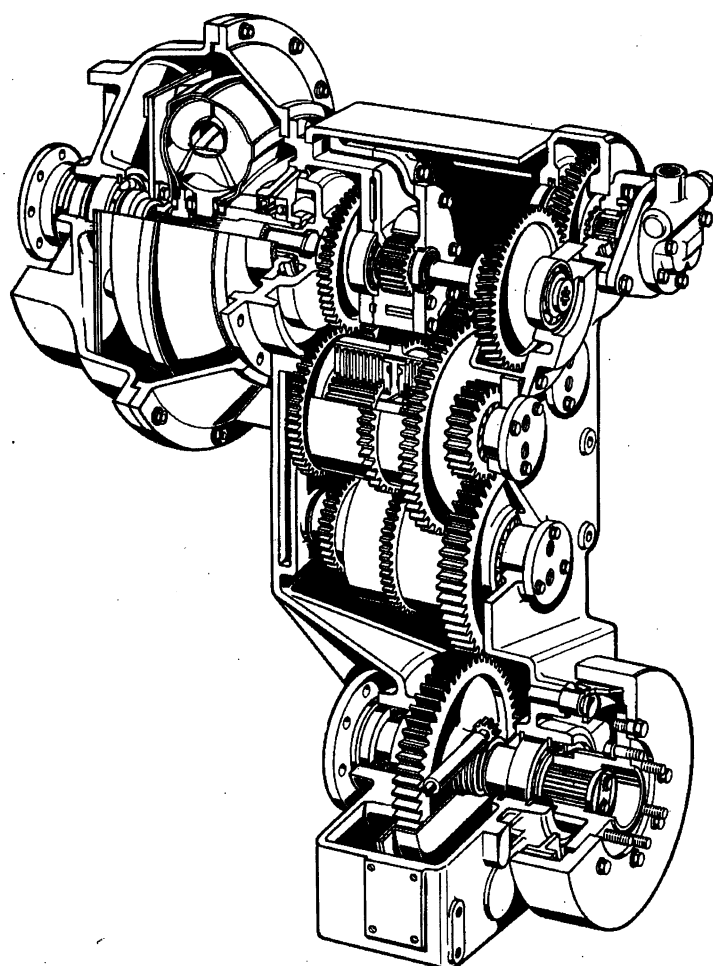


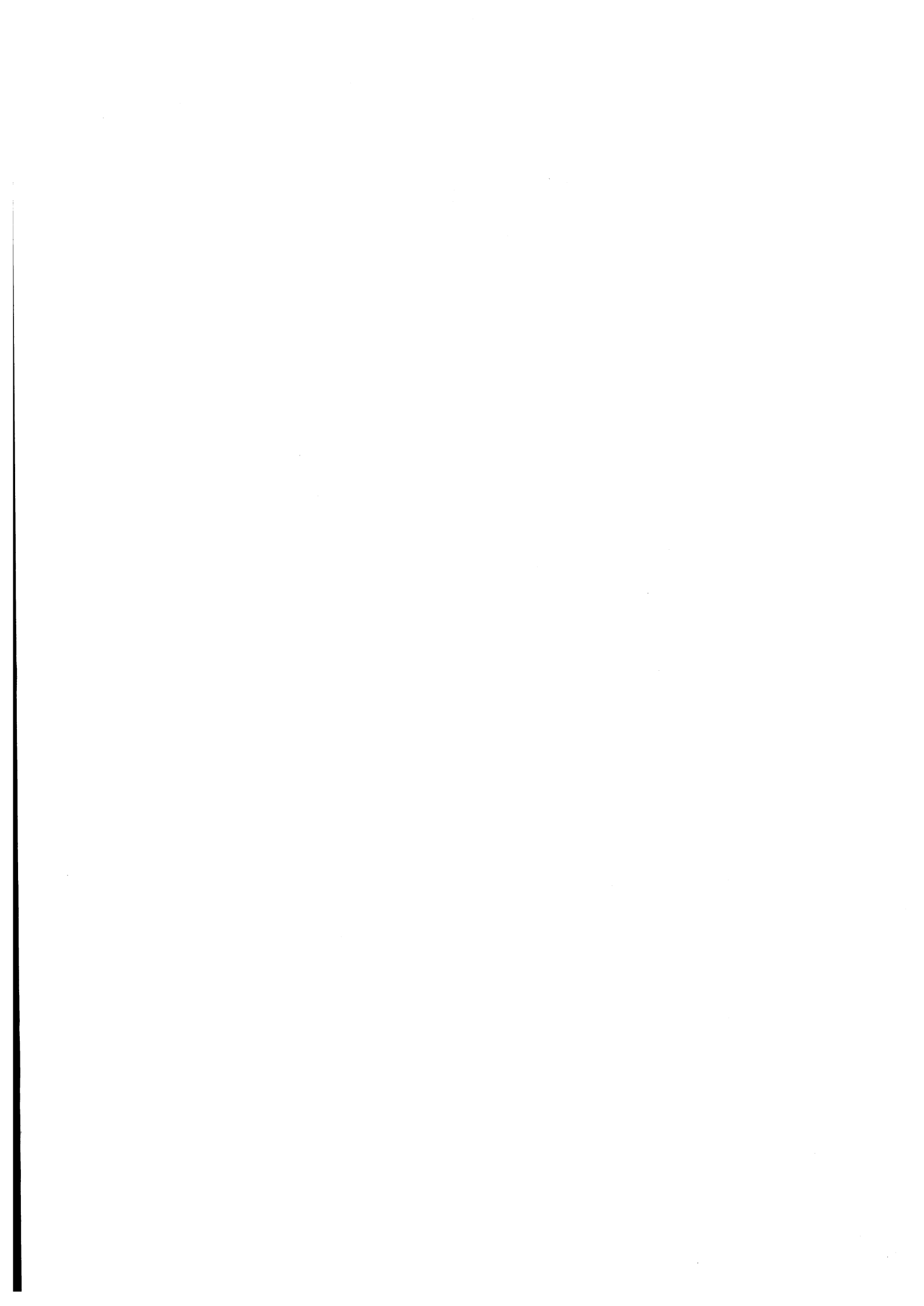
# **Werkstatt-Handbuch Workshop manual Manuel d'atelier**

