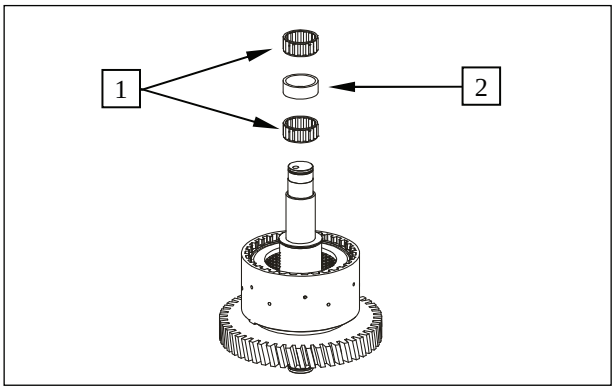


Figure 4

Remove needle cage (1) and bush (2).

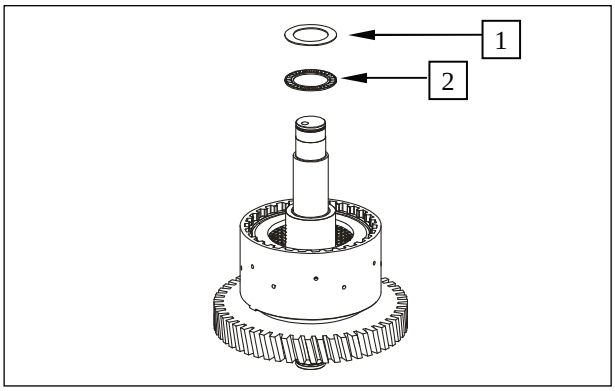


Figure 5

Remove axial disk (1) and axial needle cage (2).

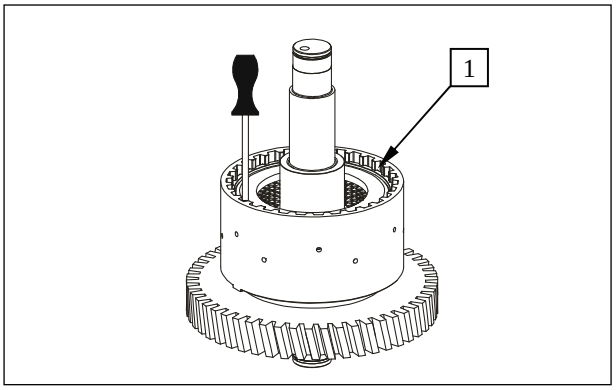


Figure 6

Disengage snap ring (1).

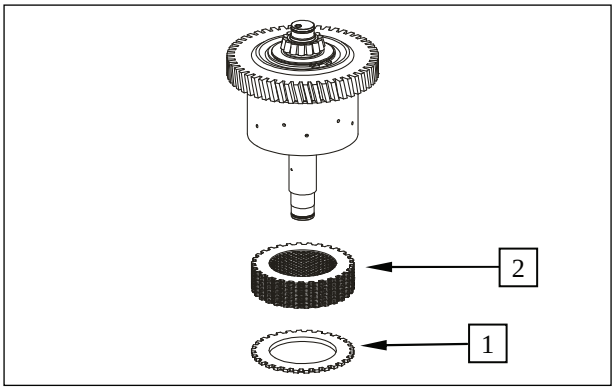


Figure 7

Remove end plate (1) and disk package (2) from the disk carrier.

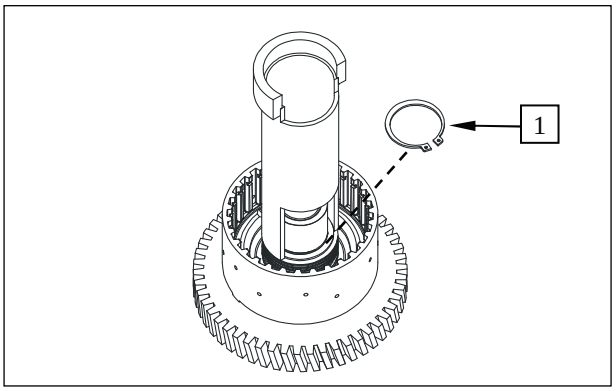


Figure 8

Preload compression springs and remove snap ring (1).

(S) Assembly aid 5870 506 128

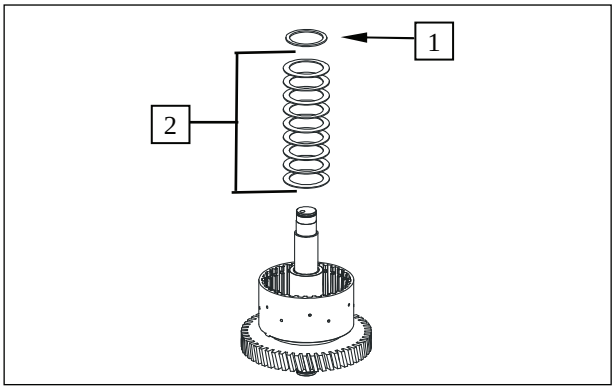


Figure 9

Remove disk (1) and cup springs (2).

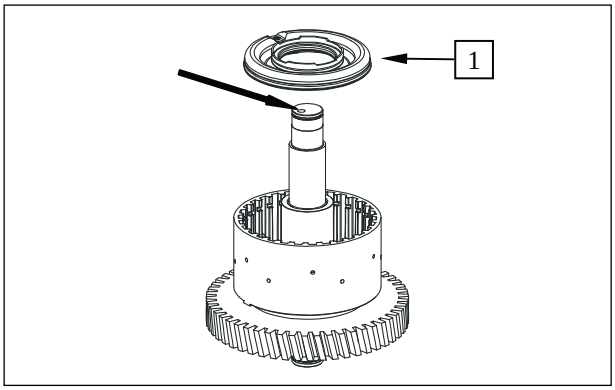


Figure 10

By means of compressed air (see arrow), press piston (1) off the shaft/disk carrier and remove it.

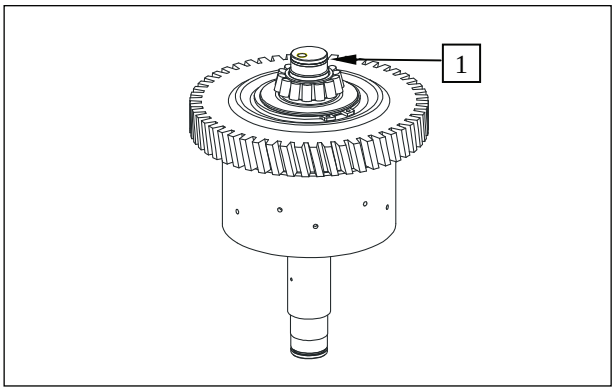


Figure 11

Snap out rectangular ring (1).

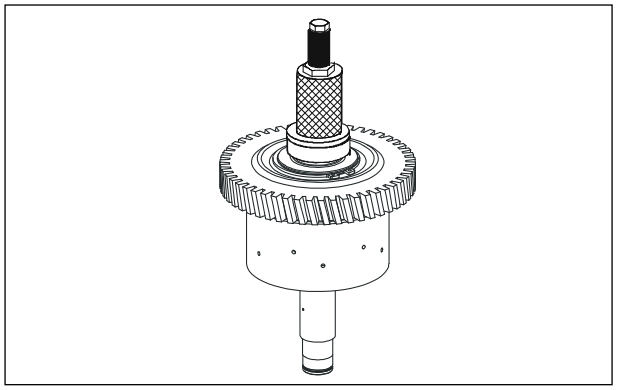


Figure 12

Pull tapered roller bearing (inner ring) off the shaft.

(S) Grab sleeve	5873 002 029
(S) Basic tool	5873 000 001

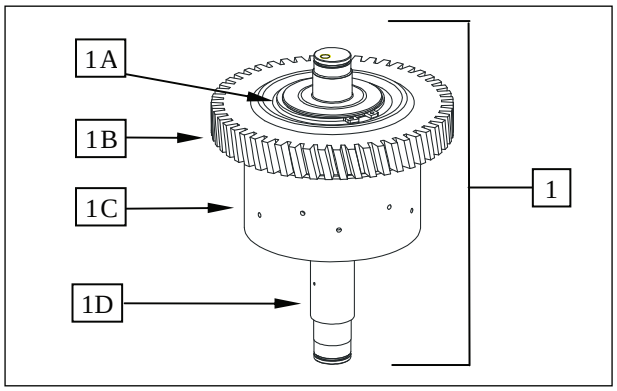


Figure 13

The clutch (1) cannot be disassembled!
It is supplied by the spare parts service only as a complete assy which consists of:

1A = Retaining ring
1B = Helical gear
1C = Disk carrier
1D = Shaft

Output shaft

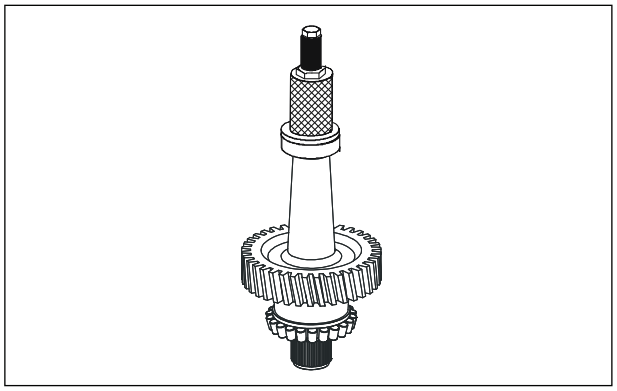


Figure 1

Pull the bearing inner ring off the output shaft.

(S) Grab sleeve	5873 000 029
(S) Basic tool	5873 000 001

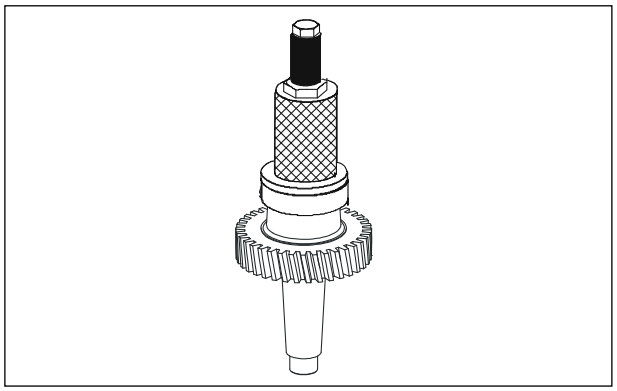


Figure 2

Rotate output shaft 180° and pull off bearing inner ring.

(S) Grab sleeve	5873 002 035
or	
(S) Rapid grip	5873 012 011
(S) Basic too	5873 002 000

Reassembly

Reassembly of clutches

Clutch KR

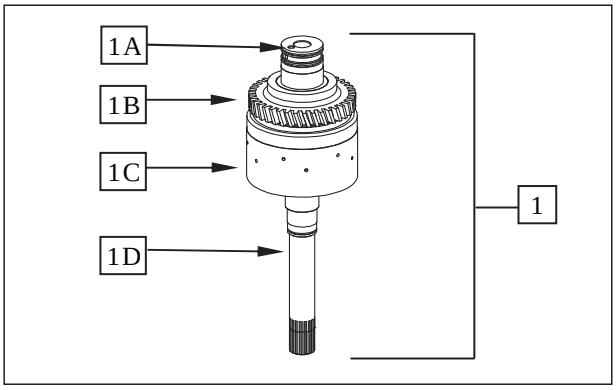


Figure 1

The clutch (1) is supplied by the spare parts service only as a complete assy which consists of:

1A = Ball
1B = Helical gear
1C = Disk carrier
1D = Input shaft

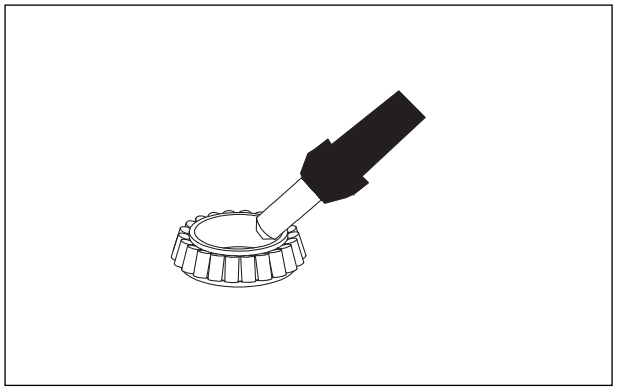


Figure 2

Heat up bearing inner ring (approx. 120° C).

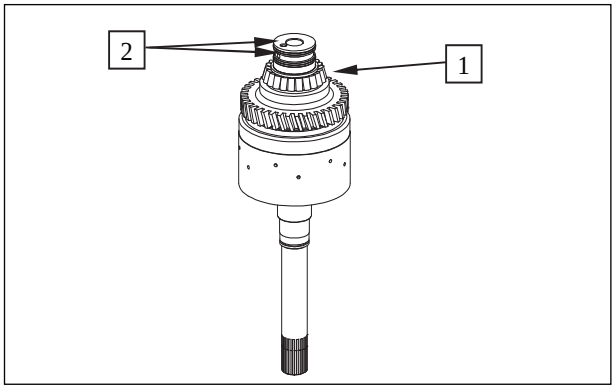


Figure 3

Mount bearing inner ring (1) until contact is obtained.
Fit rectangular rings 50x2.5 (2).

Wear protective gloves!

Adjust bearing inner ring after cooling-down.

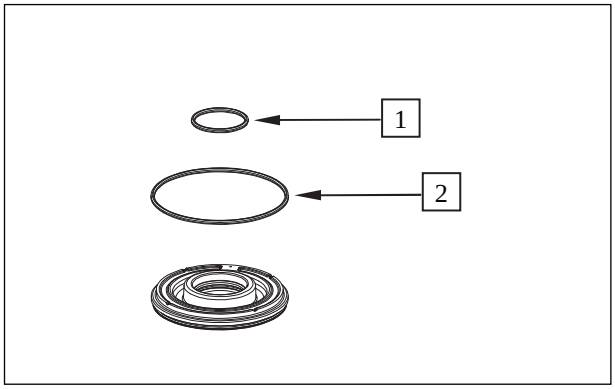


Figure 4

Insert both O-rings (1 and 2) into the piston grooves and oil them.

1 = 40x3
2 = 104.5x3

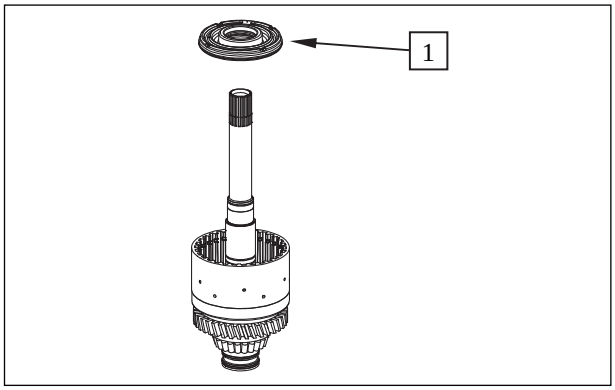


Figure 5

Insert piston (1) into the disk carrier.

Pay attention to the installation position, see Figure!

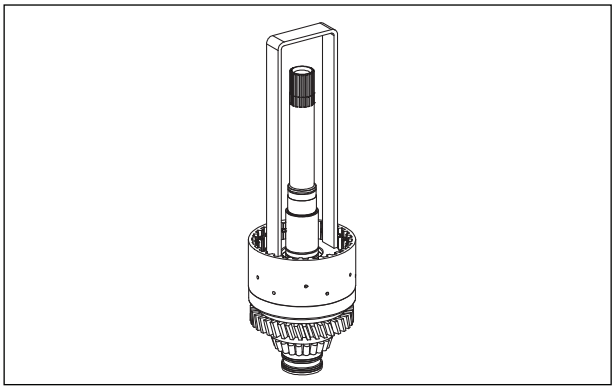


Figure 6

Use a hand-operated press to place piston into the disk carrier by means of the assembly aid.

(S) Assembly aid 5870 345 114

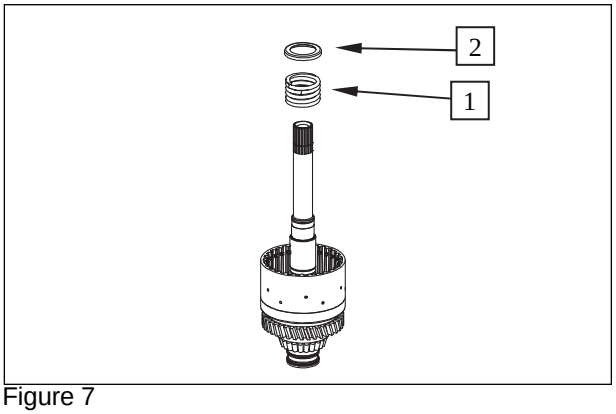


Figure 7

Mount compression spring (1) and cup spring (2).

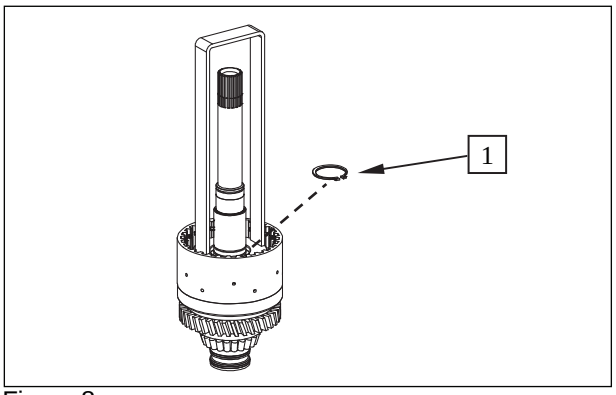


Figure 8

By means of the assembly aid, preload compression spring under a hand-operated press until the retaining ring 40x1.75 (1) can be snapped in.

(S) Assembly aid 5870 345 114

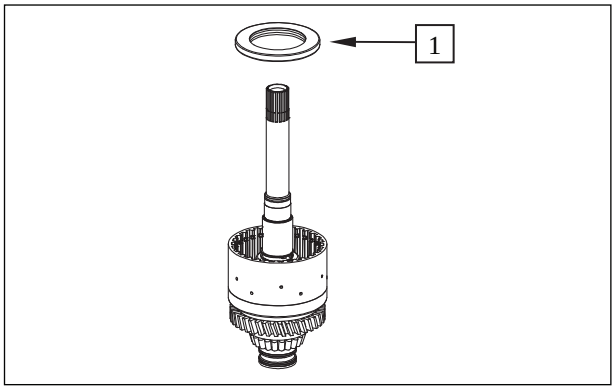


Figure 9

Mount plate assy with cup springs (1), with the open side showing towards the piston (see arrow).

☞ **Installation position plate . see Figure-10.**

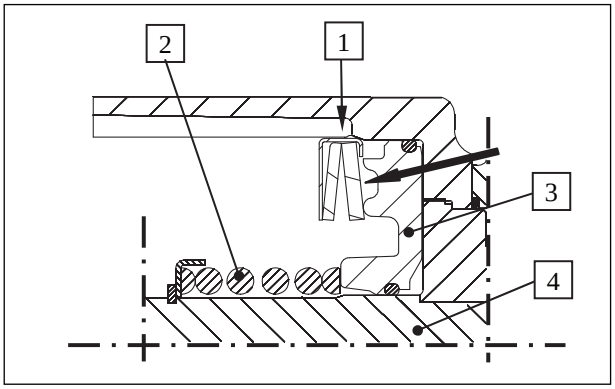


Figure 10

Fit plate (1) according to sketch (see arrow).

Legend:
1 = Plate with cup springs
2 = Compression spring with spring cup and retaining ring
3 = Piston with O-rings
4 = Clutch assy

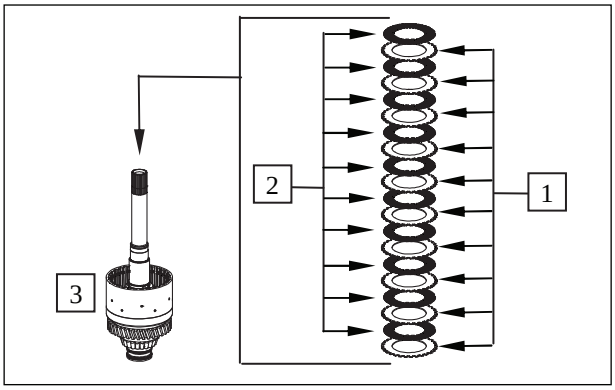


Figure 11

Install outer and inner disks alternately into the disk carrier (3) as shown in Figure 11.

Starting with an outer disk and ending with an inner disk.

Legend:
1 = Outer disks (10 pcs)
2 = Inner disks (10 pcs)
3 = Clutch assy

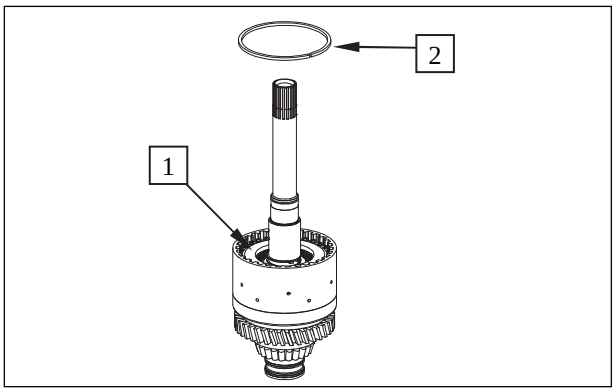


Figure 12

Mount end plate (1) with the flat side showing towards the disk package and fix it by means of snap ring (2) (e.g. thickness = 2.5 mm / recommended value).

Pay attention to the installation position of the end plate!

