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Tightening Torques for Bolts/Screws and Nuts Extract from ZFN 148

This standard applies to screws/bolts acc. to DIN 912, DIN 931, DIN 933, DIN 960, DIN 961, as well as ISO 4762, ISO 4014, ISO 4017, ISO 8765, ISO 8676, and to nuts acc. to DIN 934 as well as ISO 4032, ISO 8673.

This Standard contains data on tightening torques for screws/bolts and nuts in strength categories 8.8, 10.9, and 12.9, and nuts in strength categories 8, 10, and 12.

Surface condition of bolts /screws and nuts: Thermally blackened and oiled or galvanized and oiled or galvanized, chromated, and oiled.

Tighten screws/bolts with a calibrated ratchet dial torque or ratchet wrench.

NOTE
Deviating tightening torques are listed separately in the Repair Manual.

Regular screw thread

Size	Tightening torque (Nm) for		
Screw/Bolt	8.8	10.9	12.9
Nut	8	10	12
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

Fine screw thread

Size	Tightening torque (Nm) for		
Screw/Bolt	8.8	10.9	12.9
Nut	8	10	12
M8x1	24	36	43
M9x1	36	53	62
M10x1	52	76	89
M10x1.25	49	72	84
M12x1.25	87	125	150
M12x1.5	83	120	145
M14x1.5	135	200	235
M16x1.5	205	300	360
M18x1.5	310	440	520
M18x2	290	420	490
M20x1.5	430	620	720
M22x1.5	580	820	960
M24x1.5	760	1100	1250
M24x2	730	1050	1200
M27x1.5	1100	1600	1850
M27x2	1050	1500	1800
M30x1.5	1550	2200	2550
M30x2	1500	2100	2500

Edition: August 1991

Designation ZF part number	Name	Quantity approx.	Application	Remarks
Grease 0750 199 019	For example: Spectron FO 20	1 gram 1 gram 2 grams	Shaft sealing ring **02.510** Grooved ring **02.630** Shaft sealing ring **31.080**	
Grease 0671 190 050	Olista Longtime 3EP	5 grams 3 grams 5 grams 3 grams	Shaft sealing rings **68.060/140** Bush **68.130** Locating face Release fork **68.060** Release bearing **68.050** Ball cup **68.060/120**	
Sealing compound 0666 790 054	1215 gray	3 grams	Sealing surface housing I / housing II (depends upon the version, also refer to chapter on “Mounting Housing I“)	
Sealing compound 0666 790 033	No. 574	 3 grams 0.5 grams 0.5 grams 1 gram	**Sealing surface** Connection plate / Housing I Cover **31.050** Sealing cap **32.010/050** Range change housing / Housing II (depends upon the version, also refer to chapter on “Mounting RC Housing“)	
Jointing compound 0666 690 017	No. 241	0.5 grams	Hex-head screw **02.670**	
Jointing compound 0666 690 022	No. 262	0.5 grams	Ball bolt **06.080**	
Anti-corrosion oil 0750 199 008	For example MZK 150	 1 ml	Pump shaft **02.560** Rotor **02.550**	
Transmission oil	according to ZF List of Lubricants TE-ML 02	refer to: Type plate	Oil fill transmission	

NOTE: Inquire size of containers before placing any orders!

Fig. no.	Figure	Order no. Application	Qty.	Remarks
1		**6008 208 503** **ZF-Testman pro complete** Scope of supply: - 6008 208 100 ZF-Testman pro with DPA05 + cable - 6008 208 015 Application CD - 6008 208 016 License	1	Only for ZF Sales and Service Organizations
2		**6008 208 501** **ZF-Testman pro diagnosis software** Scope of supply: - 6008 208 011 ZF-Testman pro Update CD - 6008 208 015 Application CD - 6008 208 016 License	1	Only for ZF Sales and Service Organizations
3		**6008 208 003** **ZF-Testman pro for ZF customers** Scope of supply: - 6008 208 100 ZF-Testman pro with DPA05 + cable - 6008 208 900 ZF-Testman pro software for user interface (basic CD installation)	1	following agreement with ZF Friedrichshafen AG
4		**Application software** **ZF-AS Tronic 2** 6008 208 819	1	Single user license
5		**6008 207 003** **AS Tronic table mode adapter**	1	Adapter cable for programming and configuration purposes and for diagnosis outside the vehicle

NOTE: Please inquire as to packaging unit before ordering.

3 If necessary, select the corresponding compensating disk **31.030** by using the spare parts catalog.

NOTE
The compensating disk **31.030** is no longer needed for modern transmissions since the output cover **31.050** was modified accordingly.

4 Coat the sealing surface of the output cover **31.050** with **Loctite no. 574**.

NOTE
Sealing surfaces must be clean and free of oil and grease.