## **POWERSHIFT TRANSMISSION**

### **ZF 6WG 180/200**



**899647808**



# **WORKSHOP MANUAL FOR ZF-POWERSHIFT TRANSMISSIONS**

## **WG-180 AND WG-200**

**In this Workshop Manual, the Disassembly and Reassembly of several Transmission Versions as well as Assemblies are treated.**

**The technical development of the product and the extension of the possible Versions may require varying steps, which can be carried out without great difficulty by trained personnel, consulting the Perspective Illustrations of the corresponding Spare Parts Lists.**

**Indications regarding Description, Installation, Instructions, Operating and Maintenance, see corresponding Operating Instructions!**

**ZAHNRADFABRIK PASSAU GmbH**

Donaustr. 25 - 71

D - 94034 Passau

**Abt.: KTD / Section : KTD**

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**Sous reserve de modification techniques!**

**Ausgabe / Edition : 1994/02**



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## **PREFACE**

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

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

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

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

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

***1. Constantly trained personnel***

***2. Prescribed installations, e.g. Special Tools***

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

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

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

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

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

**Zahnradfabrik Passau GmbH**

**Service Department**

## **GENERAL WORKING INSTRUCTIONS**

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

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

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

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

The old sealing compound must be carefully removed.

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

The latter refers especially to new parts.

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

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

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

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

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

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

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

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

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

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

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

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

**IMPORTANT INSTRUCTIONS**  
**CONCERNING THE LABOUR SAFETY**

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

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

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

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

The Repairer himself is obliged to provide for the training.

**BEZEICHNUNG DER GESETZLICHEN EINHEITEN**  
**DENOMINATION OF STANDARD DIMENSIONS**  
**DENOMINATION DES DIMENSIONSSTANDARDISEES**

**Hinweis :**    längenbezogene Maße in kg/m;            flächenbezogene Maße in t/m<sup>2</sup>

**Note :**        linear density in kg/m;                            areal density in t/m<sup>2</sup>

**Nota :**        Density lineaire en kg/m;                        Density superficielle en t/m<sup>2</sup>

Begriff Unit Unité	Formelzeichen	neu New Nouveau	alt old Vieü	Umrechnung Conversion Conversion	Bemerkungen Note Nota
Masse Mass Mass	m	kg (Kilogramm)	kg		
Kraft Force Force	F	N (Neweton)	kp	1 kp = 9,81 N	
Arbeit Work Travail	A	J (Joule)	kpm	0,102 kpm = 1J = 1 Nm	
Leistung Power Puissance	P	KW (Kilowatt)	PS(DIN)	1 PS = 0,7355 KW 1 KW = 1,36 PS	
Drehmoment Torque Couple	T	Nm (Newtonmeter)	kpm	1 kpm = 9,81 Nm	T (Nm) = F (N)*r(m)
Kraftmoment Moment (Force) Moment (Force)	M	Nm (Newtonmeter)	kpm	1 kpm = 9,81 Nm	M (Nm) = F (N)*l(m)
Druck (Über-) Pressure (Overpress) Pression (Sur-)	pü	bar	atü	1,02 atü = 1,02 kp/cm <sup>2</sup> = 1 bar = 750 torr	
Drehzahl Speed Nombre de Tours	n	min <sup>-1</sup>			

**VERGLEICHSTABELLE FÜR MASSEINHEITEN**  
**CONVERSION TABLE**  
**TABLEAU DE CONVERSION**

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

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

**Coefficient of friction:  $\mu$  total = 0,12 for screws and nuts without aftertreatments as well as for phosphates nuts. Tighten by hand!**

**Torque limits, of not expecially, can be taken from the following list:**

**Metric ISO-Standard Thread DIN 13, Page 13**

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

**Metric ISO-Fine Tread DIN 13, Page 13**

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

## INSCRIPTIONS ON A ZF-MODEL IDENTIFICATION PLATE FOR ZF-HYDROMEDIA-REVERSING-TRANSMISSIONS:

- 1 = Gearbox type
- 2 = Gearbox-No.
- 3 = ZF-Parts List-No.
- 4 = Total ratio of the Gearbox
- 5 = Value for the control pressure
- 6 = ZF-Parts List-No. of the Torque Converter
- 7 = Type of the ZF-Torque Converter

**Zahnradfabrik Passau**  
G.m.b.H.

**ZF** **Passau Grubweg**  
Baumuster / Getriebe-Nr.

1	2
3	4
5	7
6	

Stücklisten-Nr.    Übers. gesamt

Schaltdruck (bar)

Wandlerstückl.    Wandlerbezeichng.