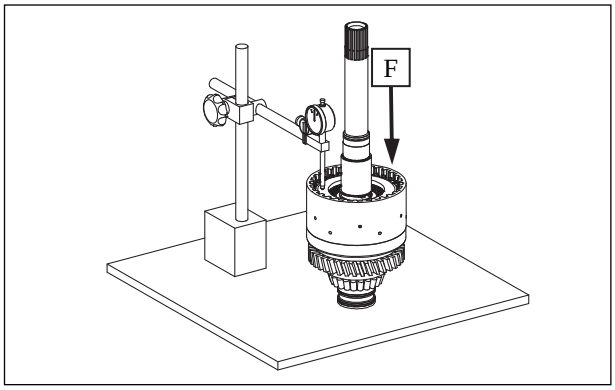


Figure 13

Equally press on end plate with F (approx. 100 N = 10 kg) and set dial indicator to .zero“.

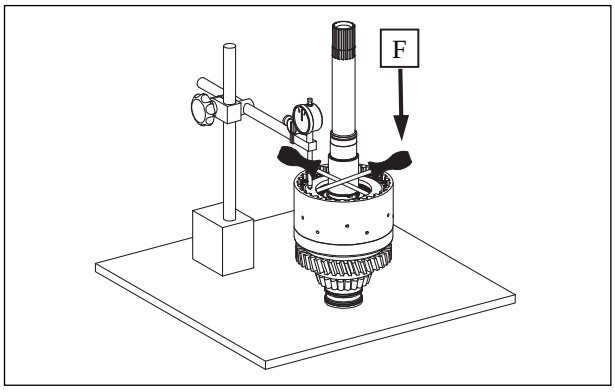


Figure 14

Then press end plate against the snap ring (upwards) and read the disk clearance.

Disk clearance: 2.2 to 2.6 mm

In case of deviations, the disk clearance must be corrected with an appropriate snap ring (optional thickness = 2.0….. 3.5 mm/available in steps of 0.25 mm)!

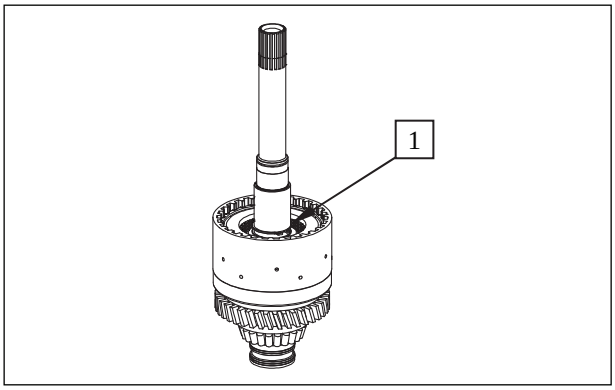


Figure 15

Snap retaining ring 40x1.75 (1) into the groove.

Contact for axial bearing - see Figure 16!

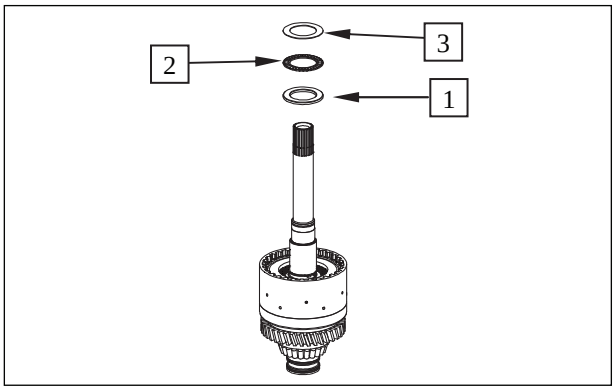


Figure 16

Mount running disk 40x60x3.5 (1), axial needle cage 40x60x3 (2) and axial washer 40x60x1 (3) and oil them.

Fit running disk (1), with the chamfer showing towards the retaining ring!

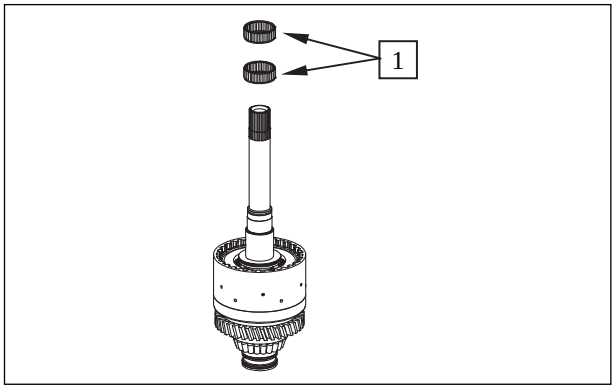


Figure 17

Mount needle cage 40x45x17 (1) and oil it.

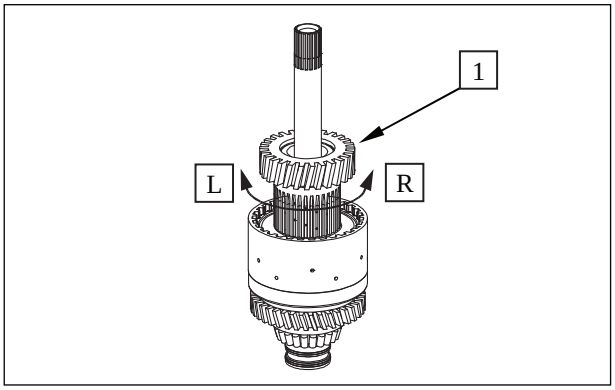


Figure 18

Mount inner disk carrier until contact is obtained.

Install inner disks by short ccw/cw rotations of the inner disk carrier (1).

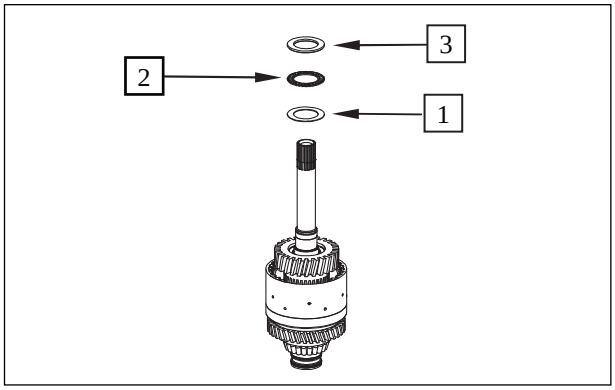


Figure 19

Mount axial washer 40x60x1 (1), axial needle cage 40x60x3 (2) and running disk (3) 40x60x3.5 and oil them.

Fit running disk (3), with the chamfer showing towards the tapered roller bearing!

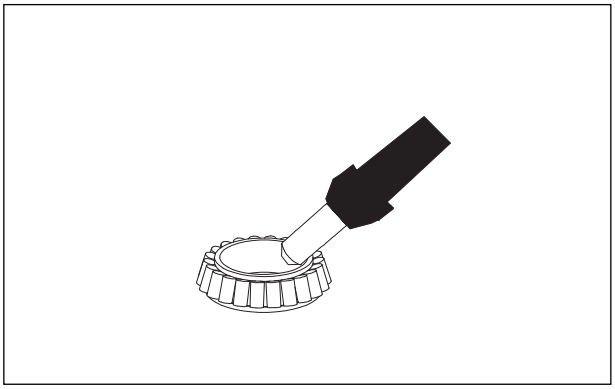


Figure 20

Heat up bearing inner ring (approx. 120° C).

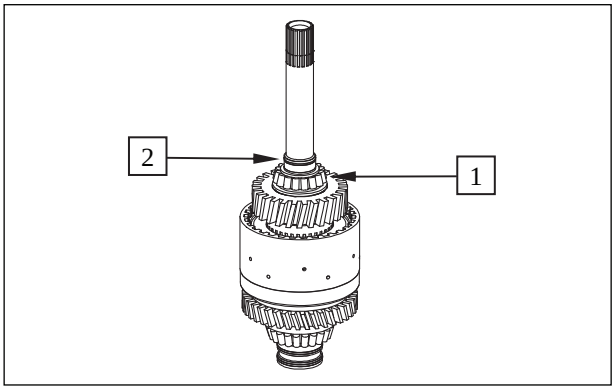


Figure 21

Mount bearing inner ring (1) until contact is obtained.

Fit rectangular ring 30x2 (2).

Wear protective gloves!

Adjust bearing inner ring after cooling-down.

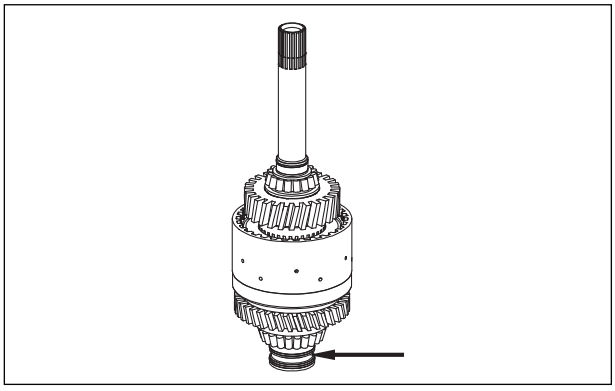


Figure 22

Check closing and opening of the clutch by means of compressed air at the hole (see arrow).
Closing and opening of the clutch must be clearly audible.

Clutch KV

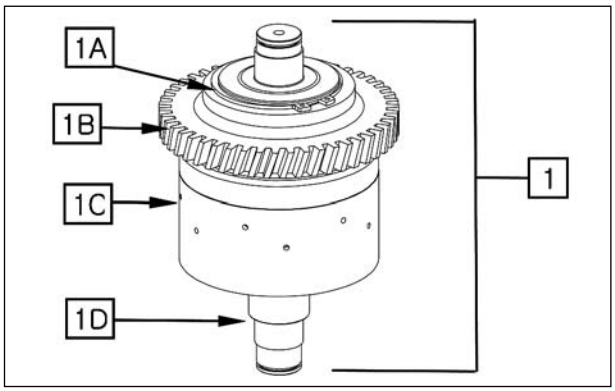


Figure 1

The clutch (1) is supplied by the spare parts service only as a complete assy which consists of:

1A = Retaining ring
1B = Helical gear
1C = Disk carrier
1D = Shaft

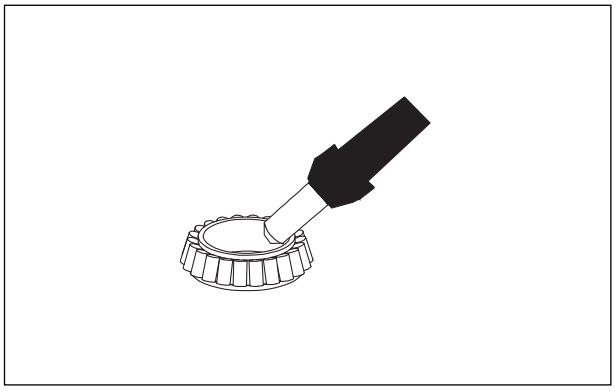


Figure 2

Heat up bearing inner ring (approx. 120° C).

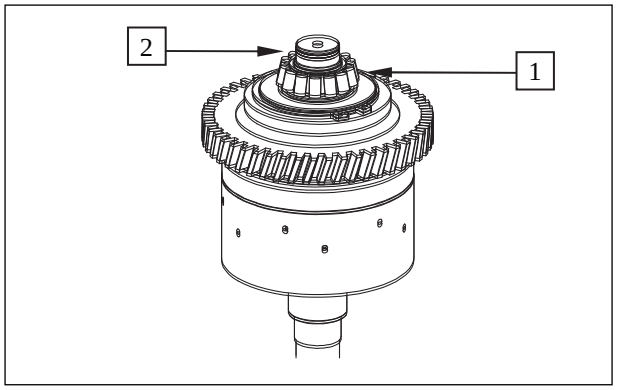


Figure 3

Mount bearing inner ring (1) until contact is obtained.

Fit rectangular rings 30x2 (2).

Wear protective gloves!

Adjust bearing inner ring after cooling-down.

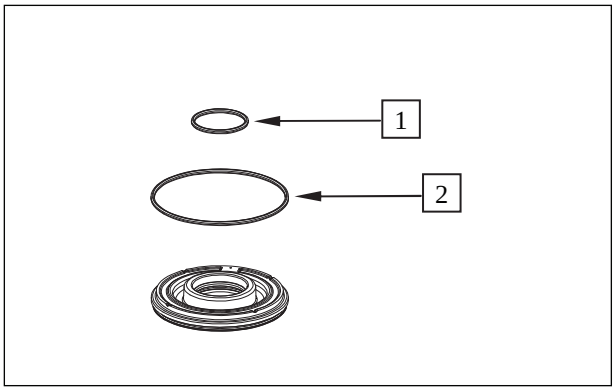


Figure 4

Insert both O-rings (1 and 2) into the piston grooves and oil them.

1 = 40x3
2 = 104.5x3

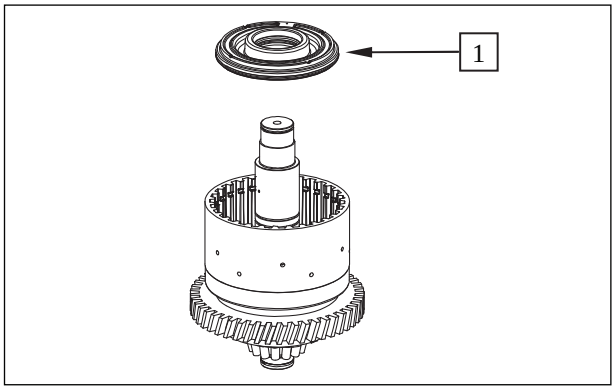


Figure 5

Insert piston (1) into the disk carrier.

Pay attention to the installation position, see Figure!

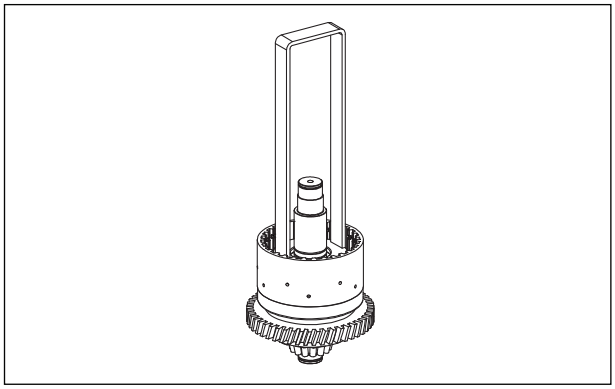


Figure 6

Use a hand-operated press to place piston into the disk carrier by means of the assembly aid.

(S) Assembly aid 5870 345 114

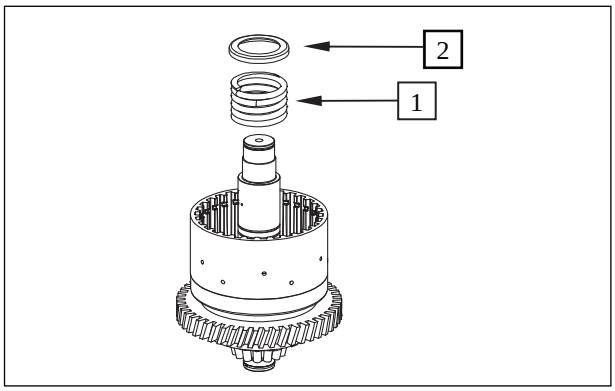


Figure 7

Mount compression spring (1) and spring cup (2).

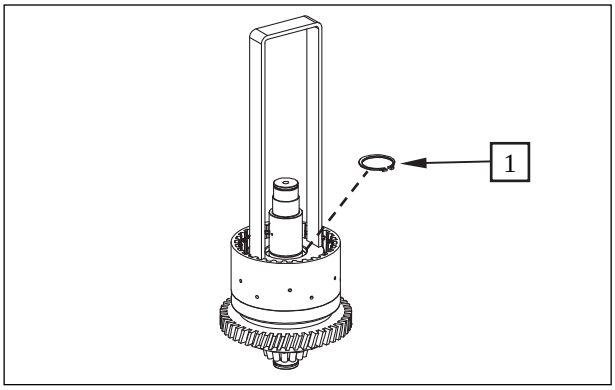


Figure 8

By means of the assembly aid, preload compression spring under a hand-operated press until the retaining ring 40x1.75 (1) can be snapped in.

(S) Assembly aid 5870 345 114

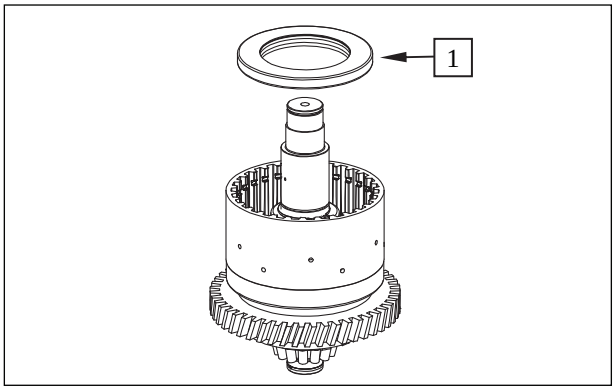


Figure 9

Mount plate assy with cup springs (1), with the open side showing towards the piston (see arrow).

☞ **Installation position plate . see Figure-10.**

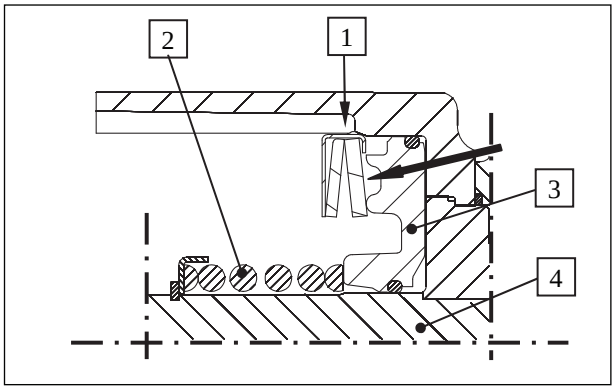


Figure 10

Fit plate (1) according to sketch (see arrow).

Legend:
1 = Plate with cup springs
2 = Compression spring with cup spring and retaining ring
3 = Piston with O-rings
4 = Clutch assy

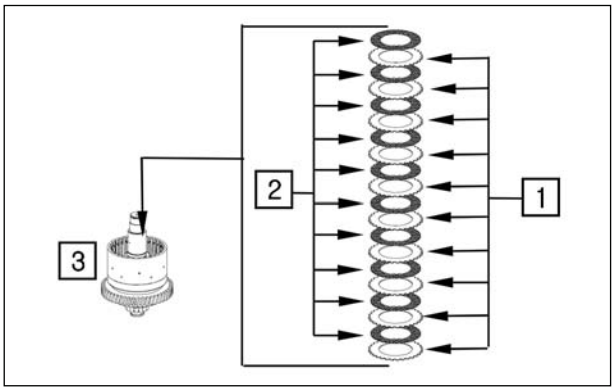


Figure 11

Install outer and inner disks alternately into the disk carrier (3) as shown in Figure 11.

Starting with an outer disk and ending with an inner disk.

Legend:

1 = Outer disks (10 pcs)
2 = Inner disks (10 pcs)
3 = Clutch assy

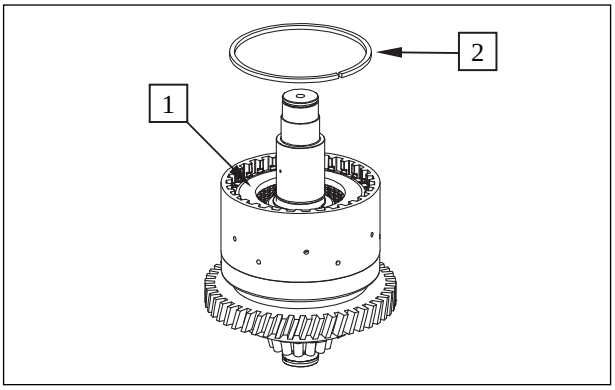


Figure 12

Mount end plate (1) with the flat side showing towards the disk package and fix it by means of snap ring (2) (e.g. thickness = 2.5 mm / recommended value).

Pay attention to the installation position of the end plate!

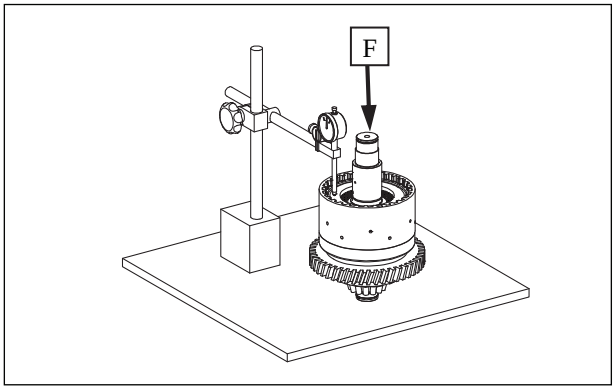


Figure 13

Equally press on end plate with F (approx. 100 N = 10 kg) and set dial indicator to .zero“.

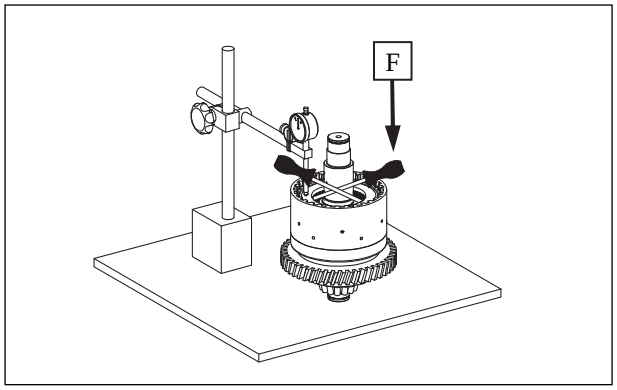


Figure 14

Then press end plate against the snap ring (upwards) and read the disk clearance.