5 Put on the output cover **31.050** if necessary, with the compensating disk **31.030**.

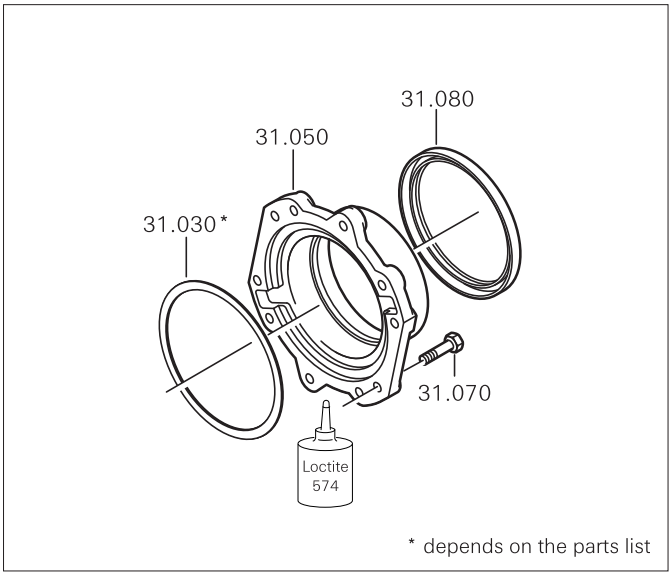
6 Tighten 10 M10 hex-head screws **31.070** to 46 Nm.

NOTE
Do only mount cover **31.110** if the range change housing has already been installed and the screw plug **31.090** was installed as well.

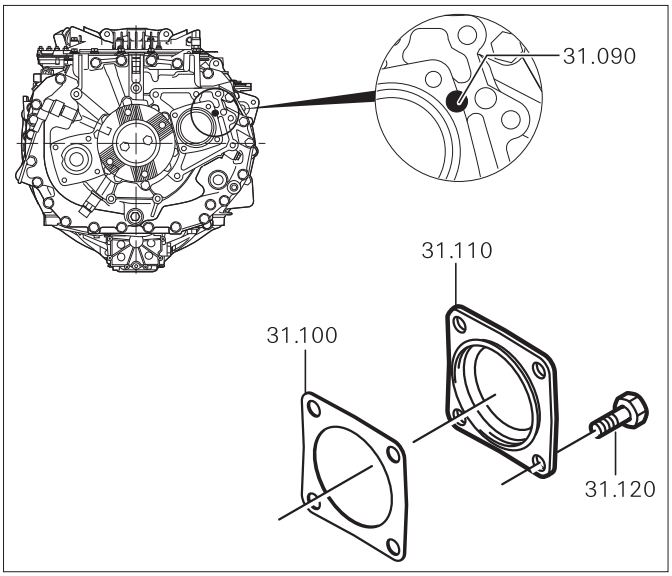
7 Clean sealing surface at RC housing and cover **31.110**.

8 Fit new seal/gasket **31.100** and cover **31.110**.

9 Tighten four M12 hex-head screws **31.120** to 79 Nm.



028255

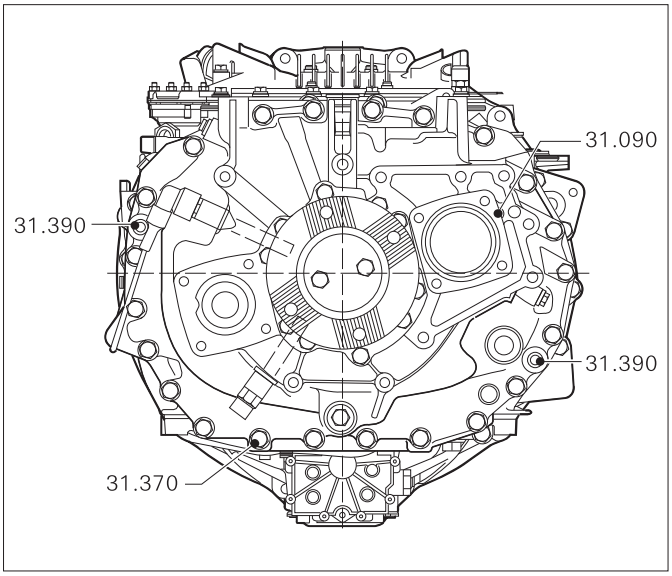


018225

16 Tighten screw plug M10x1 **31.090** to 15 Nm.

17 Insert two cylindrical pins **31.390**. Screw in 22 hex-head screws **31.370** and tighten to 50 Nm.

CAUTION
Screws of an appropriate length must be used to mounting the retaining plates.



018224

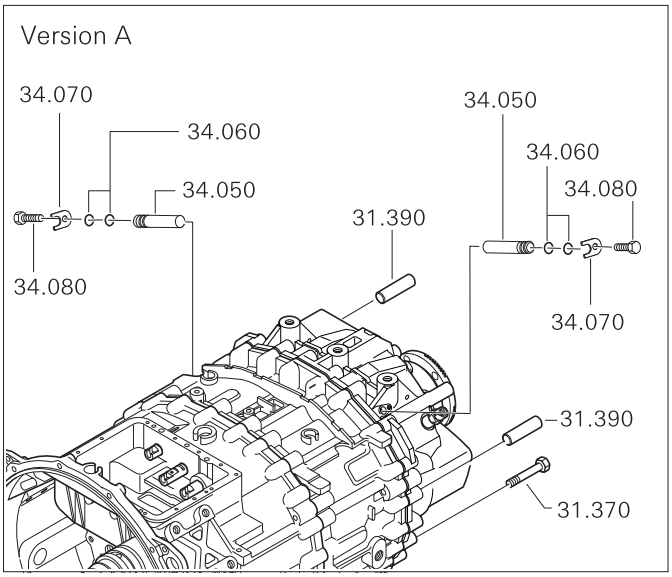
Version A

18 Insert new O-rings **34.060** at the pivot bolts **34.050**.

NOTE
If the pivot bolts **34.050** are inserted too far into the RC housing, then, you will have to dismount the RC housing again.