Ölstand  
nur bei Motorleerlauf messen

Ölsorte  
nach ZF-Schmierstoffliste 03  
ZF-Wandler-  
Lastschalt-Getriebe

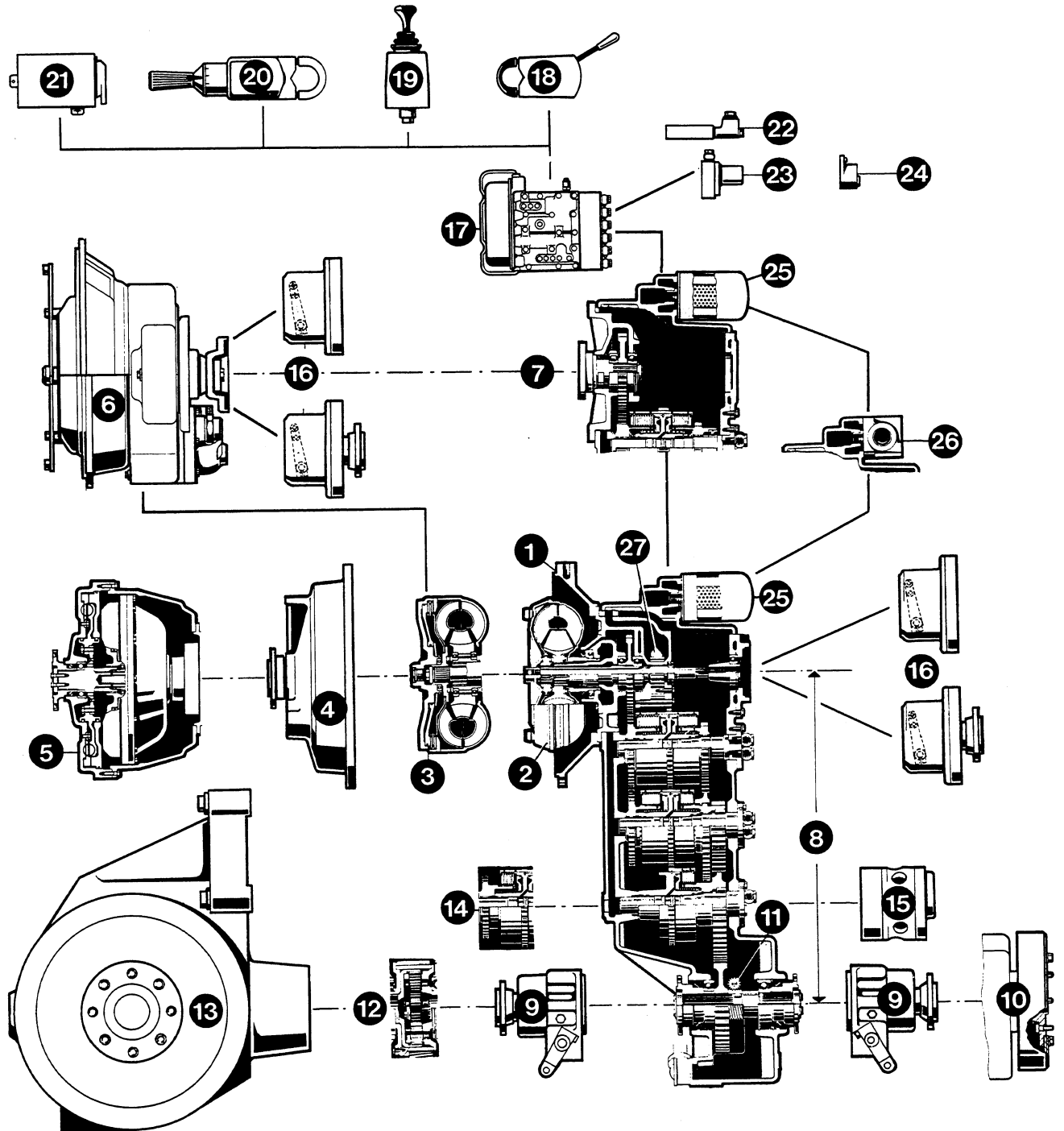
### NOTES REGARDING THE SPARE PARTS ORDERS:

When ordering genuine ZF-Spare Parts, please indicate:

- |   |   |                                 |
|---|---|---------------------------------|
| <ul style="list-style-type: none"> <li>1. Gearbox type</li> <li>2. Serial-No.</li> <li>3. ZF-Parts List-No.</li> </ul>  | } | See Model Identification Plate! |
| <ul style="list-style-type: none"> <li>4. Mark and type of vehicle</li> <li>5. Denomination of the spare part</li> <li>6. Spare parts-No.</li> <li>7. Way of transport</li> </ul> |   |                                 |

When all of the above required indications are considered, errors in the delivery of spare part orders can be avoided!