Disk clearance: 2.2 to 2.6 mm

In case of deviations, the disk clearance must be corrected with an appropriate snap ring (optional thickness = 2.0 …... 3.5 mm/available in steps of 0.25 mm)!

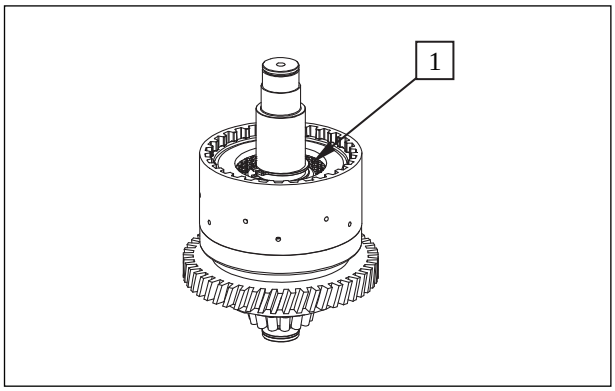


Figure 15

Snap retaining ring 40x1.75 (1) into the groove.

Contact for axial bearing - see Figure 16!

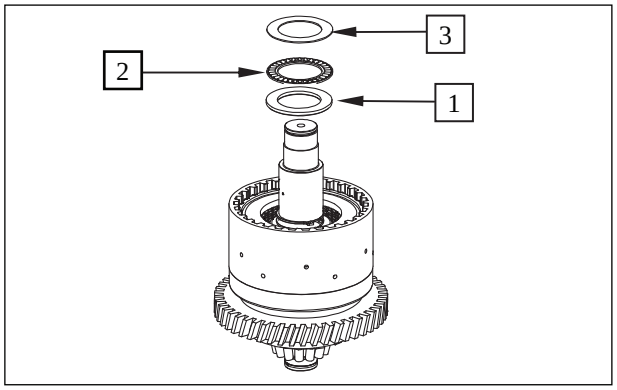


Figure 16

Mount running disk 40x60x3.5 (1), axial needle cage 40x60x3 (2) and axial washer 40x60x1 (3) and oil them.

Fit running disk (1), with the chamfer showing towards the retaining ring!

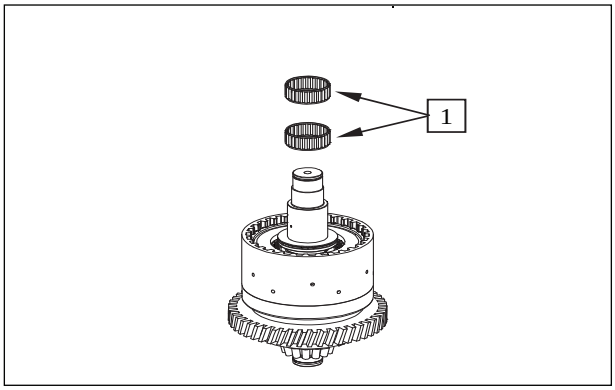


Figure 17

Mount needle cage 40x45x17 (1) and oil it.

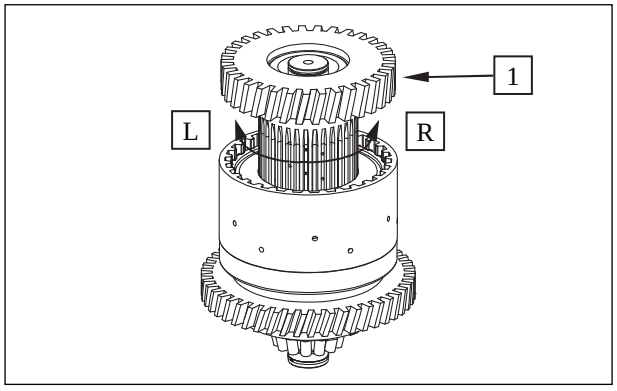


Figure 18

Mount inner disk carrier until contact is obtained.

Install inner disks by short ccw/cw rotations of the inner disk carrier (1).

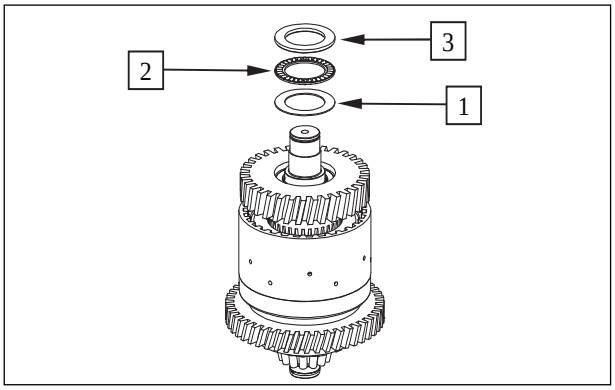


Figure 19

Mount axial washer 40x60x1 (1), axial needle cage 40x60x3 (2) and running disk (3) 40x60x3.5 and oil them.

Fit running disk (3), with the chamfer showing towards the tapered roller bearing!

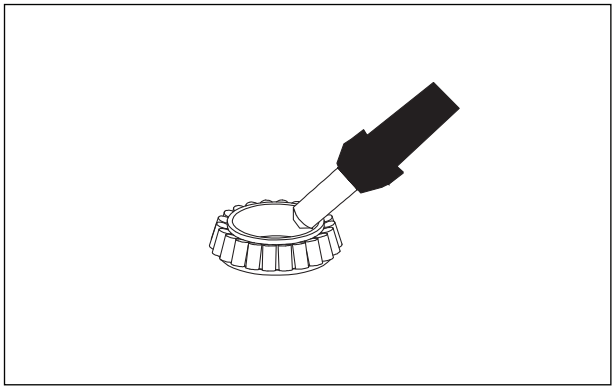


Figure 20

Heat up bearing inner ring (approx. 120° C).

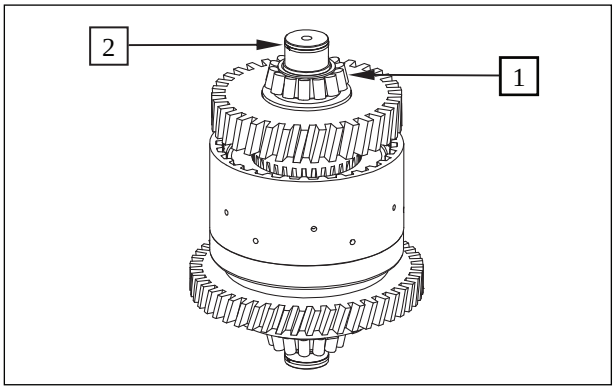


Figure 21

Mount bearing inner ring (1) until contact is obtained.

Fit rectangular ring 30x2 (2).

Wear protective gloves!

Adjust bearing inner ring after cooling-down.

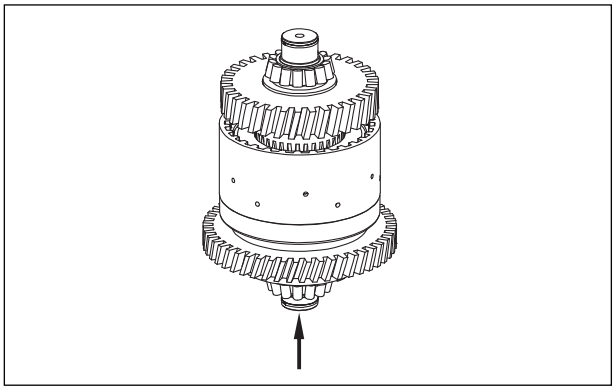


Figure 22

Check closing and opening of the clutch by means of compressed air at the hole (see arrow).
Closing and opening of the clutch must be clearly audible.

Clutch KD

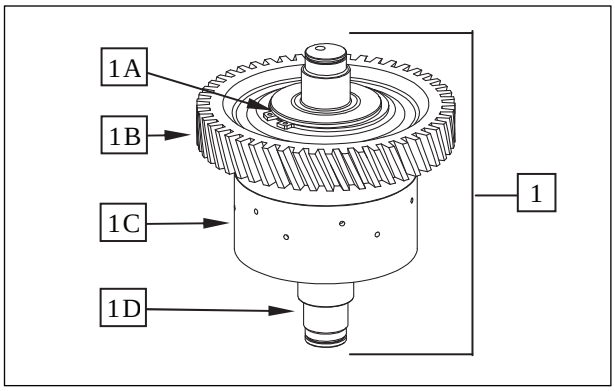


Figure 1

The clutch (1) is supplied by the spare parts service only as a complete assy which consists of:

1A = Retaining ring
1B = Helical gear
1C = Disk carrier
1D = Shaft

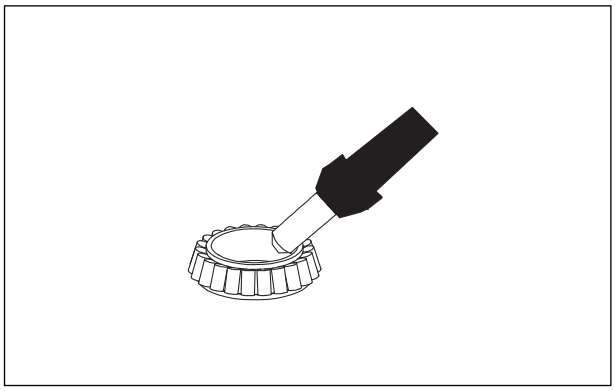


Figure 2

Heat up bearing inner ring (approx. 120° C).

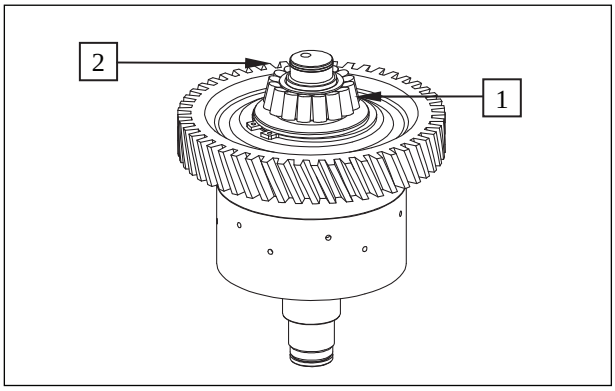


Figure 3

Mount bearing inner ring (1) until contact is obtained.

Fit rectangular rings 30x2 (2).

Wear protective gloves!

Adjust bearing inner ring after cooling-down.

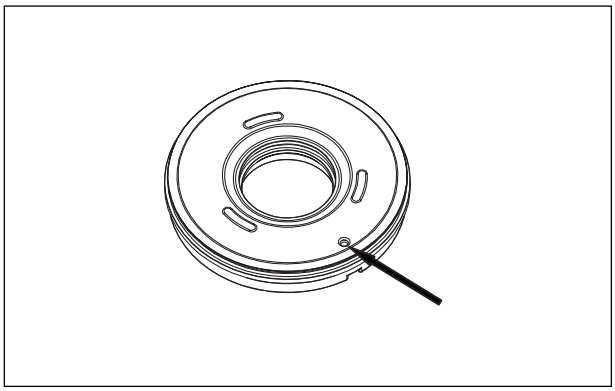


Figure 4

Piston (1) with drain valve.

Check function of the drain valve (2). There must be no jamming of the ball (see arrow).

The piston (1) is supplied by the spare parts service only as a complete assy!

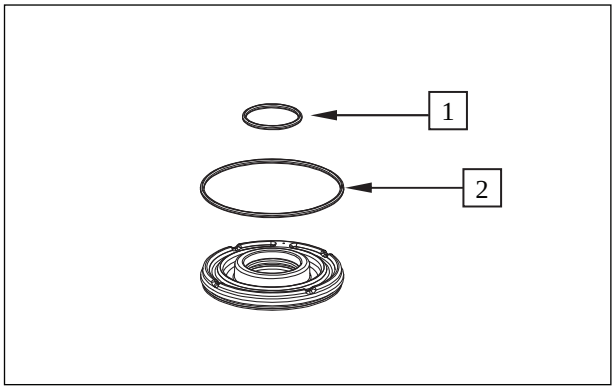


Figure 5

Insert both O-rings (1 and 2) into the piston grooves and oil them.

1 = 40x3
2 = 104.5x3

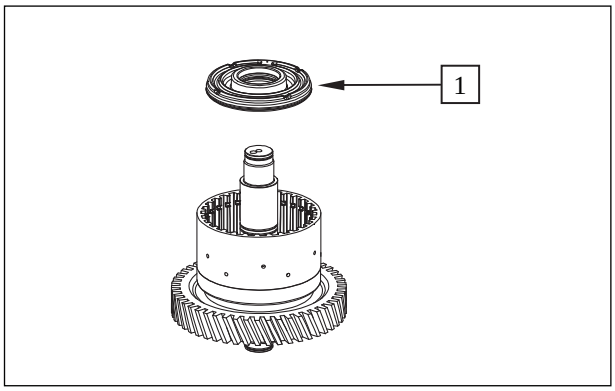


Figure 6

Insert piston (1) into the disk carrier.

Pay attention to the installation position, see Figure!

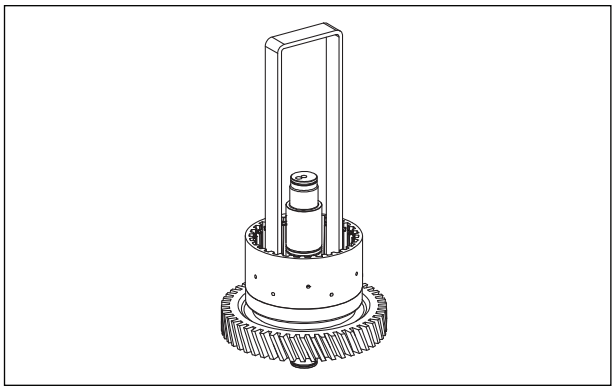


Figure 7

Use a hand-operated press to place piston into the disk carrier by means of the assembly aid.

(S) Assembly aid 5870 345 114

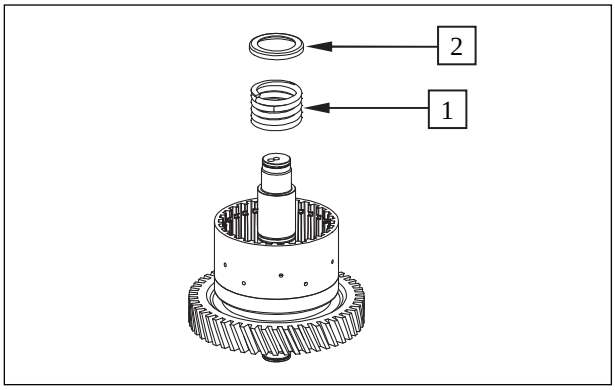


Figure 8

Mount compression spring (1) and spring cup (2).

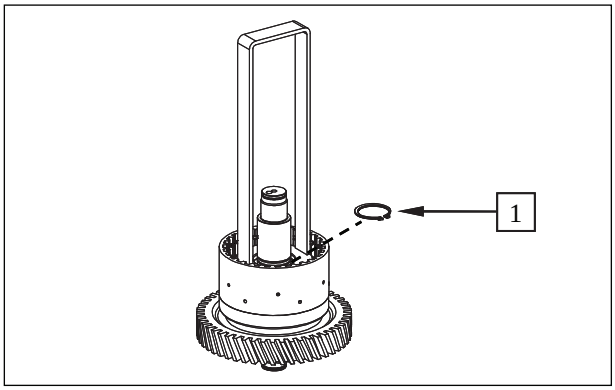


Figure 9

By means of the assembly aid, preload compression spring under a hand-operated press until the retaining ring 40x1.75 (1) can be snapped in.

(S) Assembly aid 5870 345 114

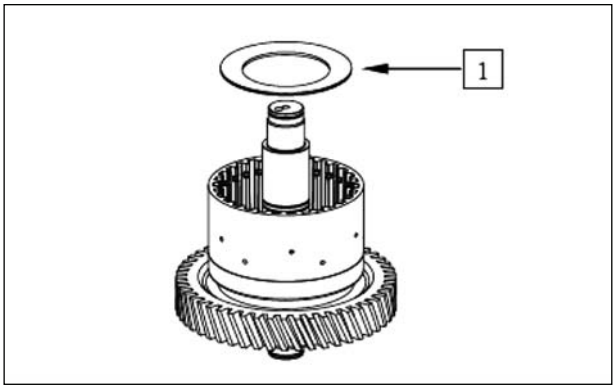


Figure 10

Cup spring (1) into the disk carrier

Pay attention to the installation position, see Figure-13!

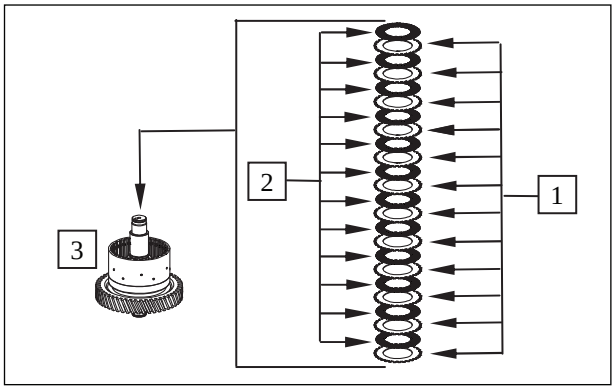


Figure 11

Install outer and inner disks alternately into the disk carrier (3) as shown in Figure 10.

Starting with an outer disk and ending with an inner disk.

Legend:

1 = Outer disks (12 pcs)
2 = Inner disks (12 pcs)
3 = Clutch assy

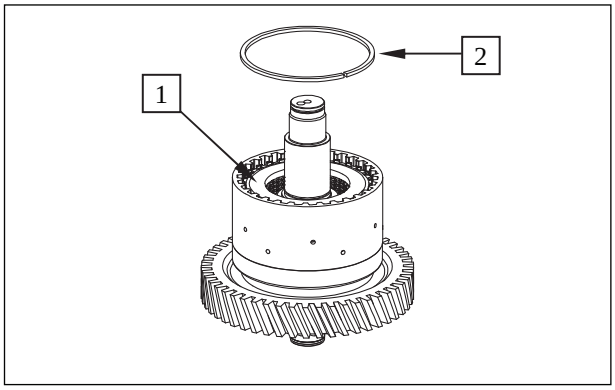


Figure 12

Mount end plate (1) with the flat side showing towards the disk package and fix it by means of snap ring (2) (e.g. thickness = 2.5 mm / recommended value).

Pay attention to the installation position of the end plate!

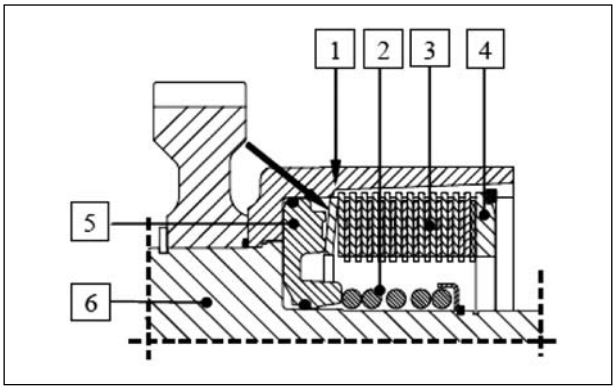


Figure 13

Cap spring (1) according to sketch (see arrow)

Legend:

1 = Cup spring
2 = Compression spring with spring cup and retaining ring
3 = Inner clutch and outer clutch disc
4 = End shim
5 = Piston with O-rings
6= Clutch assy

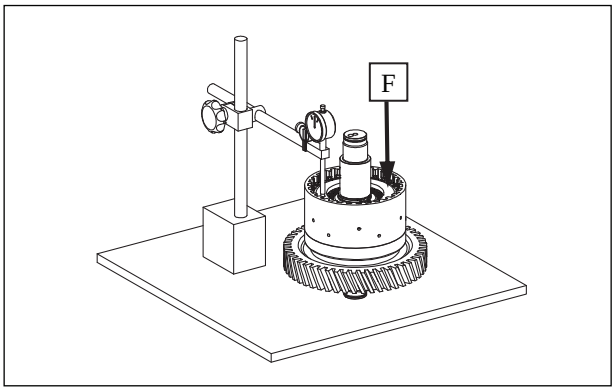


Figure 14

Equally press on end plate with F (approx. 100 N = 10 kg) and set dial indicator to .zero“.

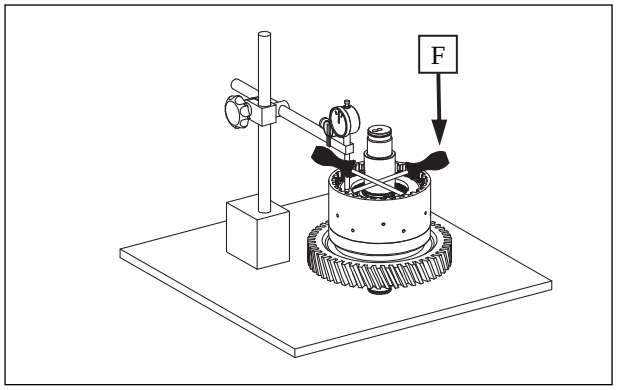


Figure 15

Then press end plate against the snap ring (upwards) and read the disk clearance.

☞ **Disk clearance: 2.6 to 3.1 mm**

☞ **In case of deviations, the disk clearance must be corrected with an appropriate snap ring (optional thickness = 2.0 …... 3.5 mm/available in steps of 0.25 mm)!**

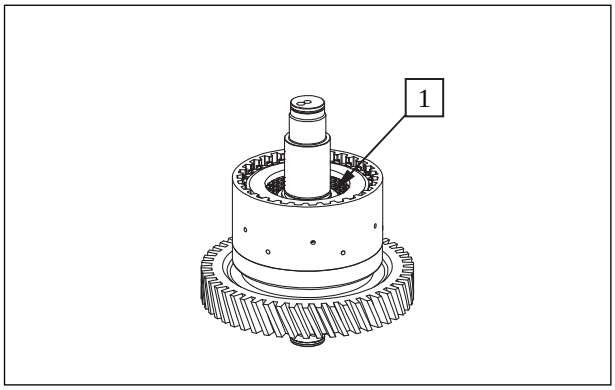


Figure 16

Snap retaining ring 40x1.75 (1) into the groove.