19 Insert the pivot bolts by means of the retaining plate **34.070** via the RC housing's bore into the gear shift fork **34.020**.

20 Fasten the retaining plate **34.070** with a hex-head screw **34.080** each and tighten to 23 Nm.



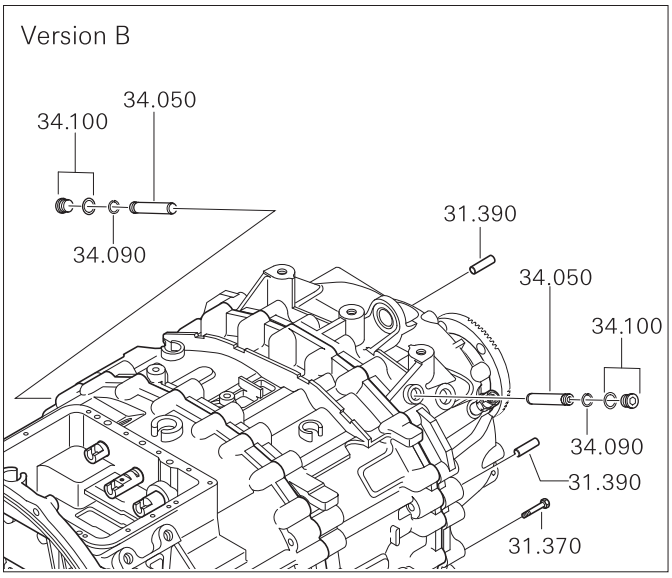
015167

Version B

18 Insert the snap ring **34.090** at the pivot bolts.

19 Cautiously insert the pivot bolts via the RC housing's bore into the gear shift fork **34.020**.

20 Tighten screw plug with sealing ring **34.100** to 40 Nm.

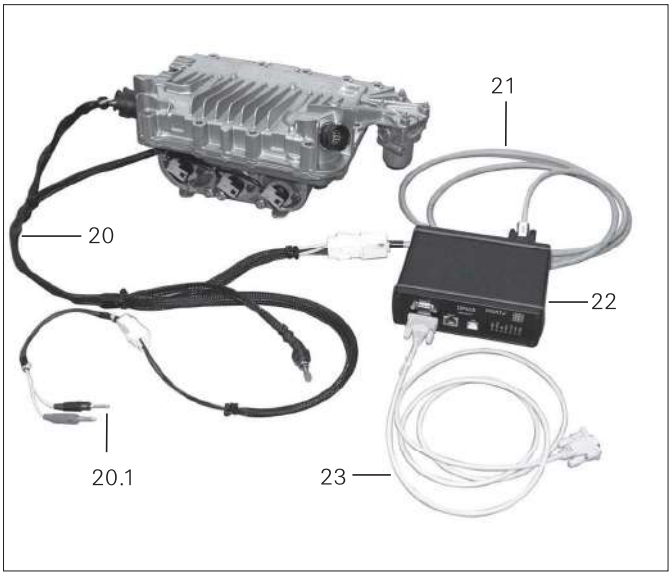


021762

Programming Transmission Actuator

When replacing the transmission actuator and/or upper section, customer-specific programming and/or parameter setting (entering EOL data) will be required.

During parameter setting, the EOL data are entered in the transmission actuator's electronics using **ZF-Testman pro and** the corresponding **software**.