# Optional versions and additional equipment for the transmissions of the WG range



- 1 Converter housing for direct installation
- 2 Torque converter
- 3 Lock-up clutch
- 4 Cover for separate installation
- 5 Retarder
- 6 HN 500 converter transmission
- 7 Input flange (for separate installation)
- 8 Centre distance input/output shafts
- 9 Axle disconnect unit

- 10 Parking brake
- 11 Speedometer connection
- 12 Inter-axle differential
- 13 Axle drive, flange-mounted
- 14 Multi-disc clutch for 4, 5 and 6-speed version
- 15 Emergency steering pump
- 16 PTO unit, engine driven
- 17 Transmission control
- 18 Steering column switch SG 4/SG 6

- 19 Console switch SG 4/SG 6
- 20 Rotary reversing switch DW 1
- 21 Automatic control unit EST 2
- 22 Inching valve
- 23 Dual pressure control valve
- 24 Pressure cut-out
- 25 Micro-filter
- 26 Transmission connection for separate filter installation
- 27 Converter charge and shift pump





**Torque converter transmissions for off-road vehicles and machinery (construction plant, special vehicles, lift trucks)**

**List of Lubricants TE-ML 03**

Transmission	Approved lubricants
WG 80/ 81/ 83/ 85 WG 100 WG 120/ 121 WG 150/ 151 WG 180/ 181 WG 200/ 201 WG 250 WG 65 HN 500 PW 45 H (1) PW 25 H PW 18 H HSt 210	<b>Engine oils</b> API CD/ CE/ CF/ SF/ SG MIL-L-2104 C/ -D/ -E MIL-L-46152 C/ -D/ -E <ul style="list-style-type: none"> <li>• SAE 10 W</li> <li>• SAE 10 W-30</li> <li>• SAE 10 W-40</li> <li>• SAE 15 W-40</li> <li>• SAE 20 W-20</li> </ul> For commercial products see overleaf  Automatic Transmission Fluids (ATF) only at ambient temperatures below -10 °C

Oil grade	Minimum oil temperature for starting engine	Minimum oil temperature for starting vehicle moving
- Engine oils SAE 20 W-20 SAE 15 W-40 SAE 10 W, 10 W-30, 10 W-40 - ATF	-10 °C -15 °C -20 °C -30 °C	+5 °C 0 °C -5 °C -10 °C

The minimum oil temperature for starting the vehicle moving can be achieved by:

- at least 20 minutes' warm-up in "Neutral" setting
- preheating

At greasing points, use a multi-purpose grease with the following properties:

lithium soap, drop point above 170 °C, NLGI Class 2.

The grease must be anti-corrosive, water-resistant and walk stable.

**Note to lubricant suppliers:** Please inform ZF immediately of any changes to the composition or trade names of approved products, and of differences in quality between Germany and other countries.

This list can be obtained through any ZF After-Sales Service point.	Zahnradfabrik Passau GmbH Postfach 26 40 D-8390 Passau 1	Telephone (08 51) 494-0 Telex 5 78 49 zp d Telefax (08 51) 45 340
---	--	---

**Engine oils API CD/CE/CF/SF/SG,  
MIL-L-2104 C/-D/-E, MIL-L-46152 C/-D/-E**

ADDINOL MINERALÖL GMBH LÜTZKENDORF,  
KRUMPA/D  
ADDINOL MINERALÖL GMBH LÜTZKENDORF,  
KRUMPA/D  
AGIP PETROLI S.P.A., MÜNCHEN/D  
AGIP PETROLI S.P.A., MÜNCHEN/D  
AGIP SCHMIERTECHNIK AUTOL-WERKE,  
WÜRZBURG/D  
AMALIE REFINING COMPANY, BRADFORD/GB  
AMALIE REFINING COMPANY, BRADFORD/GB  
AMERICOL B.V., ZAANDAM/NL  
AMPOL LIMITED, SYDNEY/AUS  
AMPOL LIMITED, SYDNEY/AUS  
ANTAR S.A., PARIS/F  
ANTAR S.A., PARIS/F  
ARAL AG, BOCHUM/D  
ASEOL AG, BERN/CH  
ASEOL AG, BERN/CH  
AVIA MINERALÖL AG, MÜNCHEN/D  
BAYWA AG, MÜNCHEN/D