☞ **Contact for axial bearing . see Figure 15!**

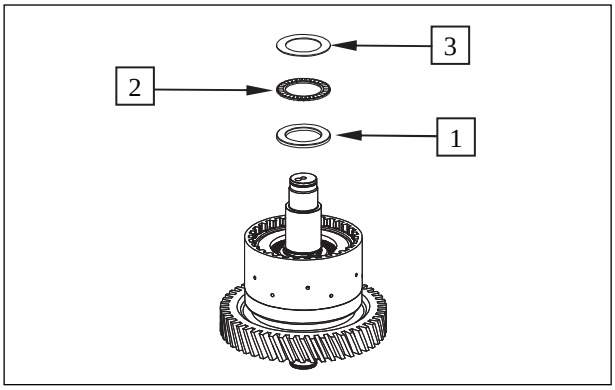


Figure 17

Mount running disk 40x60x3.5 (1), axial needle cage 40x60x3 (2) and axial washer 40x60x1 (3) and oil them.

Fit running disk (1), with the chamfer showing towards the retaining ring!

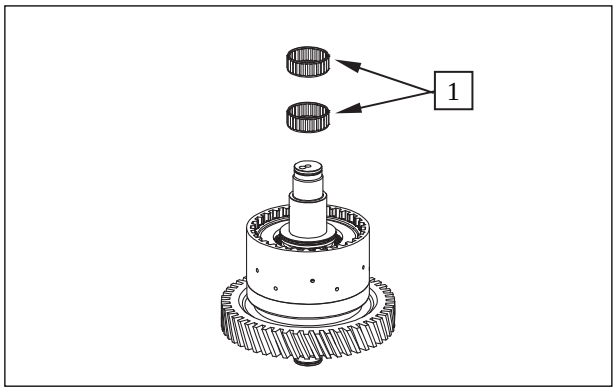


Figure 18

Mount needle cage 40x45x17 (1) and oil it.

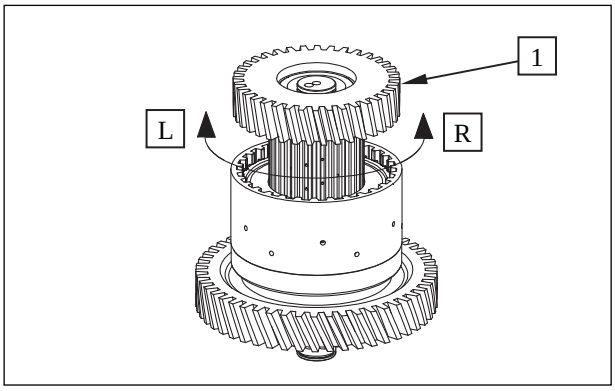


Figure 19

Mount inner disk carrier until contact is obtained.

Install inner disks by short ccw/cw rotations of the inner disk carrier (1).

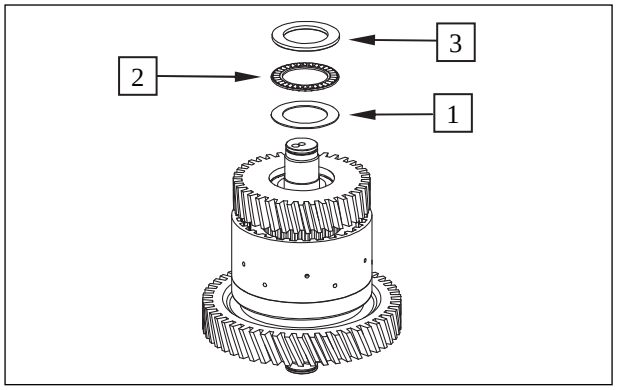


Figure 20

Mount axial washer 40x60x1 (1), axial needle cage 40x60x3 (2) and running disk (3) 40x60x3.5 and oil them.

Fit running disk (3), with the chamfer showing towards the tapered roller bearing!

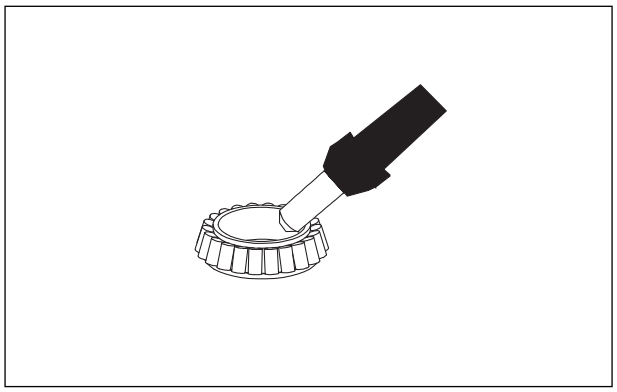


Figure 21

Heat up bearing inner ring (approx. 120° C).

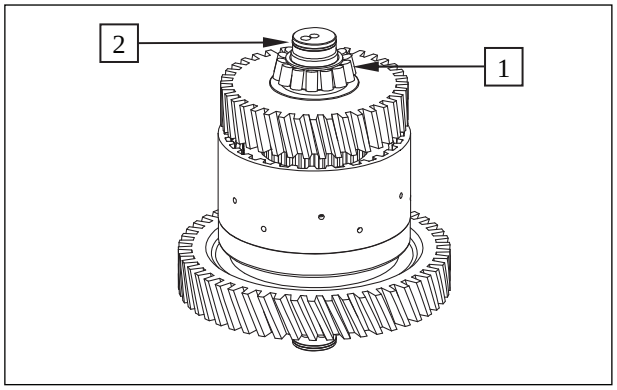


Figure 22

Mount bearing inner ring (1) until contact is obtained.

Fit rectangular ring 30x2 (2).

Wear protective gloves!

Adjust bearing inner ring after cooling-down.

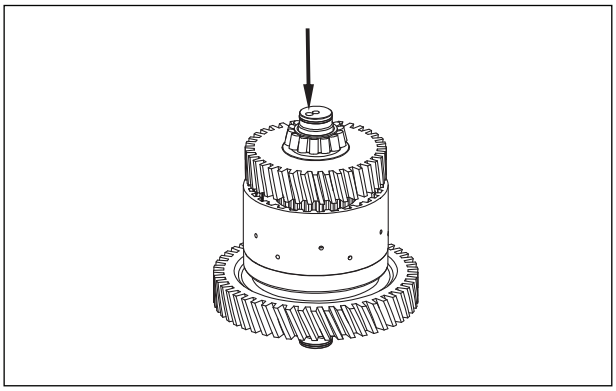


Figure 23

Check closing and opening of the clutch by means of compressed air at the hole (see arrow).
Closing and opening of the clutch must be clearly audible.

Clutch KE

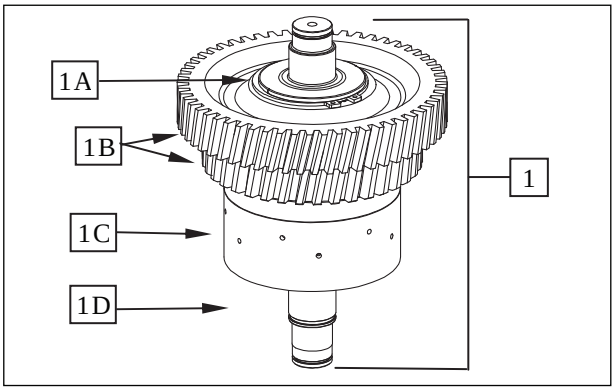


Figure 1

The clutch (1) is supplied by the spare parts service only as a complete assy which consists of:

1A = Retaining ring
1B = Helical gear
1C = Disk carrier
1D = Shaft

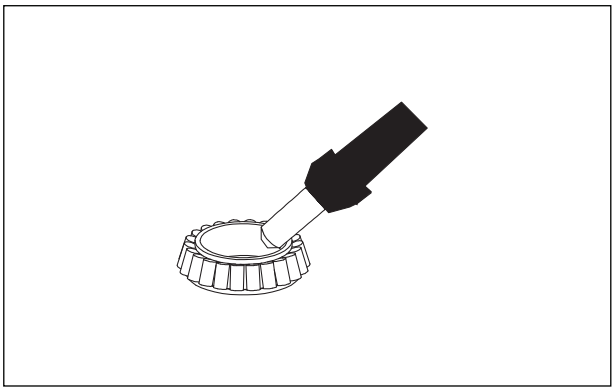


Figure 2

Heat up bearing inner ring (approx. 120° C).

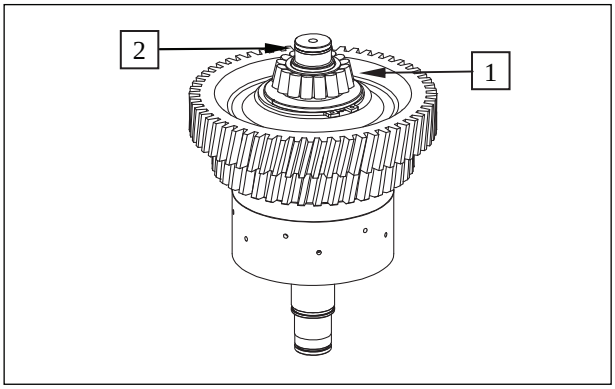


Figure 3

Mount bearing inner ring (1) until contact is obtained.

Fit rectangular ring 30x2 (2).

Wear protective gloves!

Adjust bearing inner ring after cooling-down.

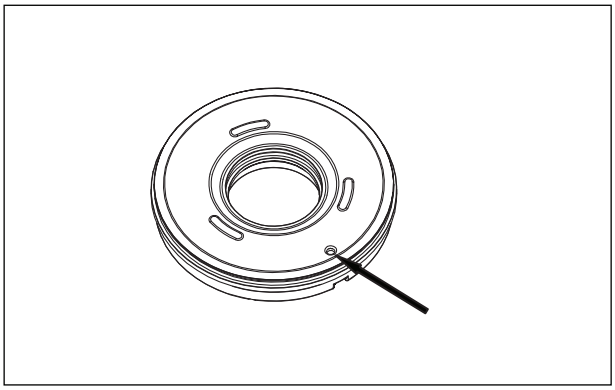


Figure 4

Piston (1) with drain valve.

Check function of the drain valve(2). There must be no jamming of the ball (see arrow).

The piston (1) is supplied by the spare parts service only as a complete assy!

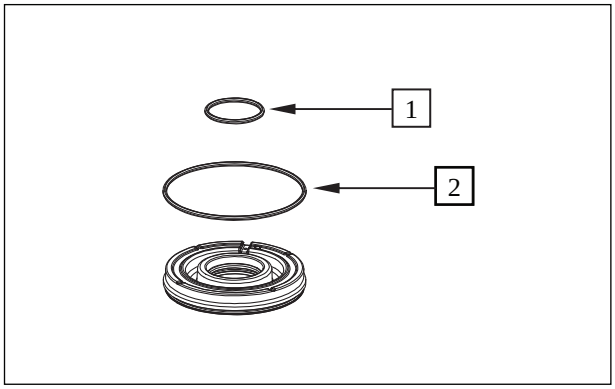


Figure 5

Insert both O-rings (1 and 2) into the piston grooves and oil them.

1 = 40x3
2 = 104.5x3

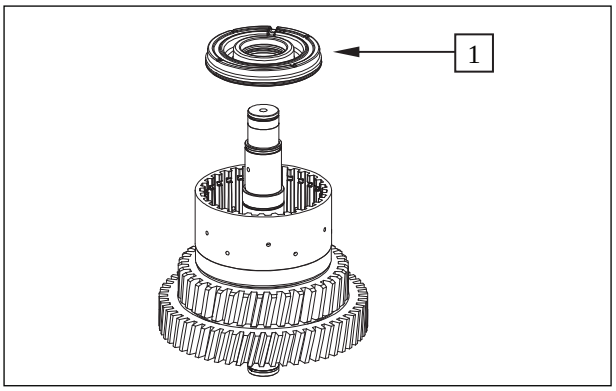


Figure 6

Insert piston (1) into the disk carrier.

Pay attention to the installation position, see Figure!

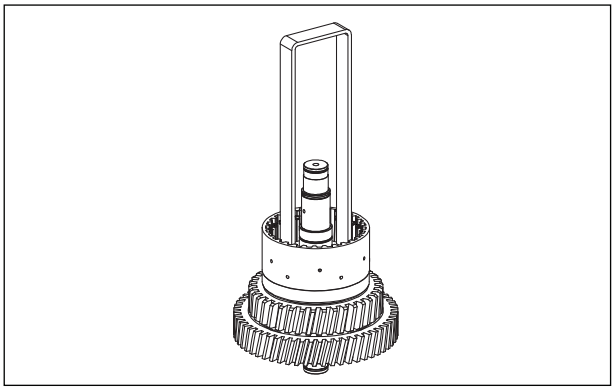


Figure 7

Use a hand-operated press to place piston into the disk carrier by means of the assembly aid.

(S) Assembly aid 5870 345 114

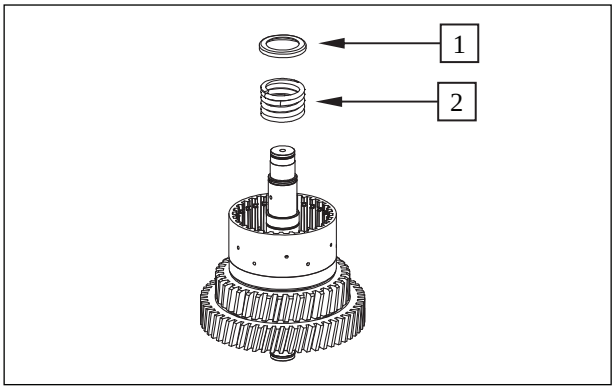


Figure 8

Mount compression spring (1) and spring cup (2).

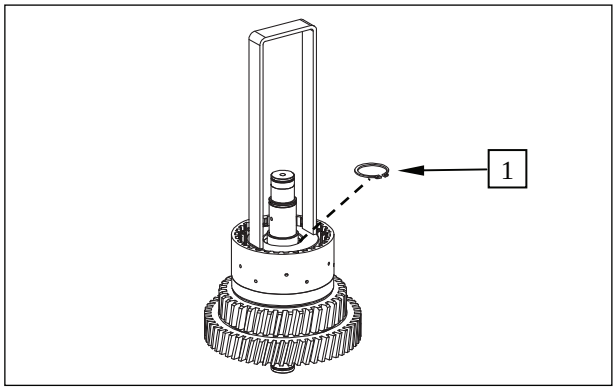


Figure 9

By means of the assembly aid, preload compression spring under a hand-operated press until the retaining ring 40x1.75 (1) can be snapped in.

(S) Assembly aid 5870 345 114

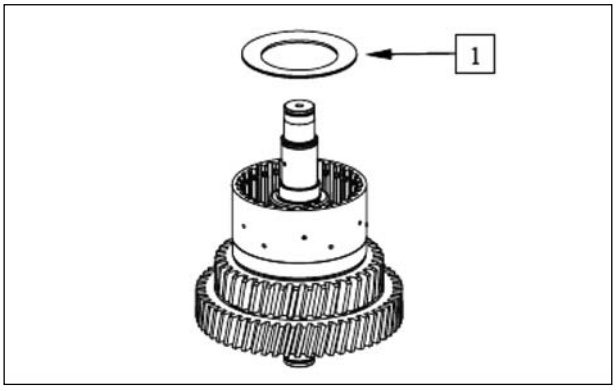


Figure 10

Cup spring (1) into the disk carrier.

Pay attention to the installation position, see Figure-13!

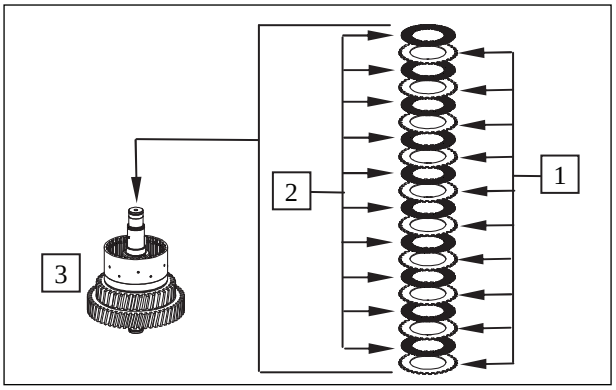


Figure 11

Install outer and inner disks alternately into the disk carrier (3) as shown in Figure 10.

Starting with an outer disk and ending with an inner disk.

Legend:

1 = Outer disks (10 pcs)
2 = Inner disks (10 pcs)
3 = Clutch assy

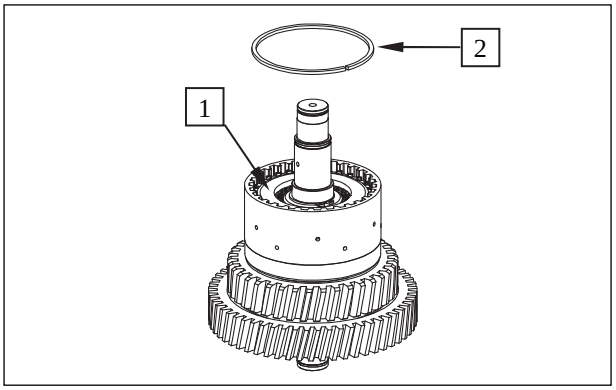


Figure 12

Mount end plate (1) with the flat side showing towards the disk package and fix it by means of snap ring (2) (e.g. thickness = 2.5 mm / recommended value).

Pay attention to the installation position of the end plate!

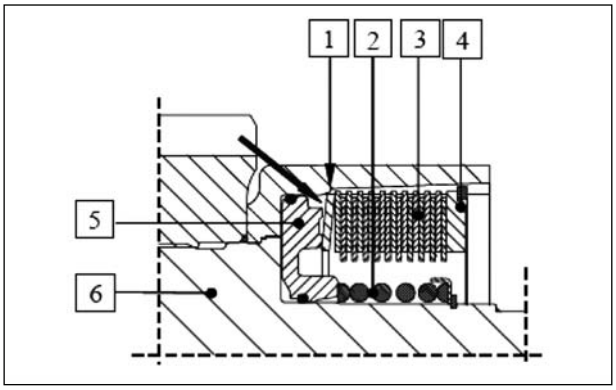


Figure 13

Cap spring (1) according to sketch (see arrow)

Legend:

1 = Cup spring
2 = Compression spring with spring cup and retaining ring
3 = Inner clutch and outer clutch disc
4 = End shim
5 = Piston with O-rings
6= Clutch assy

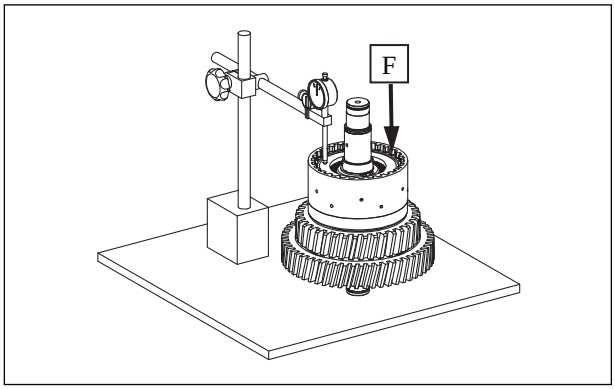


Figure 14

Equally press on end plate with F (approx. 100 N = 10 kg) and set dial indicator to .zero“.

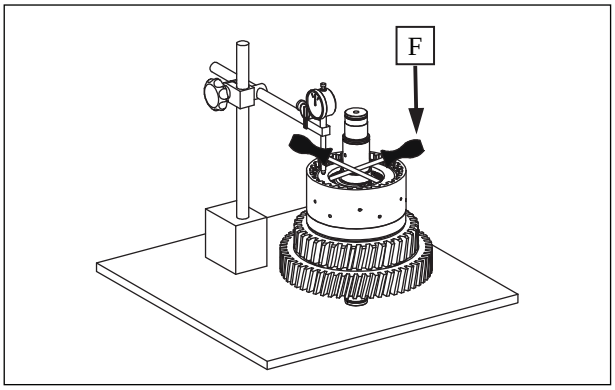


Figure 15

Then press end plate against the snap ring (upwards) and read the disk clearance.

☞ **Disk clearance: 2.2 to 2.6 mm**

☞ **In case of deviations, the disk clearance must be corrected with an appropriate snap ring (optional thickness = 2.0 …... 3.5 mm/available in steps of 0.25 mm)!**

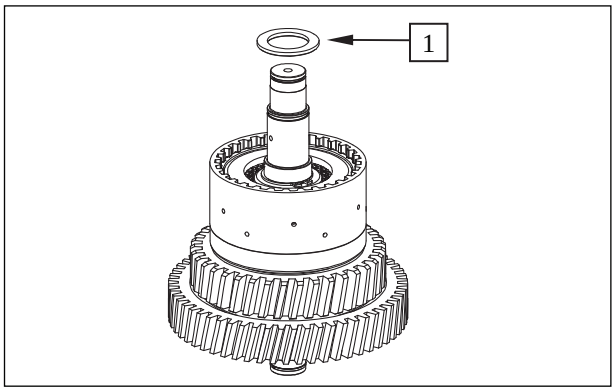


Figure 16

Mount running disk 35x52x3.5 (1).