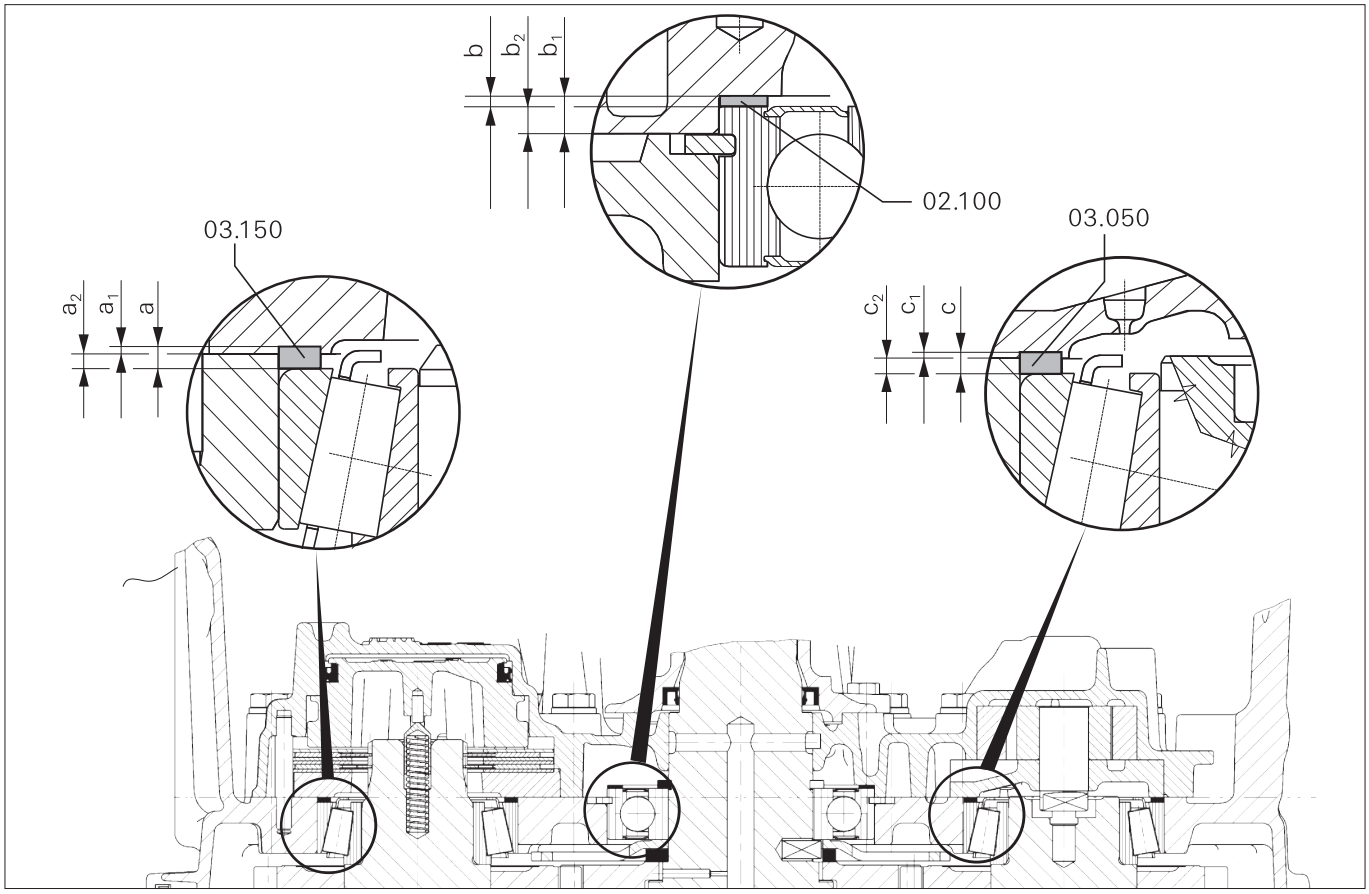


028537

Diagram of transmission actuator programming
Item:

20 Table mode adapter
20.1 Power supply connection
21 Cable from table mode adapter to the DPA05
22 DPA05
23 Cable to laptop and/or PC

CAUTION
When programming a new transmission actuator, transfer the vehicle parameters from the transmission actuator removed or re-enter them.



015199

Measure the Connection Plate

1 Turn input shaft several times back and forth. Thereby, the taper rollers of the bearings are aligned and bearing outer races are rolled in. To set the specified countershaft setting dimension of –0.05 to +0.05 mm, you first need to reach “Zero Clearance”

2 Use a drift to place the outer bearing rings on taper rollers free of clearance.

3 Use sharp object to check whether taper rollers of bearing can be moved.

NOTE
Zero clearance is attained when the taper rollers are solidly fixed but there is no preload reached.

4 Determine the distance of the bearing’s outer ring to the housing’s sealing face:

Pump	E. g. dimension c_2 = 2.00
transmission brake	E. g. dimension a_2 = 1.95
input shaft	E. g. dimension b_2 = 3.90

5 Measure connection plate.
Distance of sealing face connection plate

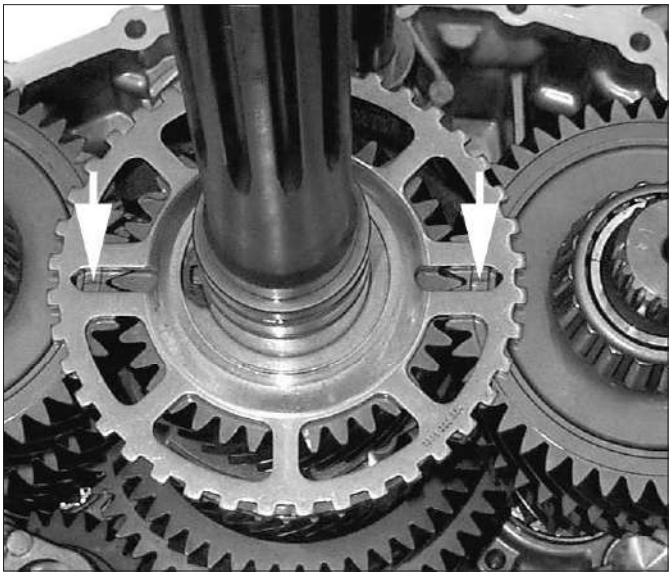
to pump cover.	E. g. dimension c_1 = 0.05
to brake cover	E. g. dimension a_1 = 0.15

to abutment face of disk **02.100**

input shaft	E. g. dimension b_1 = 5.50

6 Insert **in accordance with the respective marks** the countershafts **03.010**, **03.110**.

CAUTION
The respective marks on the countershaft must be within the range of the small counting disk 02.060 window (see arrows).



016449

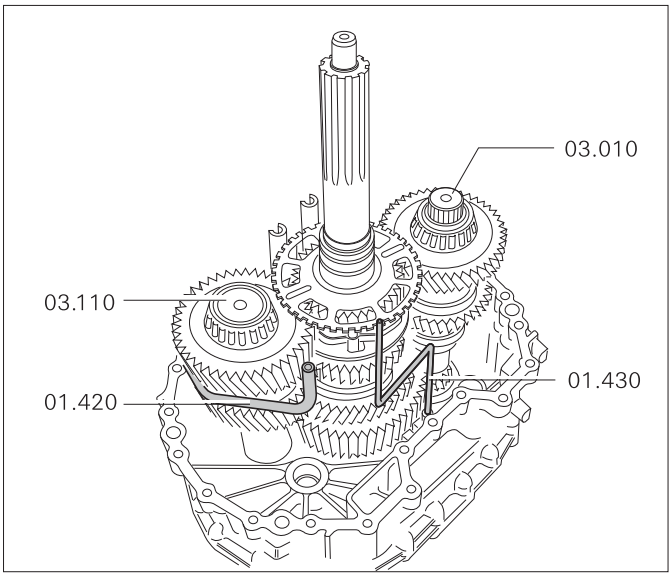
7 Engage the reverse gear and ensure that the reversing gears **05.040** and **05.140** are meshing with the countershafts.