BEVEROL-NEDERLAND B.V., BEVERWIJK/NL  
BEVEROL-NEDERLAND B.V., BEVERWIJK/NL  
BLASER & CO AG, HASLE-RUESGAU/CH  
BLASER & CO AG, HASLE-RUESGAU/CH  
BP OIL INTERNATIONAL, HAMBURG/D  
BP SOUTHERN AFRICA (PTY) LIMITED,  
CAPE TOWN/SA  
BRENNTAG MINERALÖL GMBH & CO,  
MÜLHEIM/D  
BUCHER + CIE AG, LANGENTHAL/CH  
BUCHER + CIE AG, LANGENTHAL/CH  
BURRENKOPF H.O. & CO, KÖLN/D

BURRENKOPF H.O. & CO, KÖLN/D  
CALTEX SERVICES (UK) LIMITED, LONDON/GB  
CALTEX SERVICES (UK) LIMITED, LONDON/GB  
CASTROL LTD, SWINDON/GB  
CASTROL LTD, SWINDON/GB  
CENTURY OILS LIMITED, HANLEY/GB  
CEPSA, MADRID/E  
CERA OIL S.A. (PTY) LTD,  
BOKSBURG NORTH/SA  
CHEMICO, LUIPAARDSVLEI/SA  
CHEVRON USA, SAN FRANCISCO/USA  
  
COFRAN RECHERCHE SARL,  
LA ROCHELLE CEDEX/F  
CONDAT, CHASSE SUR RHONE/F  
CONDAT, CHASSE SUR RHONE/F  
DEA MINERALÖL AG, HAMBURG/D  
DEA MINERALÖL AG, HAMBURG/D  
DELUXOL OLIE MAATSCHAPPIJ B.V.,  
ROTTERDAM/NL

DEUTSCHE BP AG, HAMBURG/D  
DEUTSCHE BP AG, HAMBURG/D  
DEUTSCHE BP AG, HAMBURG/D  
DEUTSCHE PAM, ASCHAFFENBURG/D  
DEUTSCHE SHELL AG, HAMBURG/D  
DEUTSCHE SHELL AG, HAMBURG/D  
DEUTZER OEL AG, KÖLN/D  
DEUTZER OEL AG, KÖLN/D  
DIEDERICH'S SÖHNE, WUPPERTAL/D  
DIEDERICH'S SÖHNE, WUPPERTAL/D  
DUCKHAMS OILS, BROMLEY/GB  
ELEKTRION S.A., GENT/B  
ELEKTRION S.A., GENT/B  
ELF LUB, PARIS/F  
ELF LUB, PARIS/F  
ELF LUB, PARIS/F  
ELLER-MONTAN-COMP. GMBH, DUISBURG/D  
ERTOIL S.A., MADRID/E  
ESSO AG, HAMBURG/D  
ESSO AG, HAMBURG/D  
EURO OIL-VERTRIEBS-GMBH, FRANKFURT/D  
FIAT LUBRIFICANTI, TORINO/I  
FIAT LUBRIFICANTI, TORINO/I  
FINA EUROPE S.A., BRÜSSEL/B  
FINKE E. GMBH & CO KG, BREMEN/D  
FUCHS MINERALOELWERKE GMBH,  
MANNHEIM/D  
FUCHS MINERALOELWERKE GMBH,  
MANNHEIM/D  
GARANTOL AG, MADETSWIL/CH  
GPM ESPANOLA S.A., BARCELONA/E  
GPM ESPANOLA S.A., BARCELONA/E  
GULF OIL LIMITED, CHELTENHAM/GB  
HAFA, PARIS/F  
HESSISCHE ÖLWERKE, BAD VILBEL/D  
HGK GMBH & CO. KG, DÜSSELDORF/D  
HGK GMBH & CO. KG, DÜSSELDORF/D  
HILBERT T., EMSDETTEN/D

HILBERT T., EMSDETTEN/D  
HOMBERG GMBH & CO. KG, WUPPERTAL/D  
HUILES RENAULT DIESEL, PARIS/F  
HÜRLIMANN E. AG, WÄDENSWIL/CH

ADDINOL TURBO DIESEL  
  
ADDINOL DIESEL SUPER  
AGIP SIGMA MULTI  
AGIP DIESEL SIGMA S

AUTOL-CPM-HD S3  
PRO HIGH PERFORMANCE  
XLO  
SUPER HD S3  
DEULUBE S3  
LONGHAUL  
MILANTAR 3C  
MILANTAR 2B  
ARAL TURBORAL MOTORÖL  
ASEOL MILOR  
ASEOL PERLA  
AVIA SPECIAL MOTOR OIL HDC  
BAYWA MOTORENÖL HD  
SUPERIOR  
GOLD ARTOL  
MAGNA  
BLASOL 258  
BLASOL 257  
VANELLUS C3

BP VANELLUS C3

SILVER STAR MOTORÖL HD-MIL-C  
MOTOREX MC PLUS  
MOTOREX EXTRA  
H.O.B.-MULTI-MOTOR-OIL MBC HD  
TURBO  
H.O.B.-MOTOR-OIL HD CS III  
RPM DELO 450 OIL  
RPM DELO 400 OIL  
CASTROL CRD  
CASTROL RX SUPER  
SUPERB  
CEPSA SUPER SERIE 3