☞ **Fit running disk (1), with the chamfer showing towards the retaining ring!**

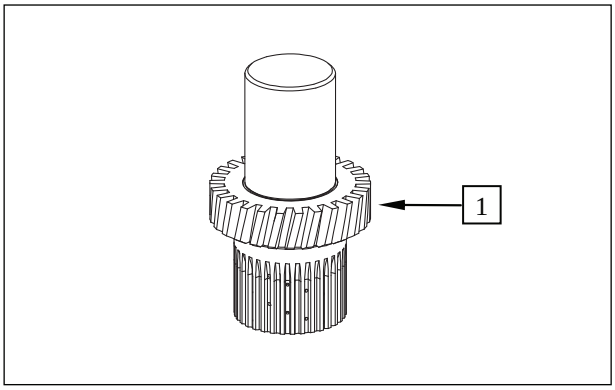


Figure 17

Press in both bearing outer rings into the inner disk carrier until contact is obtained.

Then mount the bearing inner rings.

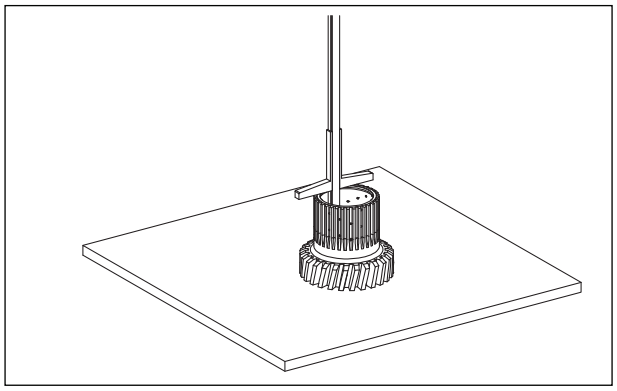


Figure 18

Setting of axial play of the inner disk carrier bearing ±0.05 mm (see Figure-16 to 21):

Determine dimension.X2“ of the inner disk carrier
→ see Figure 17

Calculation example:

Dimension A…… 97.00 mm
Dimension B…… - 57.00 mm
Dimension X2 …… = 40.00 mm

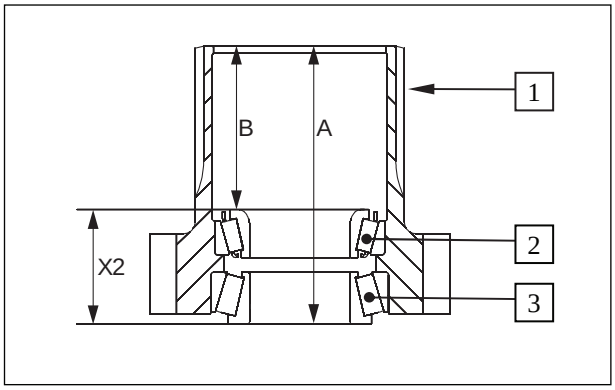


Figure 19

Legend:

1 = Inner disk carrier
2 = Tapered roller bearing 59x35x16
3 = Tapered roller bearing 62x35x18

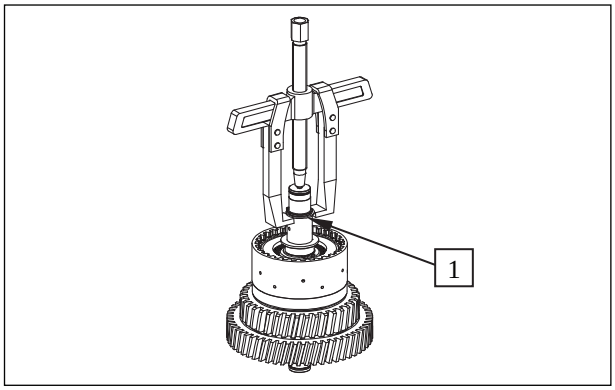


Figure 20

Mount the retaining ring e.g. 35x2.0 (1) and bring it into contact position by means of a two-armed puller.

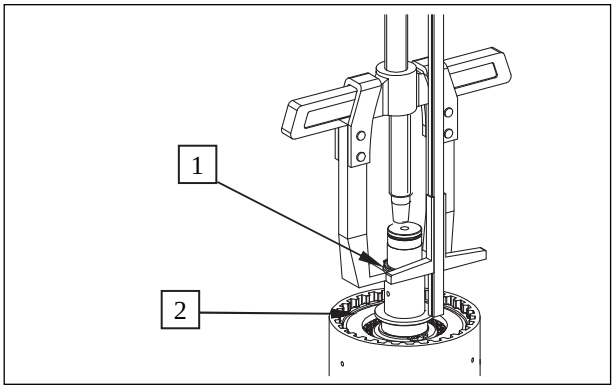


Figure 21

Determine dimension .X2“ from retaining ring (1) to running disk (2).
→ see Figure 20

Dimension X2 = 42.1 mm

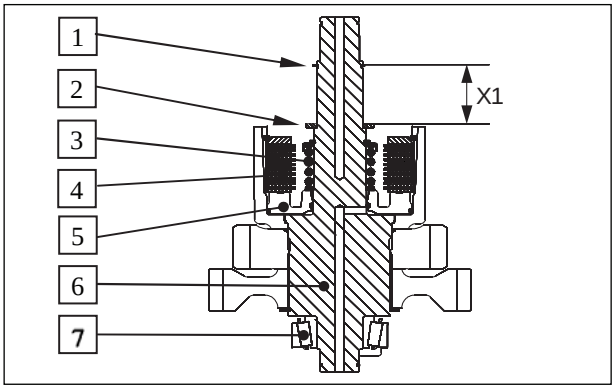


Figure 22

Legend:

1 = Retaining ring 35x2.0
2 = Running disk 35x52x3.5
3 = Compression spring with cup spring and retaining ring
4 = Disk package with end plate and snap ring
5 = Piston with O-rings
6 = Clutch assy
7 = Tapered roller bearing

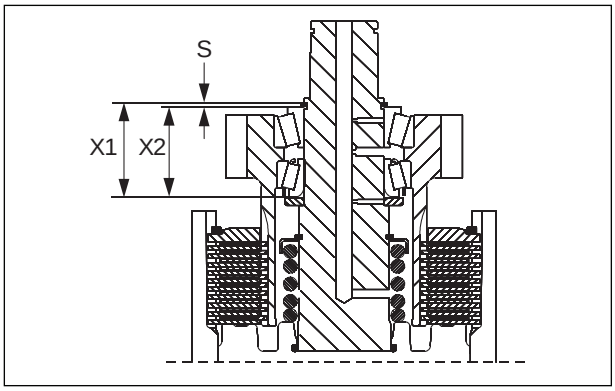


Figure 23

Axial play of inner disk carrier bearing ± 0.05

Calculation example:

Dimension X1…… 42.10 mm
Dimension X2…… - 40.00 mm
Dimension S (retaining ring)…….. = 2.10 mm

Determined retaining ring S = 2.10 mm

Axial play must be set with the retaining ring (optional thickness = 1.8 ... 2.7 mm/available in steps of 0.10 mm)!

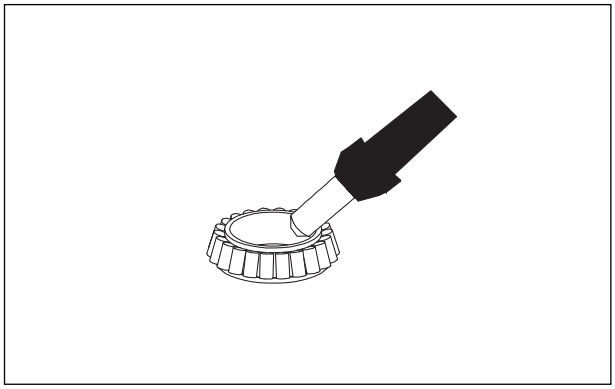


Figure 24

Heat up bearing inner ring (approx. 120° C).

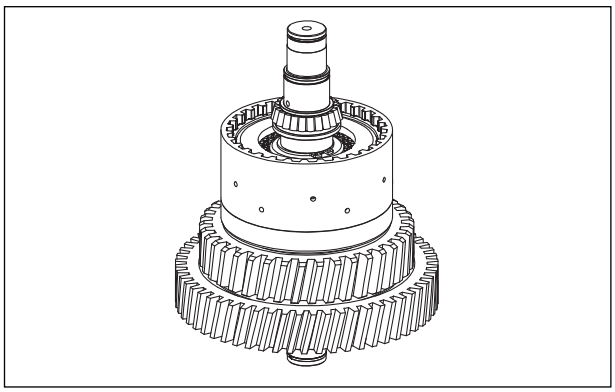


Figure 25

Mount bearing inner ring (1) until contact is obtained.

Different bearing sizes ┐ see Figure 17.

Wear protective gloves!

Adjust bearing inner ring after cooling-down!

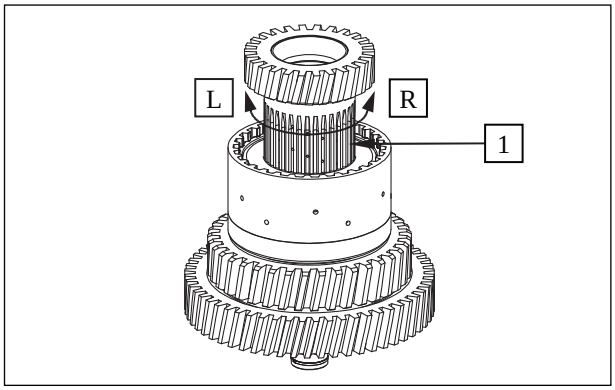


Figure 26

Mount inner disk carrier until contact is obtained.

.

Install inner disks by short ccw/cw rotations of the inner disk carrier (1).

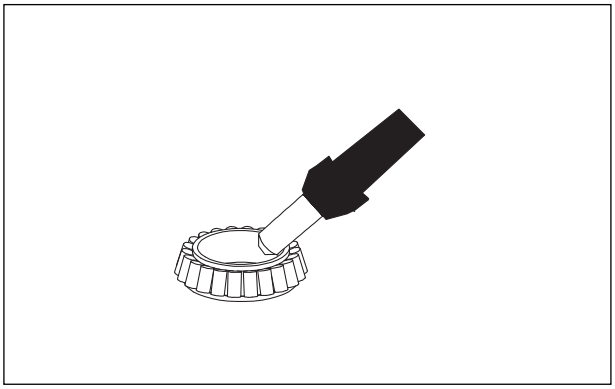


Figure 27

Heat up bearing inner ring (approx. 120° C).

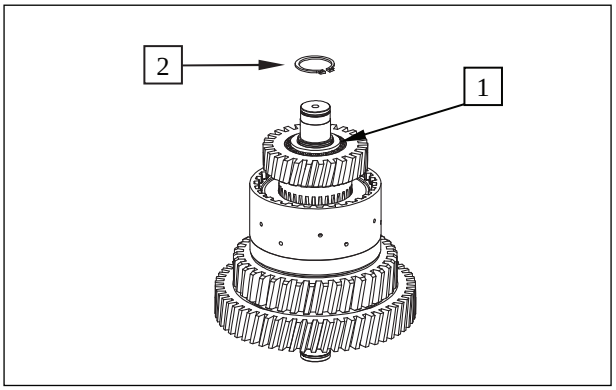


Figure 28

Mount bearing inner ring (1) until contact is obtained.

Wear protective gloves!

Adjust bearing inner ring after cooling-down!

Snap in retaining ring 35x2.1 (2).

Pay attention to an exact contact of the retaining ring in the groove!

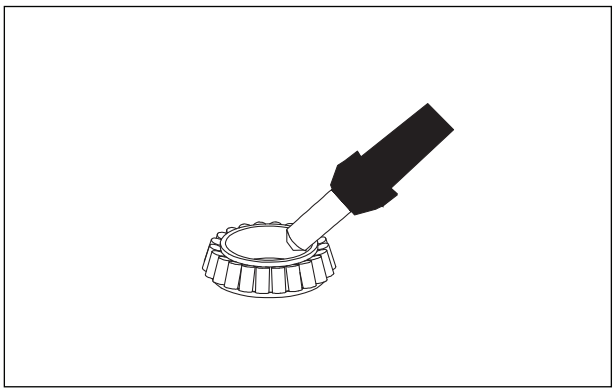


Figure 29

Heat up bearing inner ring (approx. 120° C).

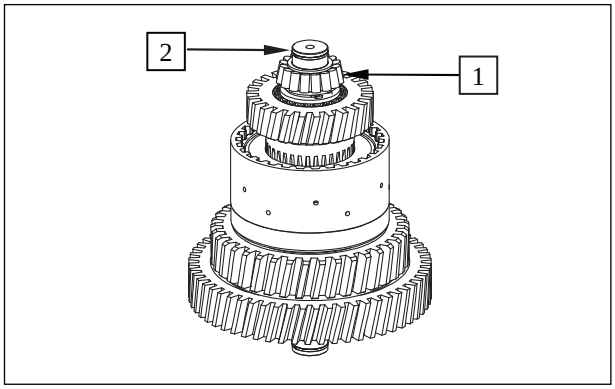


Figure 30

Mount bearing inner ring (1) until contact is obtained.

Fit rectangular ring 30x2 (2).

Wear protective gloves!

Adjust bearing inner ring after cooling-down.

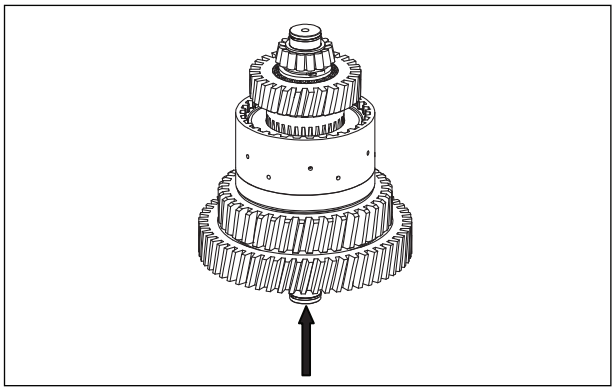


Figure 31

Check closing and opening of the clutch by means of compressed air at the hole (see arrow).
Closing and opening of the clutch must be clearly audible.

Clutch KC

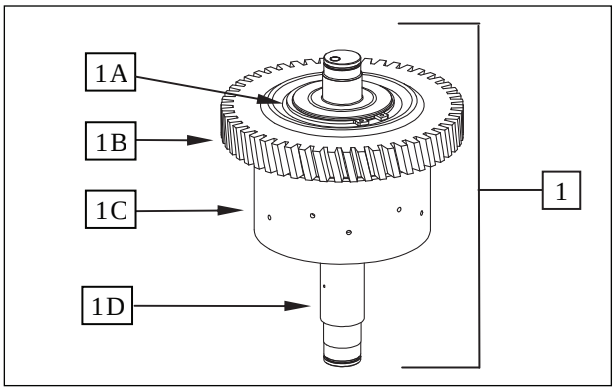


Figure 1

The clutch (1) cannot be disassembled! It is supplied by the spare parts service only as a complete assy which consists of:

1A = Retaining ring
1B = Helical gear
1C = Disk carrier
1D = Shaft

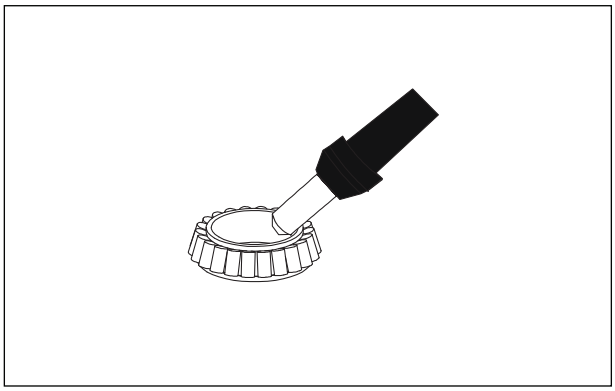


Figure 2

Heat up bearing inner ring (approx. 120° C).

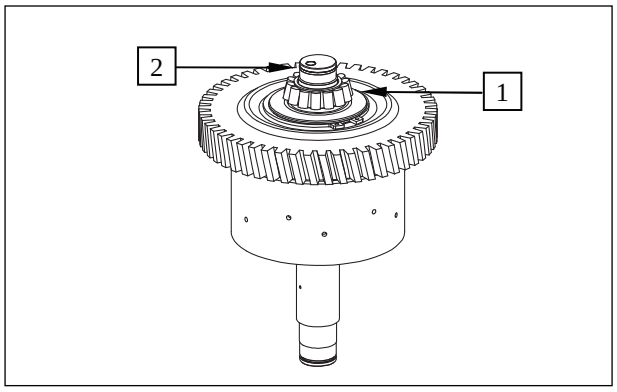


Figure 3

Mount bearing inner ring (1) until contact is obtained.

Fit rectangular rings 30x2 (2).

Wear protective gloves!

Adjust bearing inner ring after cooling-down.

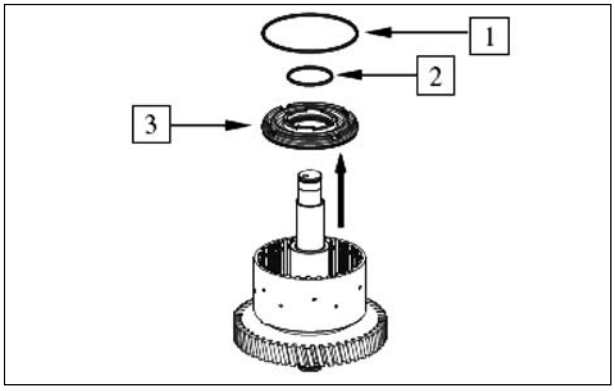


Figure 4

Insert both O-rings (1 and 2) into the piston (3) grooves and oil them.

1 = 115 x 3
2 = 52 x 3

Insert piston (3) into the disk carrier.

Pay attention to the installation position, see Figure 7!

Check function of the drain valve (see arrow) - There must be no jamming of the ball!

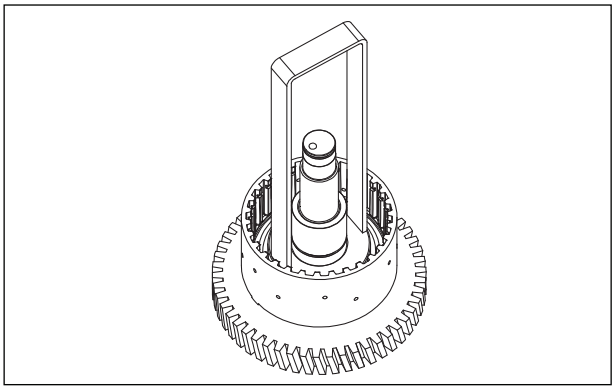


Figure 5

Use a hand-operated press to place piston into the disk carrier by means of the assembly aid.

(S) Assembly aid 5870 345 114

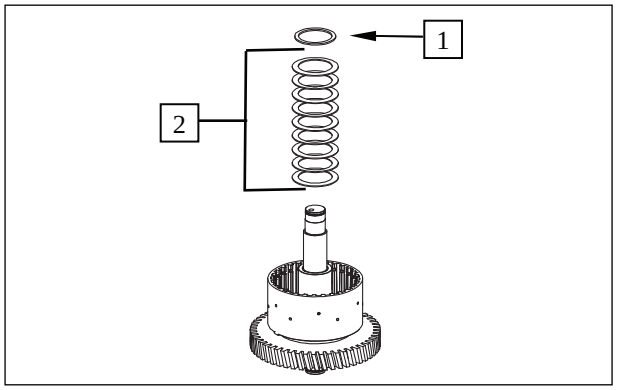


Figure 6

Mount cup spring package (1) and disk (2).

Installation position of the cup springs, see Figure 7!

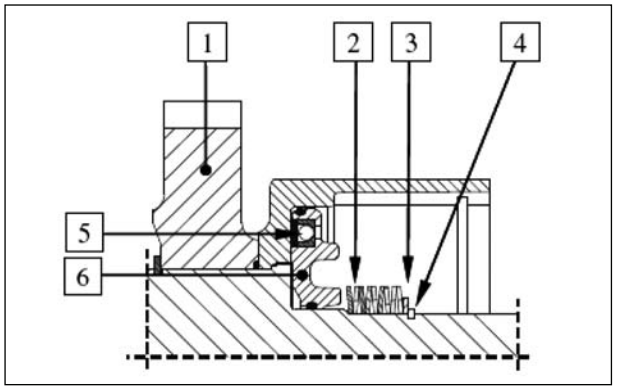


Figure 7

Install cup springs according to the sketch.

Legend:

1 = Clutch
2 = Cup springs (9 pcs)
3 = Disk
4 = Retaining ring (50x2)
5 = Drain valve (piston)
6 = Piston with O-Rings

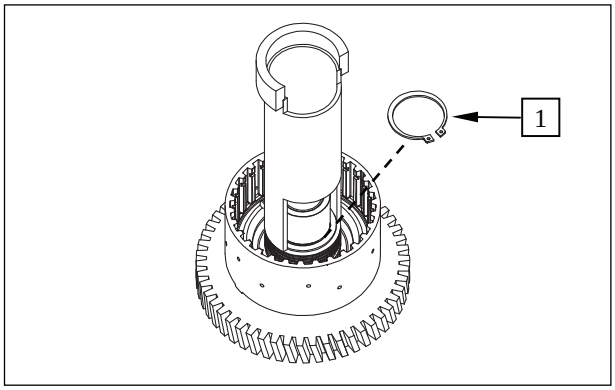


Figure 8

By means of the assembly aid, preload cup springs under a handoperated press until the retaining ring 50x2 (1) can be snapped in.