8 Fix the reversing gears **05.040** and **05.140** in position by means of a fixing bolt **1X56 138 208**.

9 Shift into neutral (sliding sleeves to be brought into neutral position) and turn shaft pack around one time.

10 Insert the two spray pipes **01.420** and **01.430**.

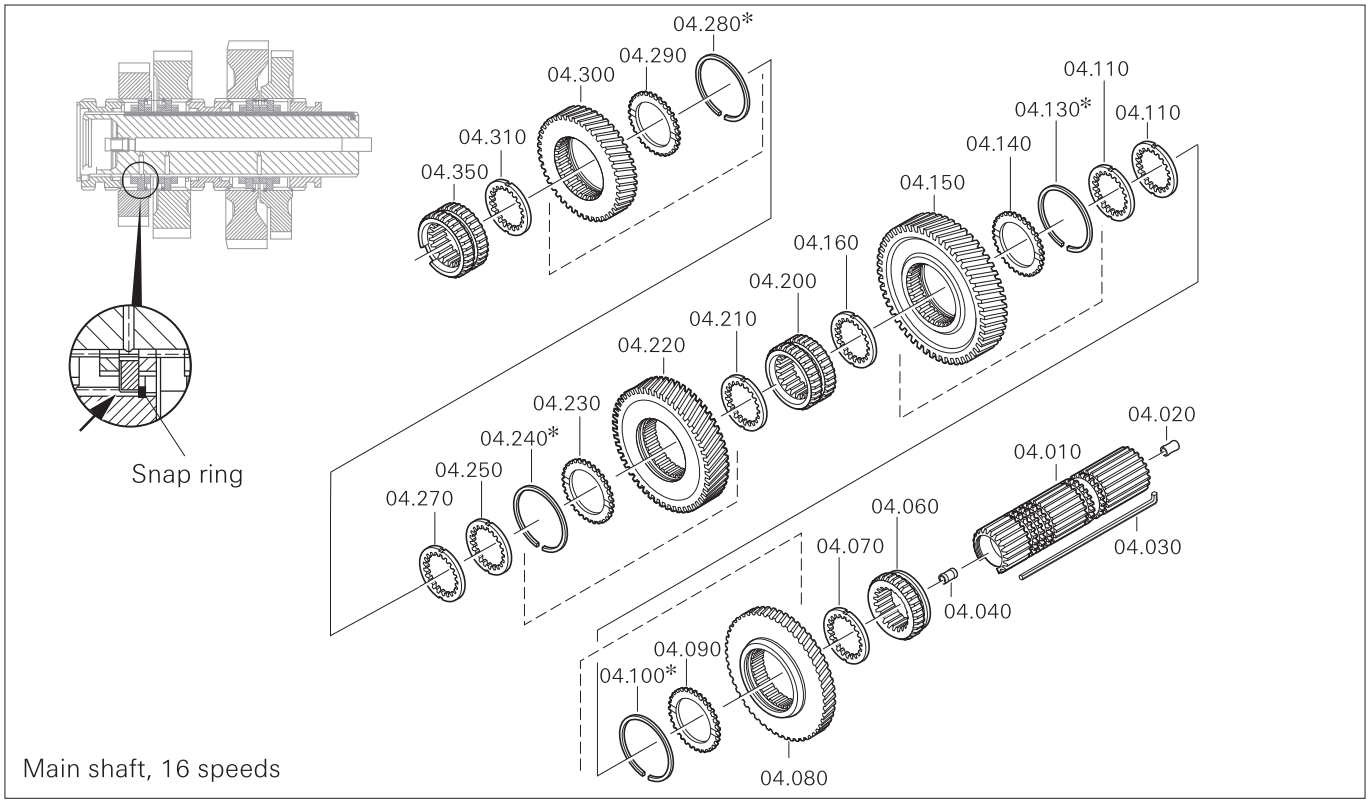
11 For mounting the housing I, please refer to the corresponding chapter.