HONEYLUBE SUPER PLUS  
LUBRO "MS" ENGINE OIL  
CHEVRON DELO 400 PLUS  
MOTOR OIL

PLURA / EQUILUX C 2000  
VICAM SPECIAL C  
VICAM TURBO SHPD  
DEA CRONOS SUPER  
DEA CRONOS SUPER DX

DELUXOL MOTOR OIL SUPERIOR-  
EXTRA  
VERITAS HDC-F PLUS DB  
BP VANELLUS C3 / ARISTOL HDC  
BP VANELLUS MULTIGRADE  
PAM HD FLEET  
MAC HD SUPERIOR MOTORENÖL  
SHELL RIMULA X  
DEUTZ ÖL SGHD-C  
DEUTZ ÖL HD-C  
CIDISOL-HD MOTORENÖL 15W-40  
CIDISOL-MOTORENÖL HD  
FLEETOL 3  
ELEKTRION UNI  
ELEKTRION HD/S  
ELF PERFORMANCE SUPER  
ELF PERFORMANCE XC  
ELF PERFORMANCE 3D  
ELLMOTOL HD C3  
ERTOIL SUPER SERIE 3  
ESSO MOTORENÖL MHC  
ESSOLUBE XD-3 PLUS  
EURO OIL LD TURBO  
URANIA C  
URANIA TURBO LD  
FINA KAPPA TD MOTOR OIL  
AVIATICON HDS-3

RENOLIN HD SUPERIOR

TITAN UNIVERSAL HD  
GARANTOL HD DIESEL S-3  
HIDROBAK 10W ESPECIAL  
MOTOR OIL S-III  
GULF SUPER DIESEL (GB)  
DETERGENTE SSC  
HESSOL SUPERIOR  
SVG HD SUPERPLUS S3  
SVG UNIVERSAL C3  
XORBOL MEHRBEREICHSÖL  
HDC S3  
XORBOL MOTORENÖL HDC  
HOMBERG-MOTOR-OEL HD-SC 4  
RENAULT DIESEL MVS  
ROLLSYNOL HD M.O. S-3

**Engine oils API CD/CE/CF/SF/SG,  
MIL-L-2104 C/-D/-E, MIL-L-46152 C/-D/-E**

ICPA, DORDRECHT/NL  
IGOL FRANCE, PARIS/F  
INA RAFINERIJ A RIJKA, KOSTRENA-URINIJI/UY  
ITALIANA PETROLI S.P.A., GENOVA/I  
KÄPPLER K. GMBH & CO KG, STUTTGART/D

KENDALL REFINING COMPANY,  
BRADFORD/GB  
KENDALL REFINING COMPANY,  
BRADFORD/GB  
KLUTH O., BARGFELD-STEGER/D

KLUTH O., BARGFELD-STEGER/D

KOMPRESSOL-OEL VERKAUFS GMBH, KÖLN/D  
KOMPRESSOL-OEL VERKAUFS GMBH, KÖLN/D  
KRAFFT S.A., ANDOAIN/E  
KROON-OIL BV, ALMELO/GB  
KUWAIT PETR.RESEARCH & TECHN. B.V.,  
ROTTERDAM/NL  
KUWAIT PETR.RESEARCH & TECHN. B.V.,  
ROTTERDAM/NL  
LABO INDUSTRIE, NANTERRE/F  
LEPRINCE & SIVEKE GMBH, HERFORD/D  
LEPRINCE & SIVEKE GMBH, HERFORD/D  
LUBRICATION ENGINEERS, INC., TEXAS/USA  
MINERALÖLWERK OSNABRÜCK,  
OSNABRÜCK/D  
MOBIL OIL AG, HAMBURG/D  
MOBIL OIL AG, HAMBURG/D  
MORRIS LUBRICANTS, SHREWSBURY/GB  
MOTUL S.A., AUBERVILLIERS/F  
NEULING P. MINERALÖLWERK, BERLIN/D  
NYNÄS INDUSTRI AB, NYNÄSHAMN/NL  
OEL-BRACK AG AARAU, HUNZENSCHWIL/CH  
OEST G. MINERALÖLWERK, FREUDENSTADT/D  
OEST G. MINERALÖLWERK, FREUDENSTADT/D

ÖMV-AG, WIEN/A  
OPAL LUBRIFIANTS, NANTERRE/F  
OPTIMOL ÖLWERKE, MÜNCHEN/D  
ORLY INTERNATIONAL G.I.E., VIEUX-THANN/F  
PANOLIN AG, MADETSWIL/CH  
PAZ OIL COMP., HAIFA/IL  
PAZ OIL COMP., HAIFA/IL  
PENNASOL MINERALÖL GMBH, UETZE/D  
PENNASOL MINERALÖL GMBH, UETZE/D  
PENNZOIL OVERSEAS B.V., ZAANDAM/NL  
PENNZOIL OVERSEAS B.V., ZAANDAM/NL  
PETROGAL S.A., LISSABON/P  
POLAROL S.A., ISSOUDUN/F  
POLAROL S.A., ISSOUDUN/F  
PRINZ-SCHULTE GMBH & CO KG, FRECHEN/D  
RAIFFEISEN IMPERATOR, BAISIEUX/F  
RAIFFEISEN HEGEG, HANNOVER/D  
RAIFFEISEN HEGEG, HANNOVER/D  
RCG NORDWEST EG, MÜNSTER/D