(S) Assembly aid 5870 506 128

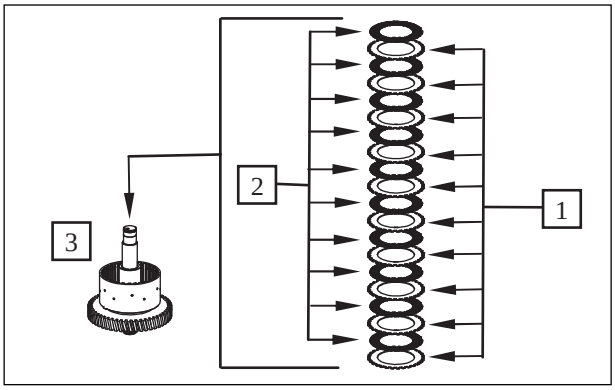


Figure 9

Install outer and inner disks alternately into the disk carrier (3) as shown in Figure 9.

Starting with an outer disk and ending with an inner disk.

Legend:

1 = Outer disks (10 pcs)
2 = Inner disks (10 pcs)
3 = Clutch assy

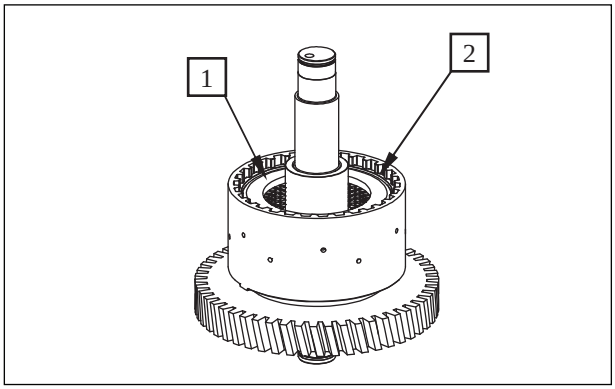


Figure 10

Mount end plate (1) with the flat side showing towards the disk package and fix it by means of snap ring (2) (e.g. thickness = 2.5 mm / recommended value).

Pay attention to the installation position of the end plate!

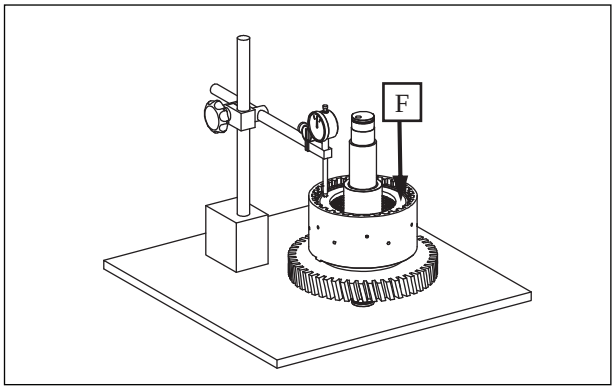


Figure 11

Equally press on end plate with F (approx. 18 N to 20 N = 1.8 to 2.0 kg) and set dial indicator to .zero“.

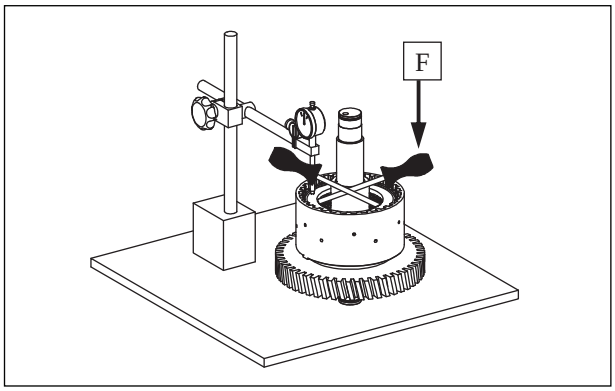


Figure 12

Then press end plate against the snap ring (upwards) and read the disk clearance.

Disk clearance: 2.0 to 3.0 mm!

In case of deviations, the disk clearance must be corrected with an appropriate snap ring (optional thickness s = 2.0 …... 4.0 mm/available in steps 0.25 mm)!

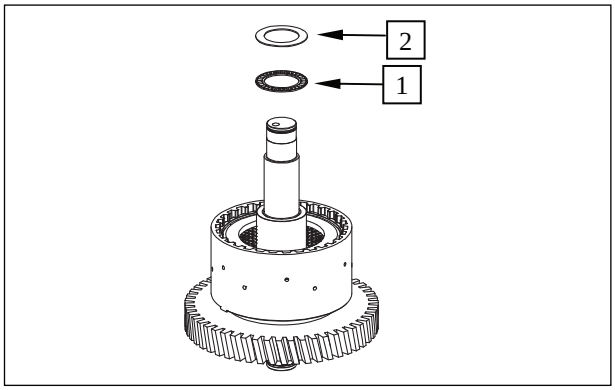


Figure 13

Mount axial needle cage 35x52x2 (1) and axial disk 35x52x1 (1) and oil them.

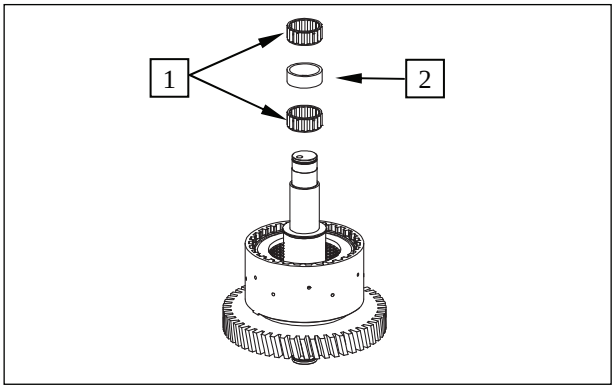


Figure 14

Mount needle cage 35x42x18 (1) and bush (2) and oil it.

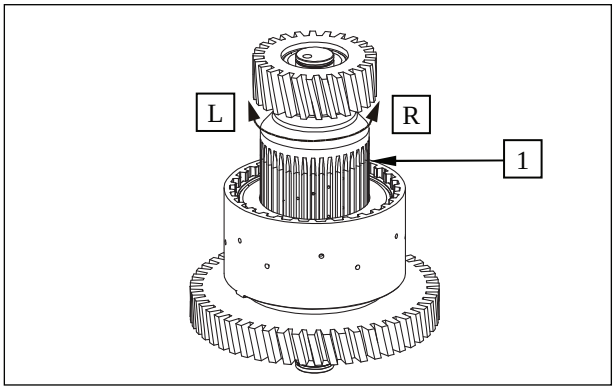


Figure 15

Mount inner disk carrier until contact is obtained.

Install inner disks by short ccw/cw rotations of the inner disk carrier (1).

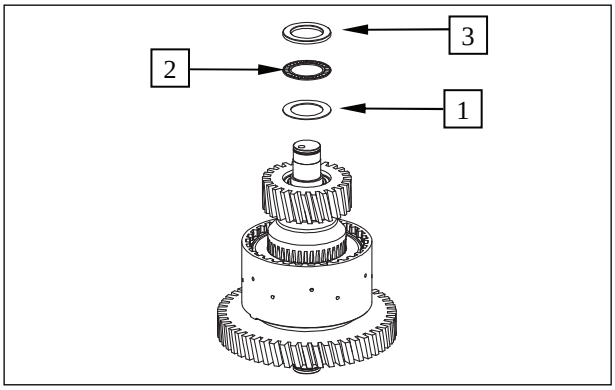


Figure 16

Mount axial washer 35x60x1 (1), axial needle cage 40x60x3 (2) and running disk (3) 40x60x3.5 and oil them.

Fit running disk (3), with the chamfer showing towards the tapered roller bearing!

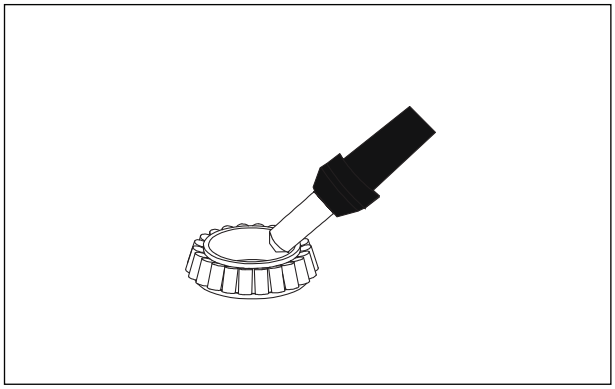


Figure 17

Heat up bearing inner ring (approx. 120° C).

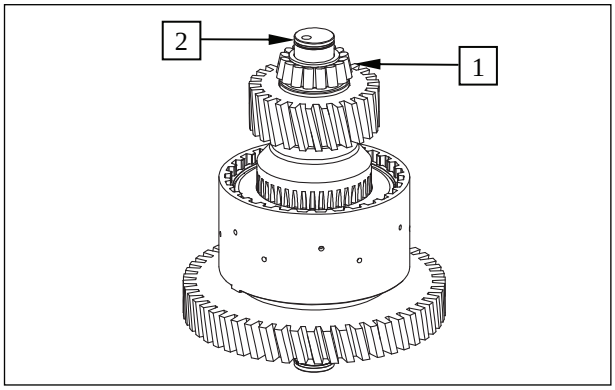


Figure 18

Mount bearing inner ring (1) until contact is obtained.

Fit rectangular ring 30x2 (2).

Wear protective gloves!

Adjust bearing inner ring after cooling-down.

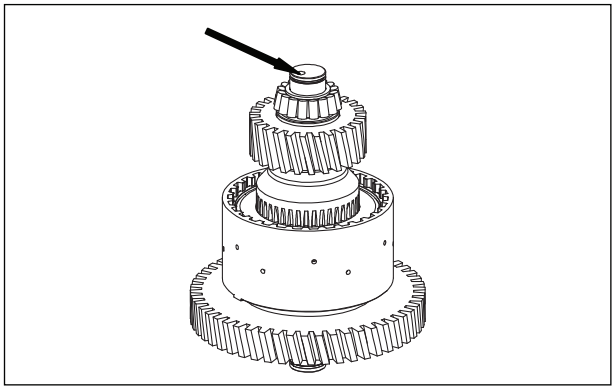


Figure 19

Check closing and opening of the clutch by means of compressed air at the hole (see arrow).
Closing and opening of the clutch must be clearly audible.

Reinstallation of clutches

Output

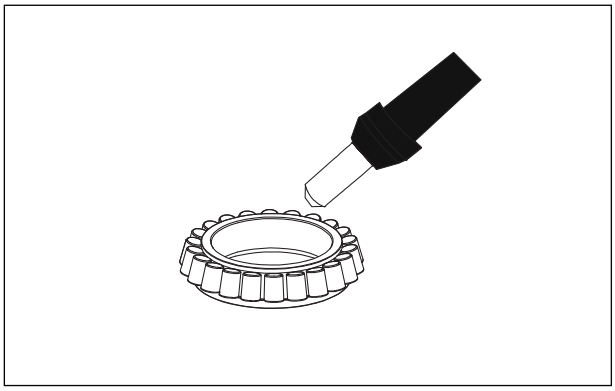


Figure 1

Heat up bearing inner ring (approx. 120° C).

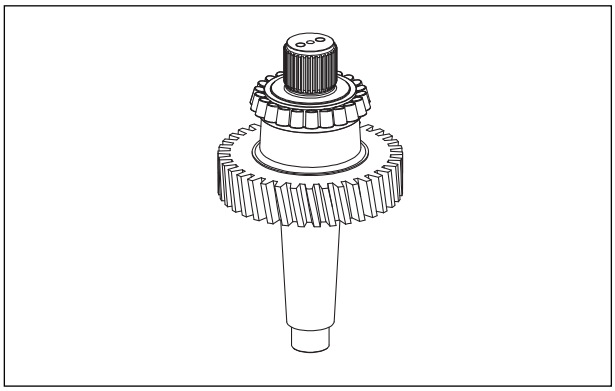


Figure 2

Mount bearing inner ring (1) until contact is obtained.

Wear protective gloves!

Adjust bearing inner ring after cooling-down.

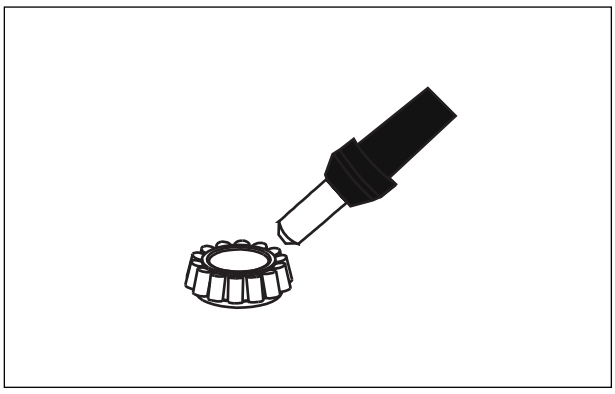


Figure 3

Heat up bearing inner ring (approx. 120° C).

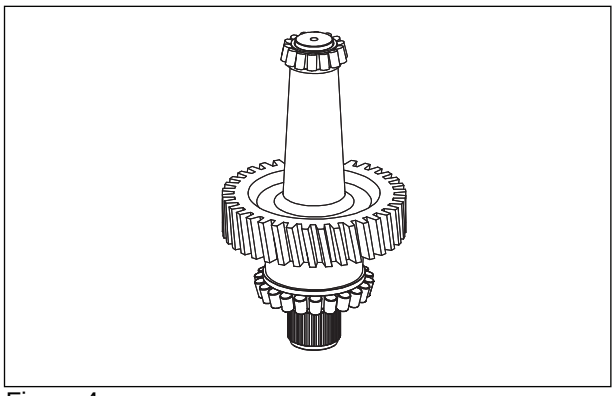


Figure 4

Mount bearing inner ring (1) until contact is obtained.

Wear protective gloves!

Adjust bearing inner ring after cooling-down.

Reassembly of oil pressure pump

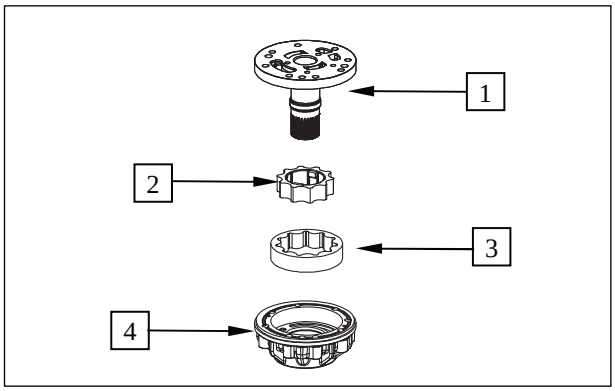


Figure 1

In case of wear marks in the pump housing, stator hollow shaft, inner rotor, outer rotor and on the sliding bearing, the pump assy must be replaced.

Legend:

1 = Stator hollow shaft
2 = Inner rotor
3 = Outer rotor
4 = Pump housing with sliding bearing

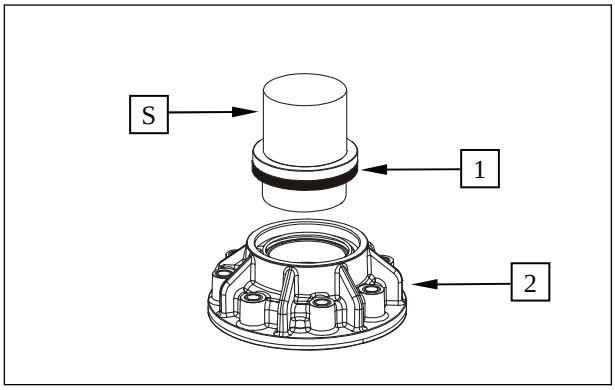


Figure 2

With the sealing lip showing downwards, carefully insert the shaft seal 55x75x8 (1) into the pump housing (2) until contact is obtained.

Apply sealing agent (Loctite no. 574) to the outer diameter!

(S) Driver tool 5870 048 219

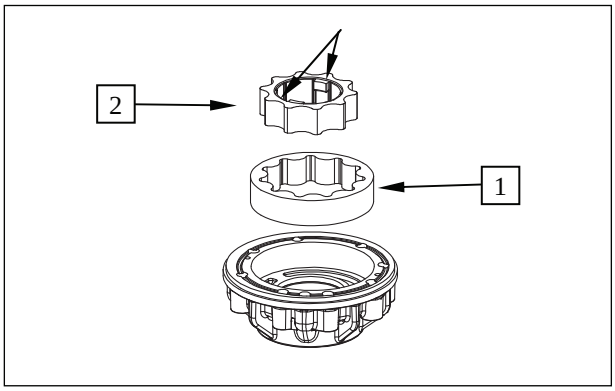


Figure 3

Mount outer rotor (1) and inner rotor (2).

The driver pins of the inner rotor (see arrows) are to be fitted in upward direction.

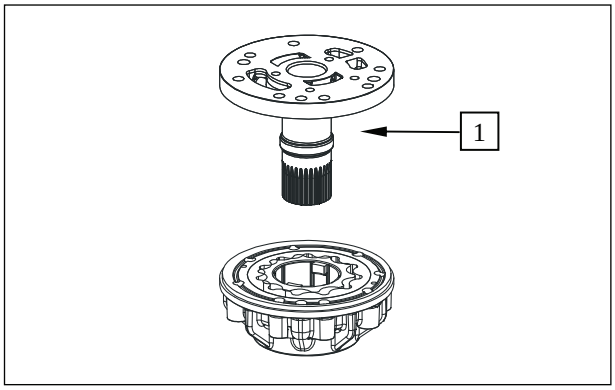


Figure 4

Fit stator hollow shaft (1).

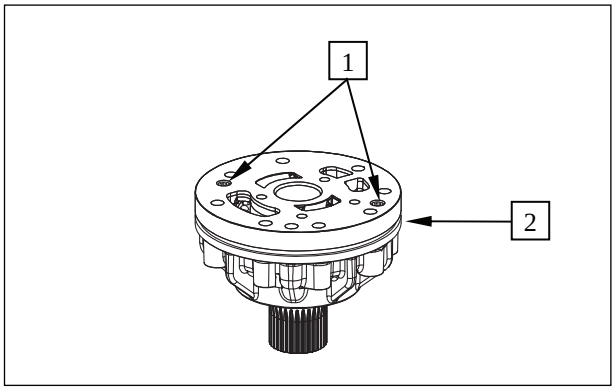


Figure 5

Fix stator hollow shaft radially with two cylindrical screws (1).

Do not tighten the cylindrical screws . just turn them in until contact is obtained and then turn them back by approx. ½ rotation!

Place O-ring (2) 135x3 into the annular groove and grease it.

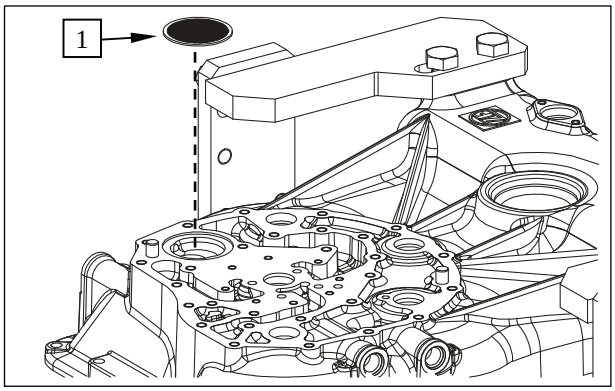


Figure 6

Insert filter (1).

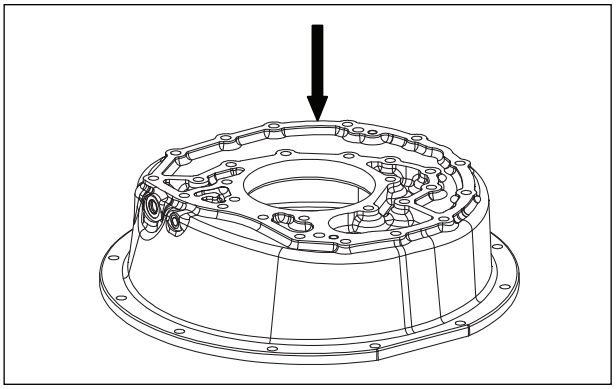


Figure 7

Wet mounting face bell housing with Loctite (type no. 574)!

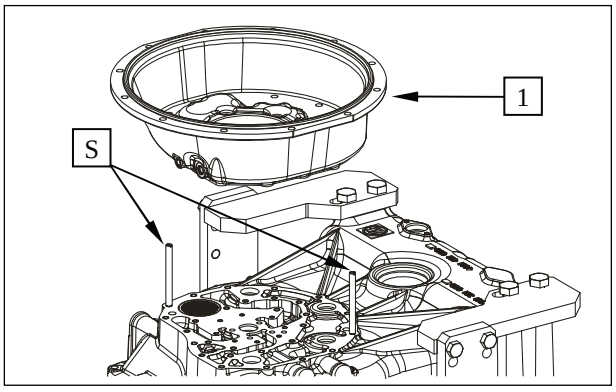


Figure 8

Fit two adjusting screws (S) and position converter bellhousing (1) equally until contact is obtained.

Pay attention to the hole pattern!

(S) Adjusting screws (M10) 5870 204 007

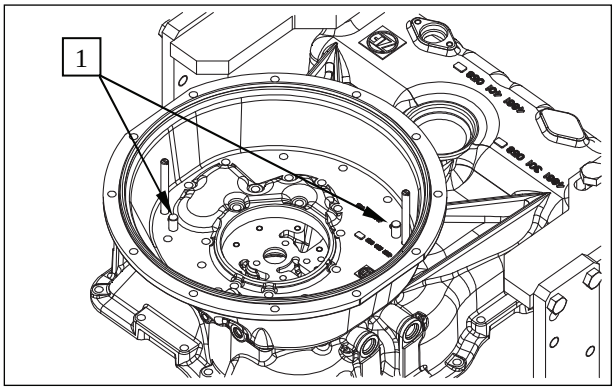


Figure 9

Force the cylindrical pins 12x24 (1) into the holes (blind holes) until contact is obtained.