016665

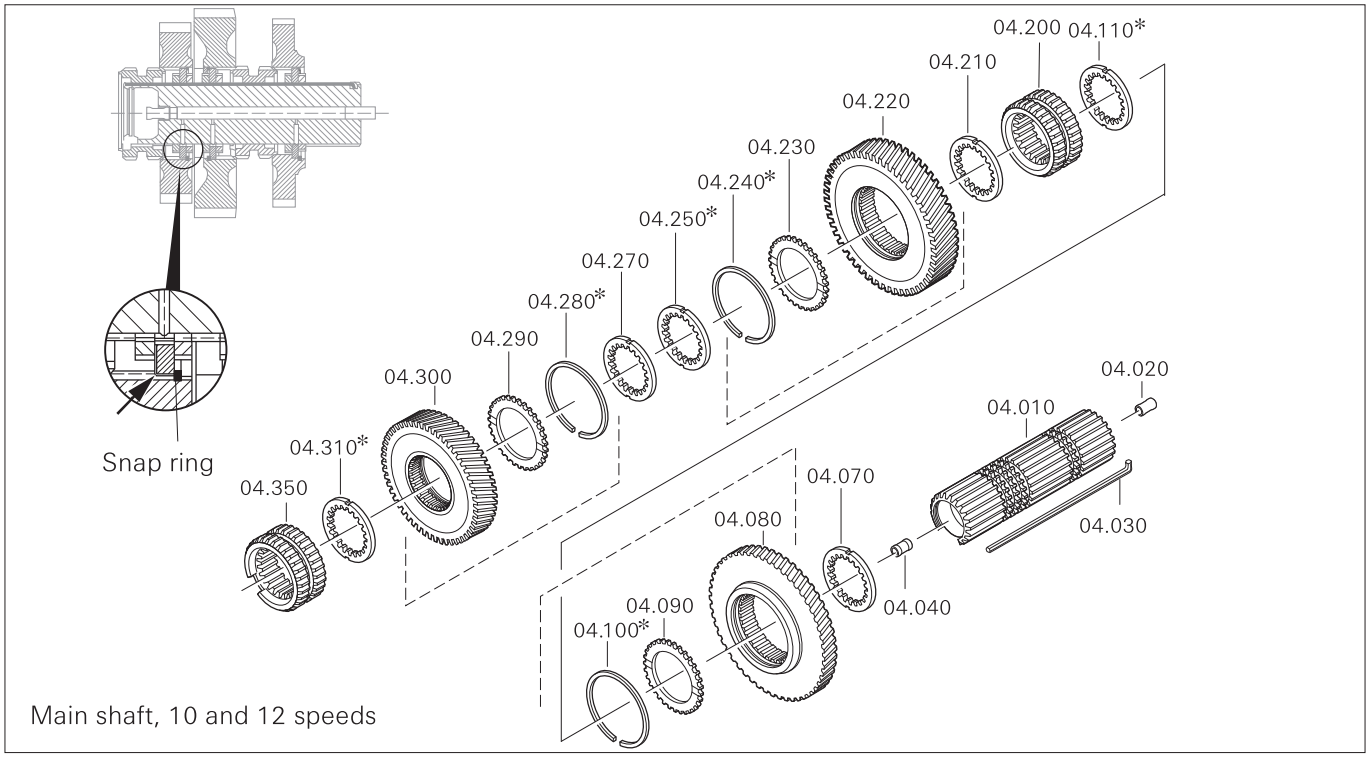
Main Shaft

NOTE
In the figure: All disks and snap rings that are marked with « * » feature a label so that during assembly they can be assigned to the correct assembly location. Thus, the measurement process is implemented for control purposes only.



Main shaft, 16 speeds

017889



Main shaft, 10 and 12 speeds

017890

Measurement 2

5 Raise the helical gear **04.080**.

NOTE
2 rim levers or something similar is necessitated for raising the helical gear **04.300**.

6 Measure from the input-end of the main shaft up to the bush.

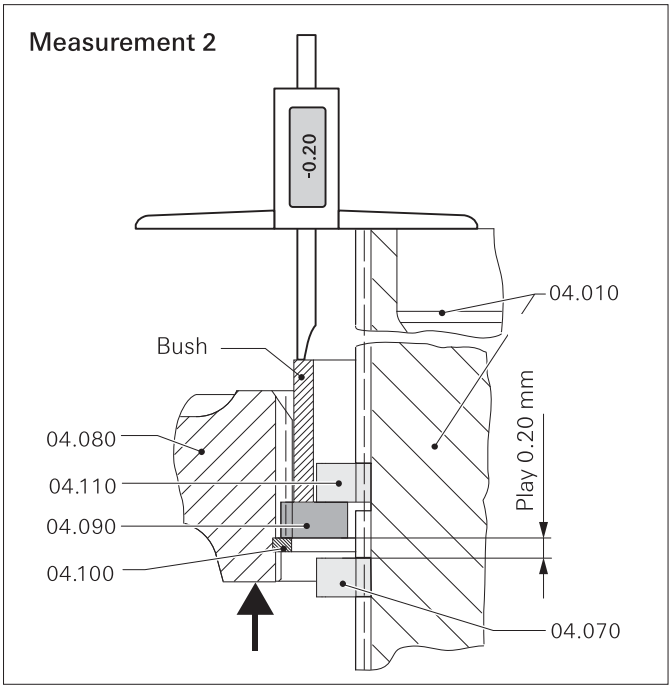
7 If the measurement value is outside of the tolerance range (0.15 up to -0.25 mm): Lift off the main shaft (MS) disk **04.110**.