REPSOL DISTRIBUCION S.A., MADRID/E  
RHEINISCHE MOTOR-ÖL, DUISBURG/D  
SONOL ISRAEL LTD., HAIFA/IL  
SOPROGRASA, S.A., MADRID/E  
STRUB & CO. AG, SCHMIERTECHNIK,  
REIDEN/CH  
STRUB & CO. AG, SCHMIERTECHNIK,  
REIDEN/CH  
SUN OIL COMPANY N.V., AARTSELAAR/B  
TEBOIL OY AB, HELSINKI/SF  
TEXACO SERVICES (EUROPE) LTD.,  
BRÜSSEL/B  
TOTAL GROUP, PARIS/F  
TURBOTANK BÖSCHE & BÖDEKER,  
BREMEN-NEUSTADT/D  
UK MIN.WERKE WENZEL &  
WEIDMANN GMBH, ESCHWEILER/D  
UNIL DEUTSCHLAND GMBH, HERFORD/D  
UNIL DEUTSCHLAND GMBH, HERFORD/D  
UNIL INTERNATIONAL, PARIS/F  
USOCO B.V., RIDDERKERK/NL

VALVOLINE INTERNATIONAL INC.,  
DORDRECHT/NL  
VALVOLINE INTERNATIONAL INC.,  
DORDRECHT/NL  
VEBA OEL AG, GELSENKIRCHEN/D  
VEEDOL INTERN. LTD., SWINDON/GB  
WESTFALEN AG, MÜNSTER/D  
WEVAG WEYERS & VAGEDES KG, BOCHOLT/D  
WEVAG WEYERS & VAGEDES KG, BOCHOLT/D  
WINTERSHALL AG, DÜSSELDORF/D  
WISURA MINERALÖLWERK GMBH & CO,  
BREMEN/D  
WISURA MINERALÖLWERK GMBH & CO,  
BREMEN/D  
YACCO SAF, CAUDEBEC-L.-ELBEUF/F  
ZELLER & GMELIN GMBH & CO, EISLINGEN/D  
ZENEX OIL (PTY) LTD, SANDTON/GB  
ZENEX OIL (PTY) LTD, SANDTON/GB

OK SUPER DS.C  
IGOL ULTRA DUTY 4D  
INA-SUPER 3  
IP AXIA D  
DRIVOLIN SUPERIOR HD MO-  
TORENÖL S3

GT-1 TURBO HIGH PERFORMANCE

SUPER-D3  
KLUTH HOCHLEISTUNGSMOT.ÖL  
HDC C3  
KLUTH MEHRBER.MOT.ÖL HDC-F  
PLUS DB  
KOMPRESSOL-ULTRALUB-C  
KOMPRESSOL-HD-S3-C-OEL  
MOTOR-OIL DMOK 3040  
KROON OIL MULTIFLEET SCD

Q8 T500

Q8 T400  
MEGALUB AC3  
LEPRINXOL SUPER  
LEPRINXOL SUPER S  
MONOLEC GFS ENGINE OIL

IROKAL PLUS C  
DEL VAC 1300  
MOBIL DELVAC 1400 SUPER  
RING FREE XHD  
MOTUL SUPERIOR HP 4D  
SUPEROL HD-C-NX SUPER  
AJCOL SDS  
PERFECTOL / PENTEX HDX-TURBO  
OEST DIMO HDC-MOTORÖL  
OEST GIGANT UNIVERSAL HD  
MOTORÖL  
ELAN MOTORÖL 104 C  
DIESOL MC3  
OPTIMOL OPTILUB C  
ORLY DRACO 2001  
PANOLIN HD EXTRA DIESEL S-3  
PAZMULAR DX  
PAZ CHAMPION SG  
PENNASOL MULTIGRADE EXTRA C  
PENNASOL MOTOR OIL EXTRA C  
LONG-LIFE MOTOR OIL  
MULTI DUTY MOTOR OIL  
GALP DIESEL  
EURALTA MTM  
EURALTA TM  
AERO-LINE SUPER HD M-C  
RAFF GRADE 2104D  
HG UNIVERSAL HD  
HG CS3 HD  
RAIFFEISEN MOT.ÖL SUPER UNIV.  
HDCT  
CS-MIZAR SERIE-3  
RMV-RHEMOTOL HD-C  
SADOL X-400  
SOPRAL SUPERDIESEL

STRUB MOTOR OIL TURBO

STRUB SUPER MULTI TURBO  
SUNOCO SUPER C  
TEBOIL POWER D

URSA SUPER LA  
TOTAL RUBIA XT/X

TURBO HD MOTORENÖL CIII

UK-PROMOTOR CONTROL HD  
UNIL MULTI D / DS  
UNIL MOTOR HP 4D / 4DS  
UNIL MEGARA RD  
USOCO-EXCELLO HD XXX  
MOTOROIL

VALVOLINE TOPFLITE C-3

VALVOLINE ALL FLEET PLUS  
VEBA MOVARA EXTRA-MOTORÖL  
VEEDOL DIESEL HDC  
WESTFALEN C3 MOTORÖL  
WEVAGOL EXTRA MULTIGRAD  
WEVAGOL EXTRA C3  
WINTERSHALL REKORD