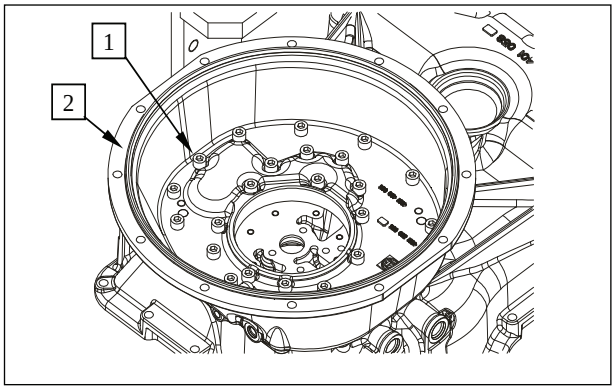


Figure 10

Fix converter bell housing (1) with cylindrical screws M10x30 (2).

Tightening torque (M10/8.8x30)..... MA = 46 Nm

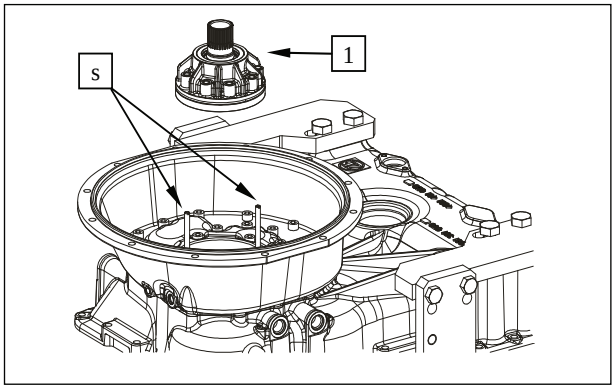


Figure 11

Fit two adjusting screws (S) and mount preassembled pump (1).

Pay attention to the hole pattern!

(S) Adjusting screws (M8) 5870 204 011

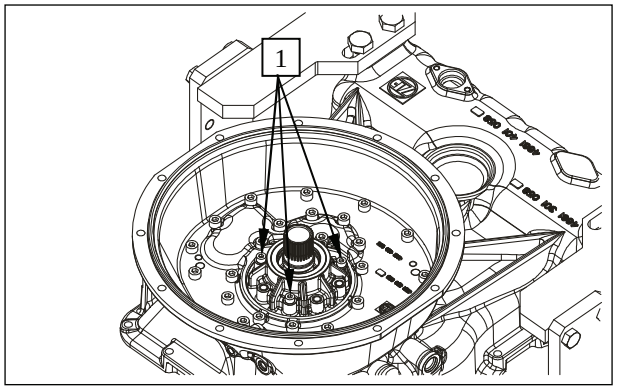


Figure 12

Position transmission pump with 3 cylindrical screws (1) M8x60 (3x120° offset position) equally until contact is obtained.

ATTENTION: Do not damage (shear off) the O-ring!

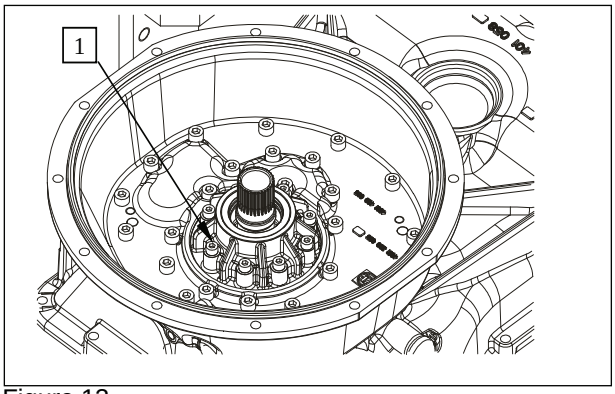


Figure 13

Fix transmission pump with cylindrical screws M8x60 (1).

Tightening torque (M8/8.8x60).....MA = 23 Nm

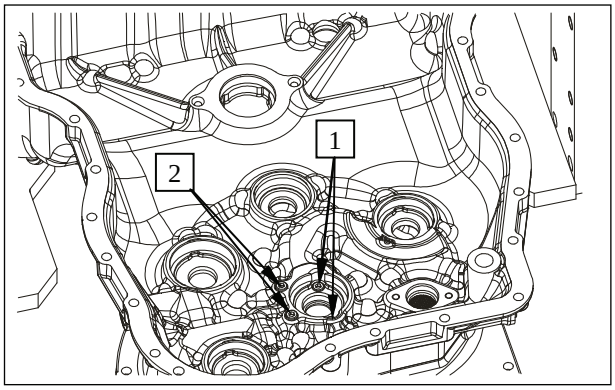


Figure 14

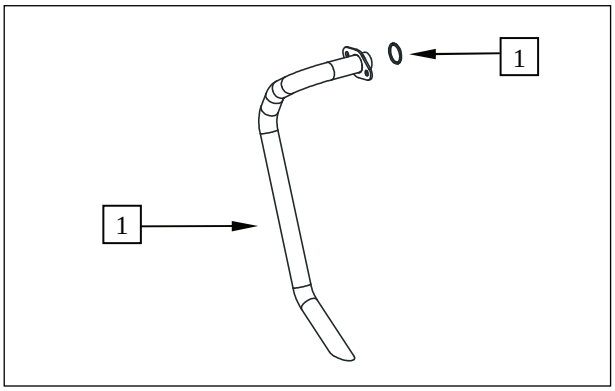


Figure 15

Fix pump with cylindrical screws (1 and 2).

1 = M8x16
2 = M8x35

Tightening torque M8/8.8x16..... M_A = 23 Nm
Tightening torque M8/8.8x35..... M_A = 23 Nm

New cylindrical screws are to be fitted on a general basis.

These cylindrical screws are already provided with adhesive (microcapsule).

The microcapsule bursts when the screw is turned in, wets screw and nut thread and hardens.

Mount O-ring 30x3 (1) onto the suction tube (2) and grease it.

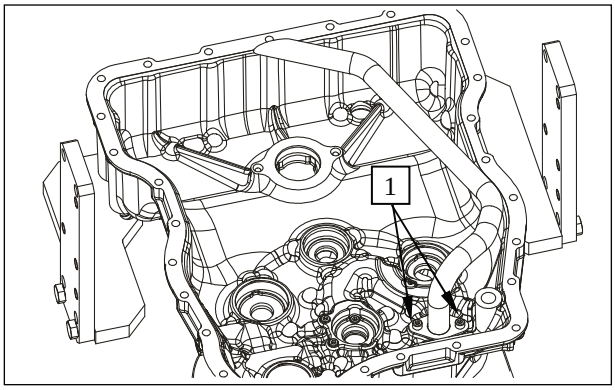


Figure 16

Fix suction tube (1) with cylindrical screws M8x16 (2).

Tightening torque M8/8.8x16 .....M_A = 23 Nm

When reusing the cylindrical screws, they must be secured with Loctite no. 243!

New cylindrical screws are already provided with adhesive (microcapsule).
The microcapsule bursts when the screw is turned in, wets screw and nut thread and hardens.

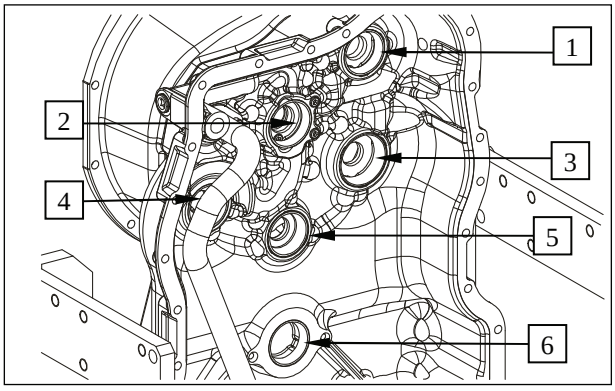


Figure 17

Insert all bearing outer rings into the bearing holes of both housing parts (see Figures 16 and 17).

1 = .KV“ clutch - forward
2 = .KR“ clutch - reverse and input
3 = .KD“ clutch - 2nd gear
4 = .KC“ clutch - 1st gear
5 = .KE“ clutch - 3rd gear
6 = Output

Place bearing outer rings into the bearing holes using assembly grease.

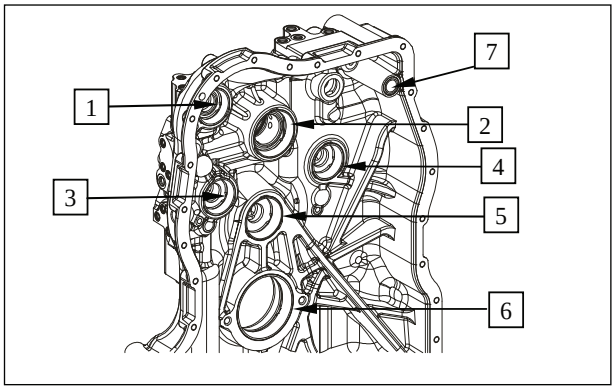


Figure 18

If, contrary to the ZF recommendation, the tapered roller bearings of clutches and input are not replaced, it is imperative to ensure the previous pairing (bearing inner ring/bearing outer ring) - see Chapter -6 Figure 4 and 5)!

Insert O-ring 24x2.5 (7) into the hole and grease it.

Reinstallation of clutches

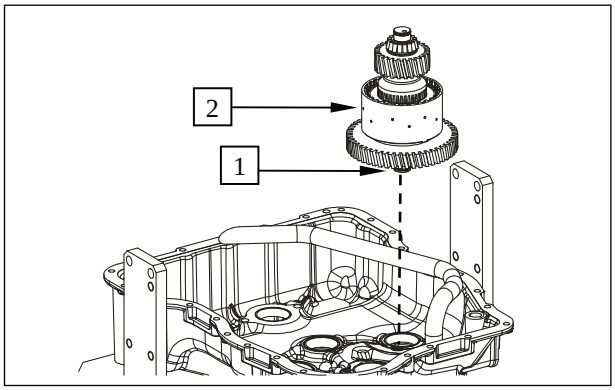


Figure 19

Align and grease rectangular ring 30x2 (1).

Position clutch KC (2).

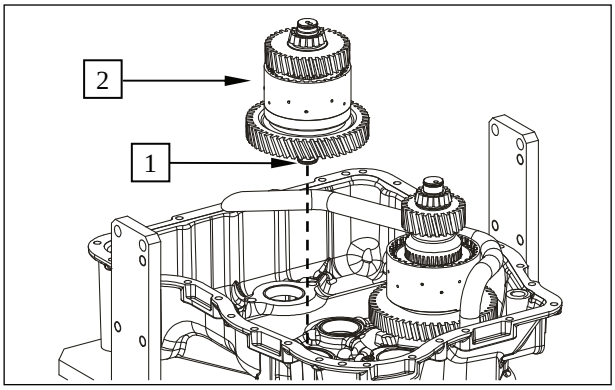


Figure 20

Align and grease rectangular ring 30x2 (1).

Position clutch KD (2).

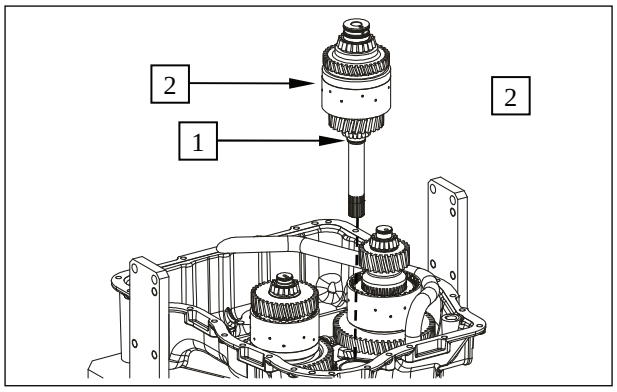


Figure 21

Align and grease rectangular rings 50x2.5 (1).

Position clutch KR- input (2).

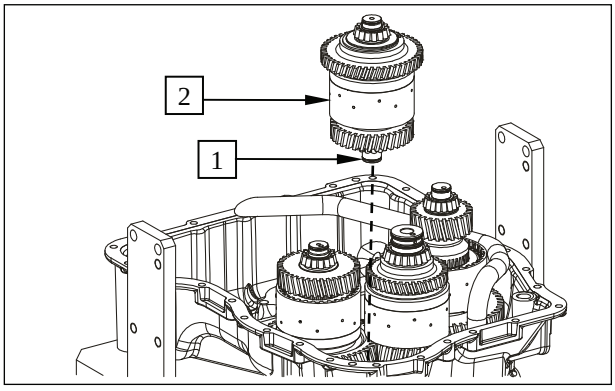


Figure 22

Align and grease rectangular ring 30x2 (1).

Position clutch KV (2).

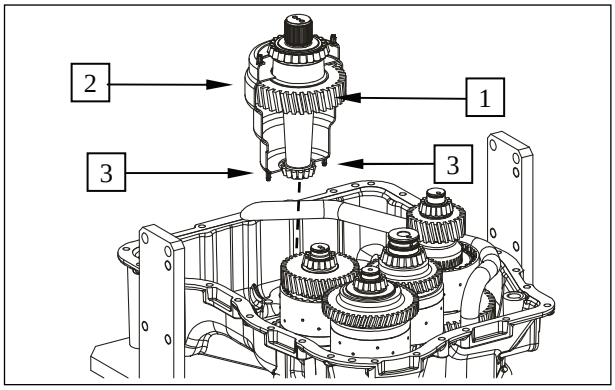


Figure 23

Position output shaft (1) together with screen sheet (2).

Bolts (3) of screen sheet must be fixed into the pilot holes!

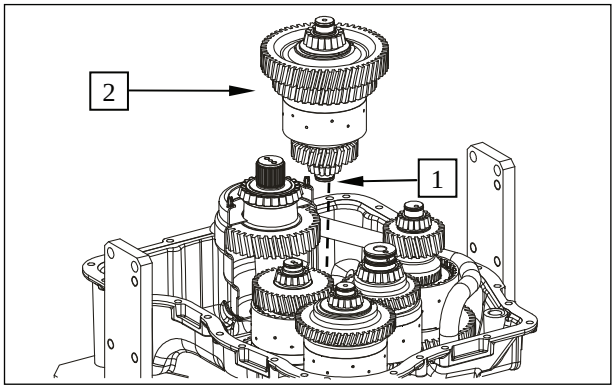


Figure 24

Align and grease rectangular ring 30x2 (1).

Position clutch KE (2).

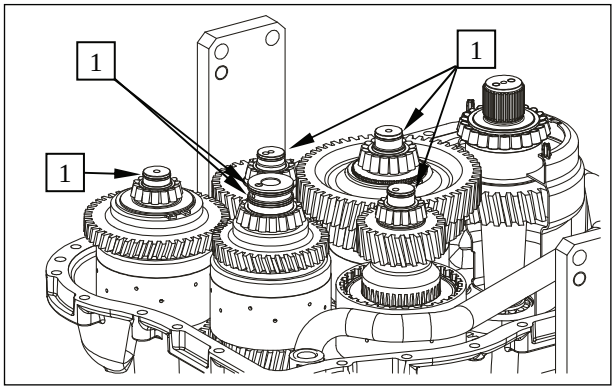


Figure 25

Align and grease rectangular rings (1).

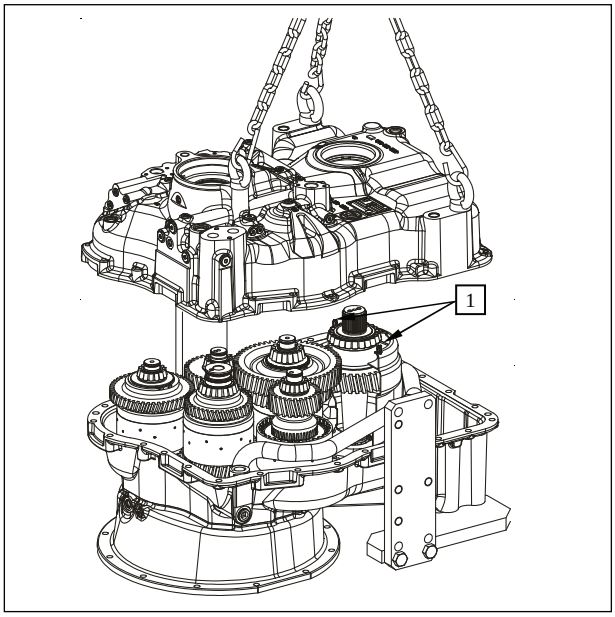


Figure 26

Use the lifting device to carefully bring the transmission housing

rear part into contact position.

Bolts (1) of screen sheet must be fixed into the pilot holes!

Wet mounting face with Loctite (type no. 574)!

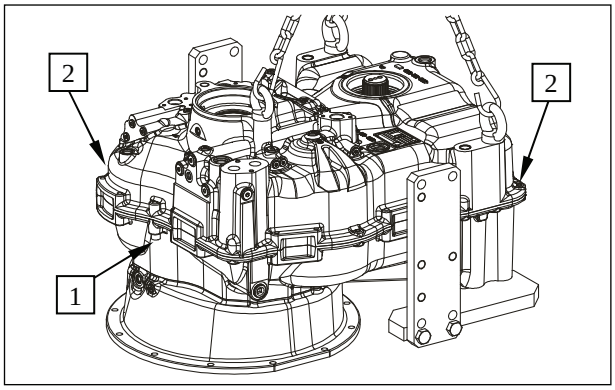


Figure 27

Hand-tighten the transmission housings crosswise with 2 cylindrical screws (1).

Fit cylindrical pins 12x24 (2) centrically to the mounting face.

Tighten the transmission housing front and rear part crosswise with 4 cylindrical screws M10 (1).

Tightening torque..... M_A = 46 Nm

Transmission rear part is not fixed to the holding fixture and could get loose after turning!
Secure the connection with cylindrical screws!

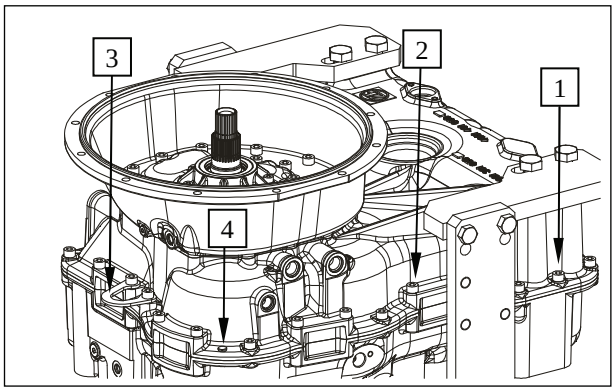


Figure 28

Fix transmission housing front and rear part by means of cylindrical screws (1 and 2).

Fit bracket (3).

Cylindrical screws (1) M10x30 (11x)
Cylindrical screws (1) M10x50 (17x)

Tightening torque (M10/8.8x30)..... M_A = 46 Nm
Tightening torque (M10/8.8x50)..... M_A = 46 Nm

4 = cylindrical pin 12x24

Reassembly of output flange

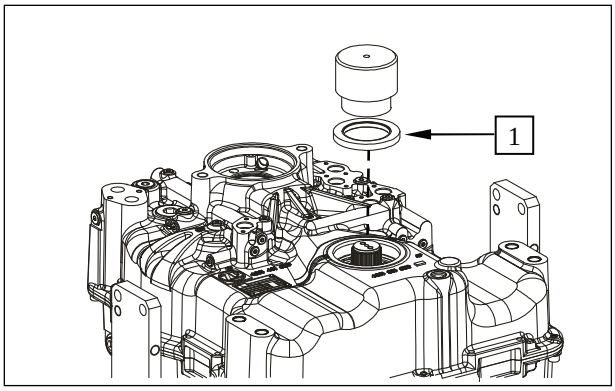


Figure 1

Use driver tool to fit the shaft seal 70x100x10 (1) until contact position, with the sealing lip showing towards the oil sump.

(S) Driver tool 5870 048 057

Fill space between sealing lip and dust lip with grease!

Wet outer diameter with spirit!

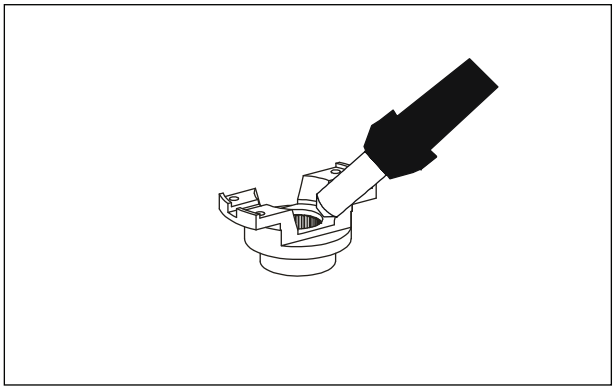


Figure 2

Heat up output flange (approx. 120° C).

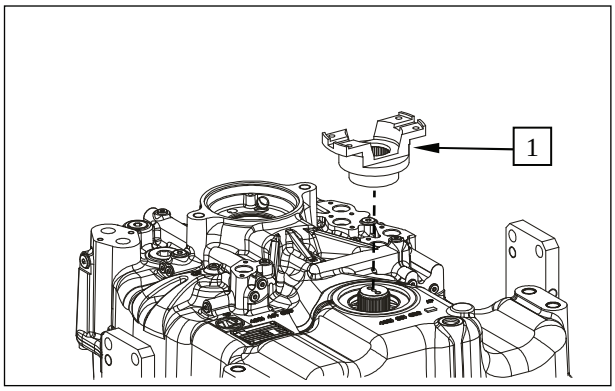


Figure 3

Mount output flange (1) until contact is obtained.