8 Select and mount a new main shaft (MS) disk (calculated) **04.110** from the OTK.

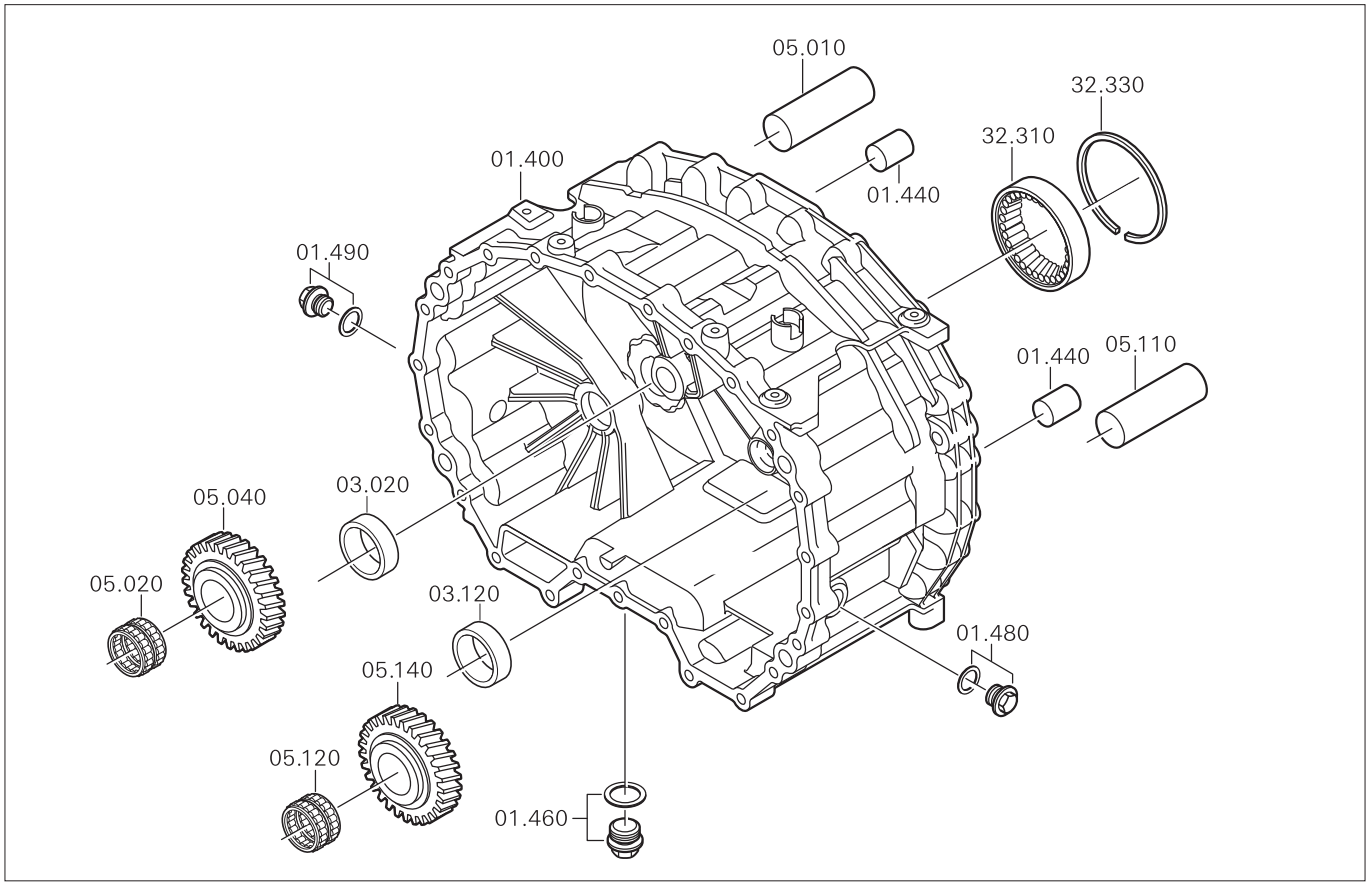
9 Check the axial play again.

10 Repeat the steps of action until the measurement value resides within the tolerance range.

11 Set the axial play for the helical gears **04.220** and **04.300** in the same way.



028234



028196

Assembling Housing II

⚠ DANGER

Only touch heated parts when wearing protective gloves.

CAUTION

In order to avoid the generation of assembly grooves, lightly coat the bearings' seats with oil prior to heating them up.

1 Heat up the bearing seat of the cylindrical roller bearing **32.310** to approx. 100 °C and insert the bearing's outer ring in the housing II (until it axially abuts).

2 Insert snap ring **32.330**.

3 Heat up the bearings' seats of the tapered-roller bearings **03.020**, **03.120** to approx. 100 °C and insert the bearing's outer rings.

4 Tighten the M24x1.5 screw plugs **01.460, 01.480**, **01.490** with 60 Nm.

5 Insert the R gear's reversing gears **05.040, 05.140** together with the needle cages **05.020**, **05.120**.

6 The idler shafts **05.010**, **05.110** are installed at a later point in time.

7 If the bolts **01.440** are missing, then heat up the housing II to approx. 90 °C, lightly grease the bolts and drive them in cautiously or use a manually operated press for pressing them in.

CAUTION

Avoid canting/misalignment of bolts during assembly danger of housing fracture!

8 For the installation of shaft pack, please refer to the corresponding chapter.

SERVICE INFORMATION

Nr. 02_04

Type: ASTRONIC
CC list SSO: All
CC list OEM: DAF
CC list customer: --

Model: 1327, 1328, 1329, 1337
Subassembly: Electrics

Date: 2004-02-03

Wiring Fastening for Clutch Actuator on ASTRONIC Transmissions

During the course of further development work, the wiring fastening for the clutch actuator was modified. The two retaining plates, to which the cable harness was previously attached by means of cable clips, were discarded in two modification stages. They have been replaced by cable clamps. A modification related to this has also been undertaken on housing section 2. The new housing section 2 has been introduced to volume production by modifying the parts list and using new item numbers.