WISURA MULTI HD-C

WISURA MULTI HD-C PLUS  
YACCO AS3 SERIE Y, YY, M, X  
DIVINOL MULTIMAX  
ZENEX MULTIGRADE MOTOR OIL  
ZENEX SINGLEGRADE MOTOR OIL

## 1. ELECTRO-HYDRAULIC GEARBOX CONTROL

### ATTENTION :

In case of malfunctions of the Transmission because of a defective gearbox control, we recommend the replacement of the complete gearbox control.

The pressure-control curve of the replacement-gearbox control (see corresponding Spare Parts List) has been accordingly adapted to the Transmission Version, resp. to the Vehicle type.

Modifications concerning the pressure-control curve may not be carried out without agreement of ZF. Therefore, the repair of gearbox control units should be carried out by ZF-Service stations only.

The relative shop equipment of our Service stations (gearbox control resp. transmission test benches) as well as constantly trained personnel ensure a professional repair.

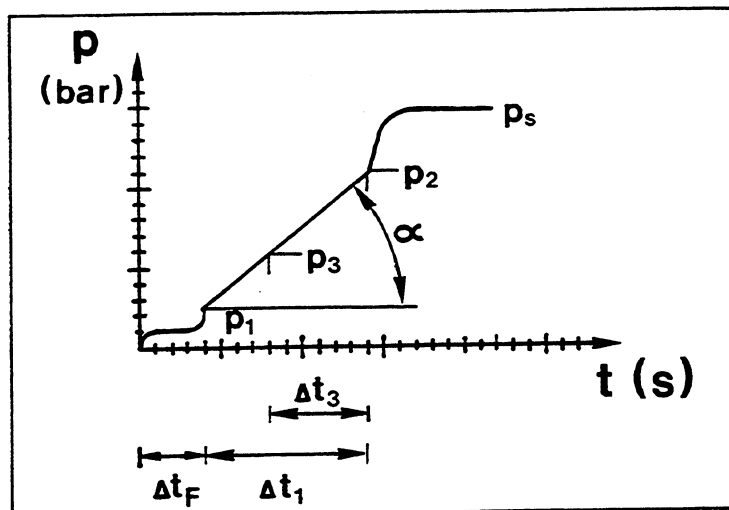
The following Disassembly and Reassembly Instructions (Page 1.01 - 1.73) will therefore be useful only as an Information for ZF-Service stations as well as for the Manufacturer of the vehicle, which are disposing of the required workshop equipment and especially trained personnel.

**Note regarding the pressure control:****Diagram 1 (Basic diagram)**

Pressure-control curve gear case

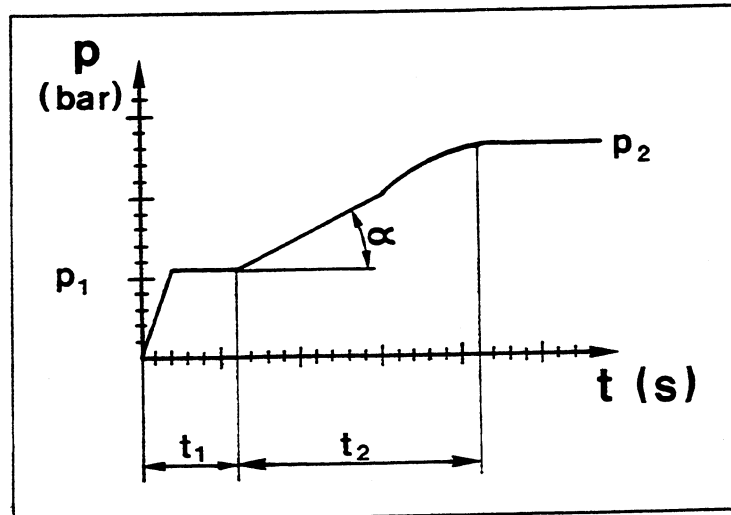
$p$  = Pressure in bar  
 $t$  = Time in seconds

$p^1$  = Modulation start  
 $p^2$  = Modulation end  
 $p^3$  = Modulation start only in dependence with 2-stage pressure control valve  
 $p_s$  = Control pressure  
 $\Delta t_F$  = Filling time  
 $\Delta t_1$  = Modulation time  
 $\Delta t_3$  = Modulation time in dependence with 2-stage pressure control valve

**Diagram 2 (Basic diagram)**

Pressure-control curve WK

$p^1$  = Modulation start  
 $p^2$  = Modulation end  
 $t_1$  = Filling time  
 $t_2$  = Modulation time

**ATTENTION:**

The pressure-control curve is different according to the Transmission Version, resp. the vehicle type and will be adjusted by means of corresponding shims and diaphragms (optional)!