Wear protective gloves!

Adjust output flange after cooling down!

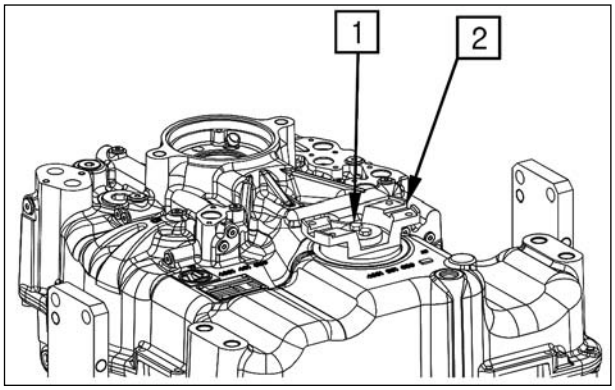


Figure 4

Insert O-ring 38x4 into the space between output flange and shaft.

Fix output flange by means of washer (1) and hexagon screws 10x25 (2).

Tightening torque (M8/10.9x25)..... M_A = 34 Nm

Reassembly of converter safety valve

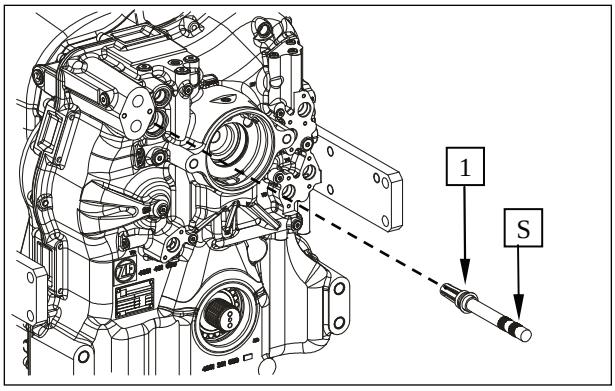


Figure 1

Insert valve (1) with drift (S) into the housing until contact is obtained.

(S) Drift 5870 705 012

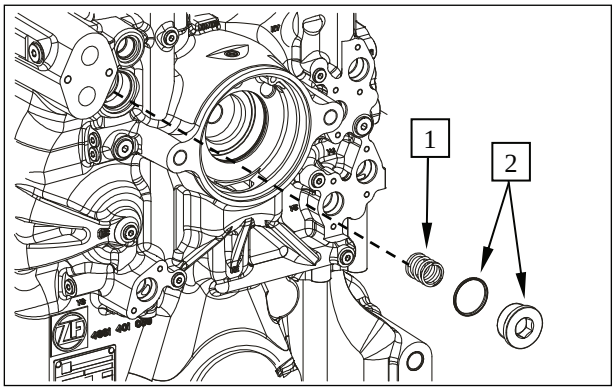


Figure 2

Place compression spring (1) into the transmission hole and fit screw plug M38x1.5 (2) with O-ring 35x2 (3).

Tightening torque.....M_A = 46 Nm

Reassembly of main pressure valve (control pressure valve)

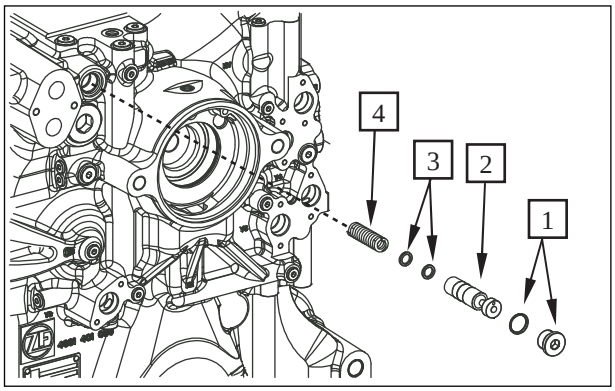


Figure 3

Main pressure valve consists of:

1 = Screw plug M22x1.5 with O-ring 19x2
2 = Piston
3 = Spacer ring (2 pcs)
Recommended value 5 mm
4 = Compression spring

The main pressure 16 + 3 bar is determined by means of the spacer rings!
Gradation of available spacer rings see spare parts list.

Tightening torque..... M_A = 60 Nm

Reassembly of central shaft (PTO) and converter

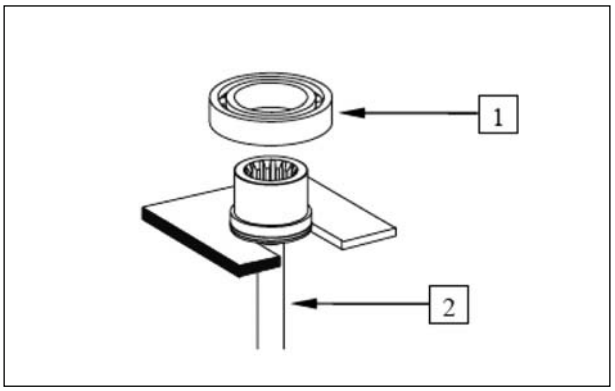


Figure 1

Press tapered bearing (1) onto the central shaft (2) until contact is obtained.

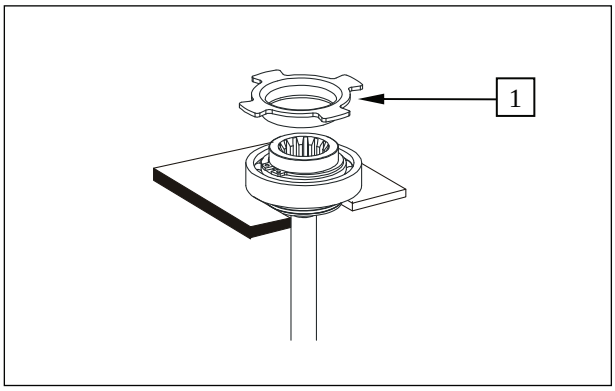


Figure 2

Press the toothed disk (1) onto the pump shaft until contact is obtained.

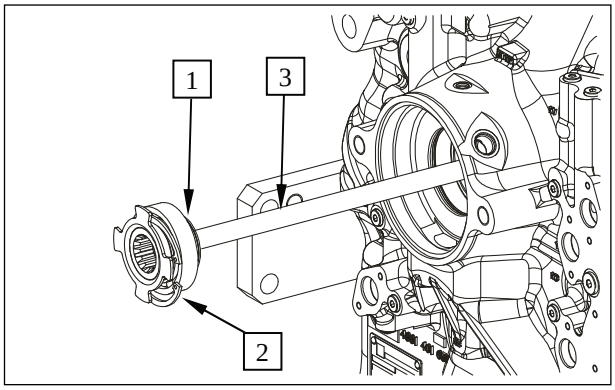


Figure 3

Mount rectangular ring 50x2.5 (1).

Grease and centrically align rectangular ring.

Mount retaining ring 75x2.5 (2).

Mount central shaft (3) until contact is obtained.

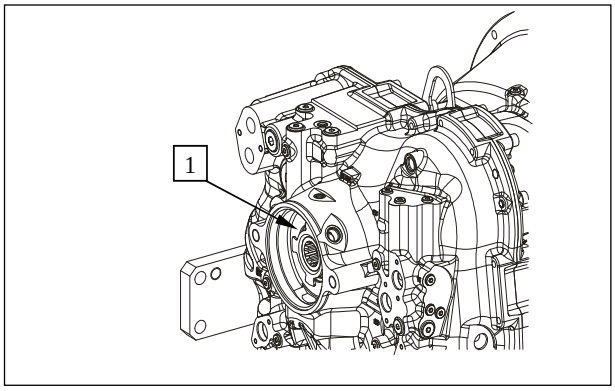


Figure 4

Fix central shaft with retaining ring 75x2.5 (1).

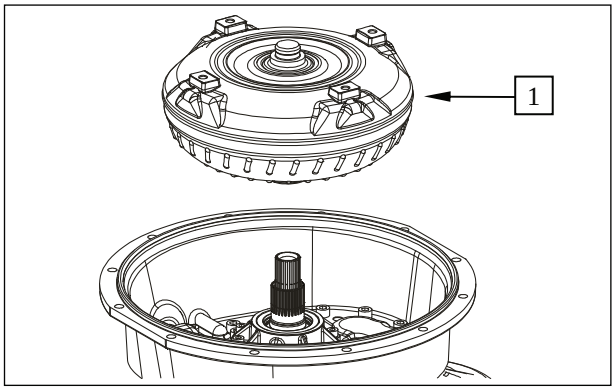


Figure 5

Mount converter (1) until contact is obtained.

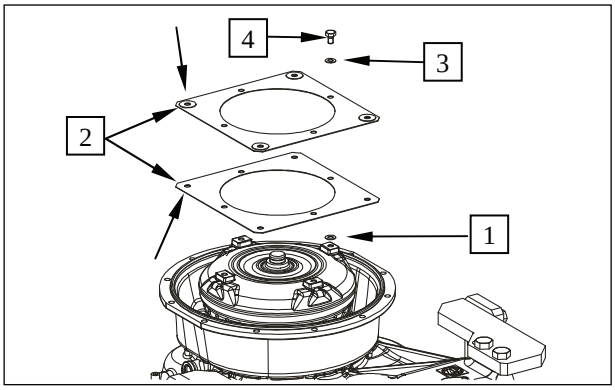


Figure 6

Position 1 washer/each / thickness = 1.0 mm (4x) (1) onto the flexplate mounting webs (4x).

Place flexplates (2).

Pay attention to the installation position! Spot-welded reinforcing disks of the flexplate to be arranged towards the outside - see arrows !

Mount washer (3) to the hexagon screw M10x16 (4) and fix the flexplates.

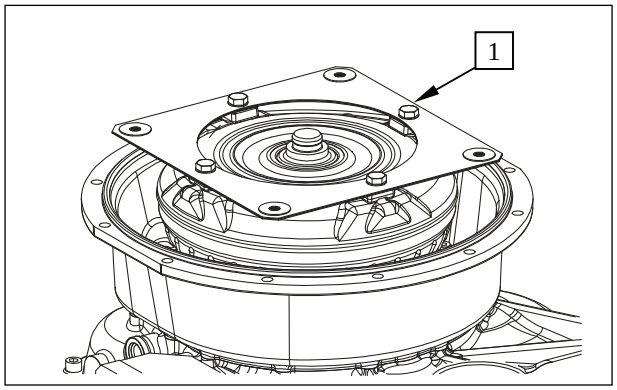


Figure 7

Tighten hexagon screws M10x16 (1).

Tightening torque (M10/8.8x16) ..... M_A = 46 Nm

When reusing the hexagon screws they must be secured with Loctite 243.

New hexagon screws are already provided with adhesive (microcapsule).
The microcapsule bursts when the screw is turned in, wets screw and nut thread and hardens.

Fix converter axially!
Risk of injury!

Pressure controller (proportional valves), inductive sensor, speed sensor (Hall sensor), temperature sensor, breather and screw plugs

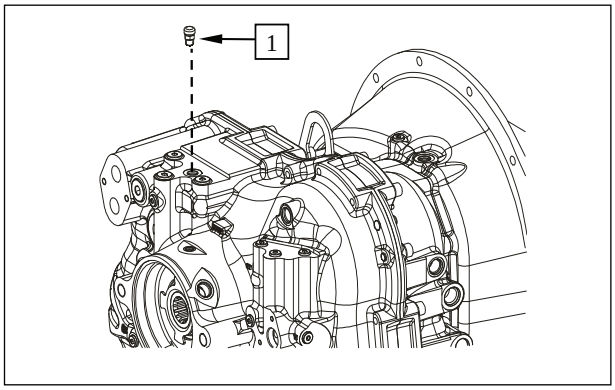


Figure 1

Mount breather (1).

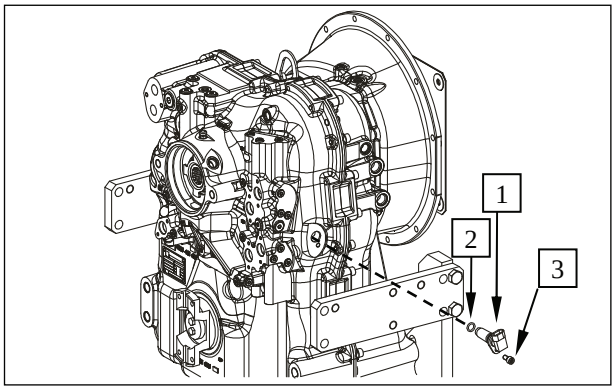


Figure 2

Mount output Hall sensor - (1) onto the speed sensor, install Oring 15.5x2.6 (2) and fix it with cylindrical screws M8x16 (3).

Tightening torque (M8/8.8x16)..... M_A = 23 Nm

When reusing the cylindrical screw, it must be secured with Loctite no. 243!

New cylindrical screw is already provided with adhesive (microcapsule).
The microcapsule bursts when the screw is turned in, wets screw and nut thread and hardens.

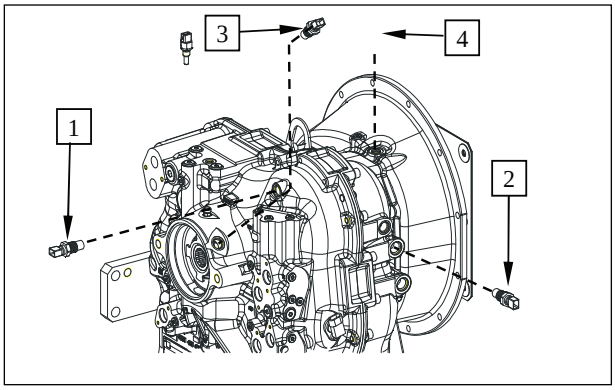


Figure 3

Fit positioned parts.

1 = Inductive sensor with O-ring 15x2 - n turbine
2 = Inductive sensor with O-ring 15x2 - n central gear chain
3 = Inductive sensor with O-ring 15x2 - n engine
Tightening torque.....M_A = 30 Nm

4 = Temperature sensor with O-ring 11x2
Measuring point .63“ after the converter
Tightening torque.....M_A = 25 Nm

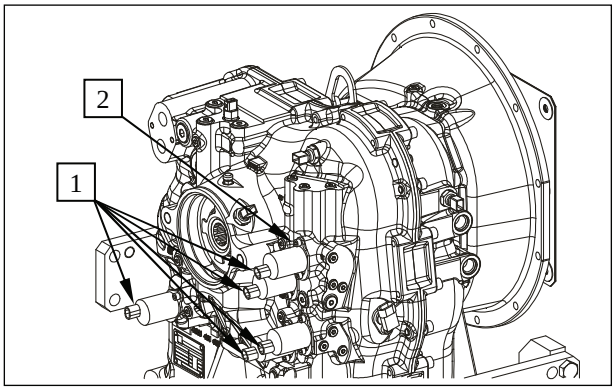


Figure 4

Fix pressure controller . proportional valves- (1) with the cylindrical screws M6x12 (2).

Tightening torque (M6/8.8x12).....M_A = 9.5 Nm

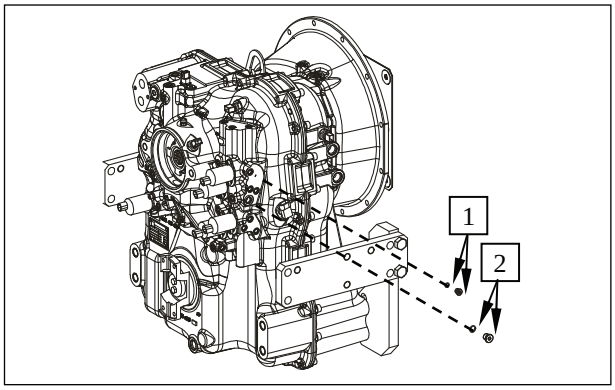


Figure 5

Mount all screw plugs (1 and 2) with O-rings.

1 = Screw plug M10x1 with O-ring 8x 1.5 (24x)
Tightening torque (M10x1 ..... M_A = 6 Nm

2 = Screw plug 9/16-18 UNF with O-ring 11.9x2 (7x)
Tightening torque (9/16-18 UNF) ..... M_A = 15 Nm

Reassembly of filter, closing components, oil filler tube with oil dipstick and oil drain plug

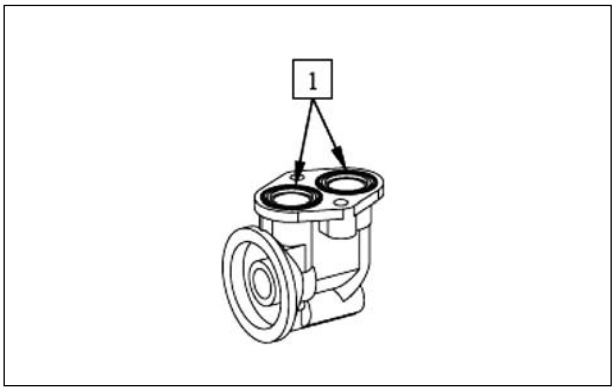


Figure 1

Place O-rings 34.2x3 (1) into the holes and grease them.

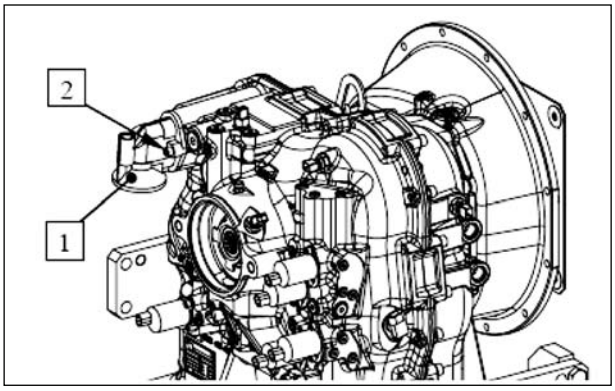


Figure 2

Attach filter head (1) with cylindrical screws M8x30 (2).

Tightening torque (M8/8.8x30) ..... M_A = 23 Nm

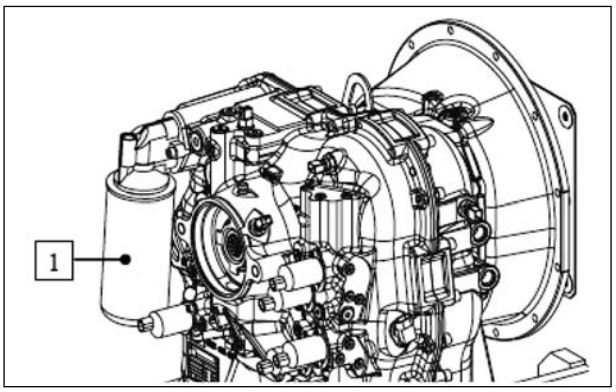


Figure 3

The ZF filter (1) has to be fitted as follows:

- **Slightly oil the seal**
- **Turn in the filter until contact with the sealing surface is obtained, and then tighten it by hand with approx. 1/3 to 1/2 rotation.**

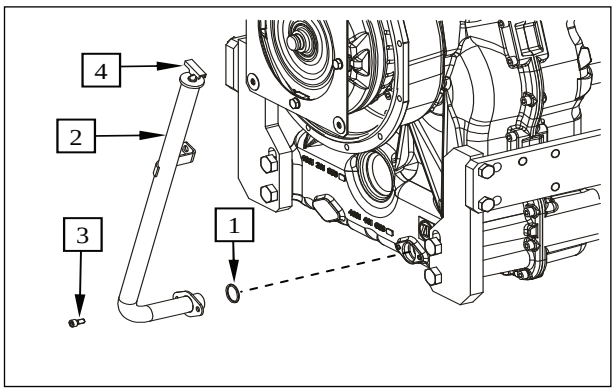


Figure 4

Install O-ring 30x3 (1) onto the oil suction tube (2), grease it and fix it with cylindrical screws M8x16 (3) to the transmission housing.

Mount oil dipstick(4).

Tightening torque (M8/8.8x16)..... M_A = 23 Nm

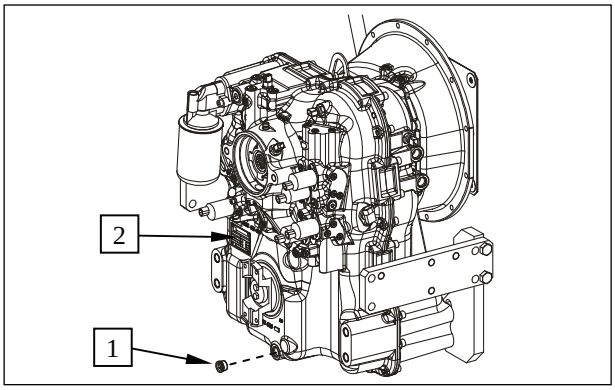


Figure 5

Fit oil drain plug 7/8-14 UN 2A (1).

Tightening torque (7/8-14 UN 2A).....M_A = 30 Nm

Fix identification plate (2) by means of grooved pins 3x5.

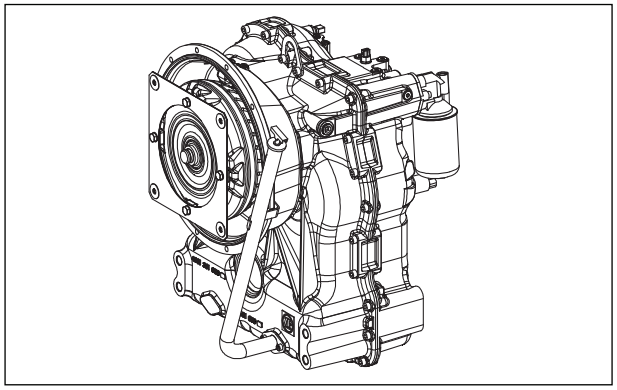


Figure 6

Before putting the transmission into operation, fill it with oil according to Operation Manual (Order no.: 5872 138 002)!