Components affected:

Parts list modification for 1st stage

	NEW	OLD		
Designation	**Item number**	**Item number**	**Model no.**	**Mod. +)**
Housing, short	1327 301 023	1327 301 020	1327 1327	2223D 2227D
Fixing device	no longer used	1328 301 052 (1x)		
Cable clip	0501 317 817 (1x)	0501 317 817 (2x)		
Housing, long	1328 301 060	1328 301 045	1328 1328 1329 1329	2231D 2234D 2237D 2239D
Fixing device	no longer used	1328 301 052 (1x)		
Cable clip	0501 317 817 (1x)	0501 317 817 (2x)		

+) Mod = announcement number of parts list modification

Parts list modification for 2nd stage

	NEW	OLD		
Designation	**Item number**	**Item number**	**Model no.**	**Mod. +)**
Fixing device	no longer used	1328 301 052 (1x)	1327 1328 1329 1337	2250D
Cable clip	no longer used	0501 317 817 (1x)		
Fastening	0501 214 086 (1x)	---		

+) Mod. = announcement number of parts list modification

Diagram of ASTRONIC 2 transmission

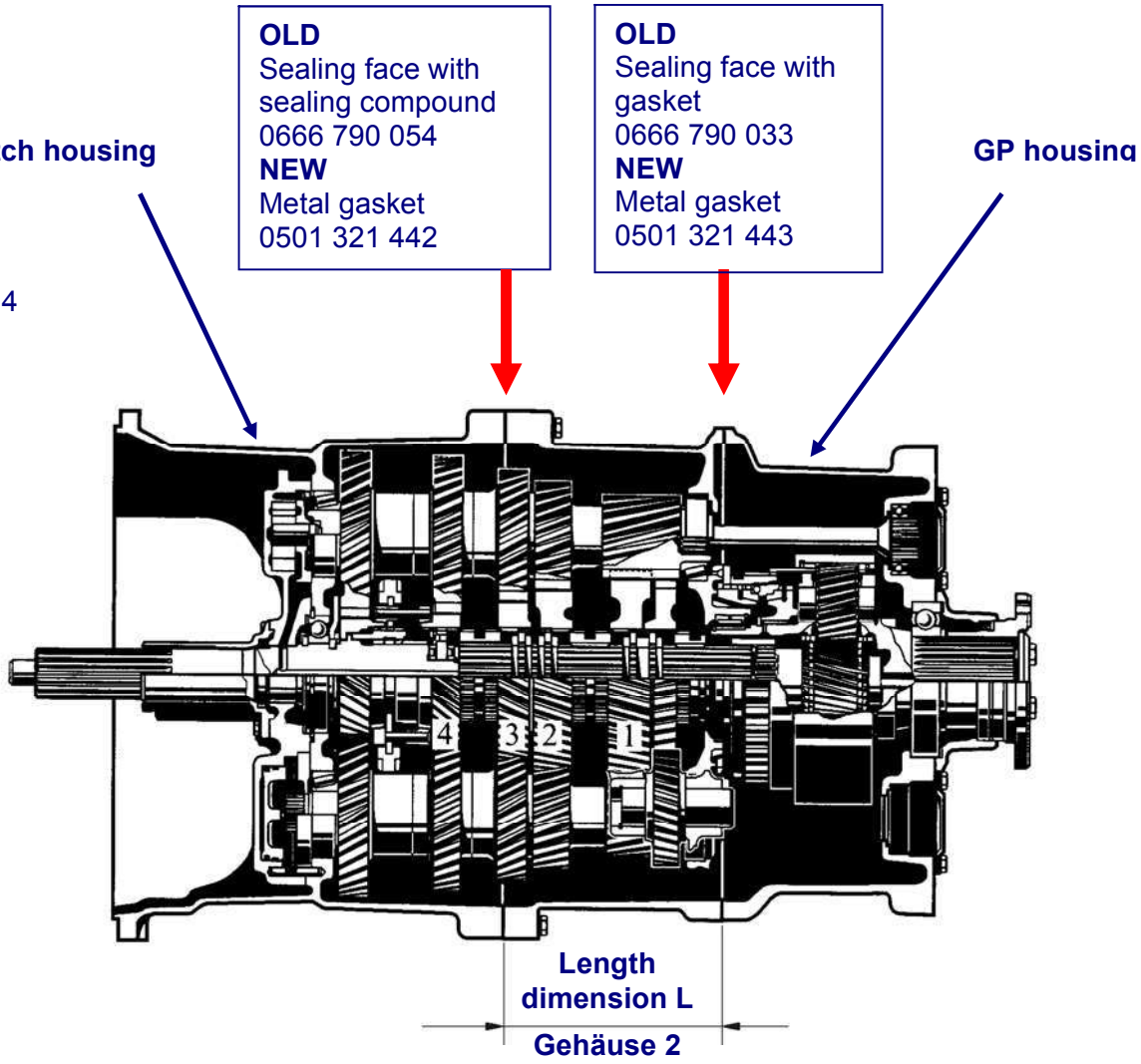


Figure 4

	Item number	Dimension L, housing 2	Remark
OLD	1328 301 060	227.5 -0.1	Housing 2, long version
	1327 301 023	184.5 -0.1	Housing 2, short version
NEW	1328 301 069	226.75 -0.13	Housing 2, long version
	1327 301 026	183.75 -0.13	Housing 2, short version

Start data:

Parts list modification for 1st step

Parts list change notification	Launch date	Remark
9723D	15.06.2005	Housing 2, long new + 2 metal gaskets
1019E	15.06.2005	Housing 2, short new + 2 metal gaskets