

ZF MT-S 3105 REAR AXLE

COMONENT TECHNICAL MANUAL ZF MT-S 3105 AXLE (RIGID MOUNT) CTM367 (01JAN06)

**CALIFORNIA
Proposition 65 Warning**

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects and other reproductive harm.

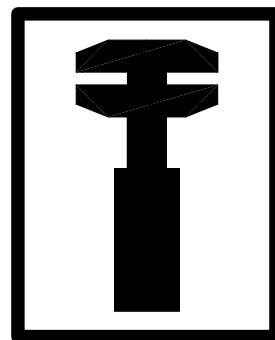


WARNING

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

Worldwide Construction and Forestry Division

English



Part No.: 5871 540 002

ZF - MULTITRAC

MT-S 3105



ZF Passau GmbH
Donaustr. 25 - 71
D- 94034 Passau

REPAIR MANUAL **for the ZF - Multitrac** **MT-S 3105**

IMPORTANT INSTRUCTIONS CONCERNING THE REPAIR MANUAL

The great variety of ZF units compels a restriction of the Disassembly and Assembly Manuals to a current ZF production unit. Technical development of the ZF units as well as extensions concerning the design possibilities may require differing steps, which can be carried out by qualified Specialists without greater difficulties with the help of the Perspective Illustrations in the corresponding Spare Parts Lists.

The described Disassembly and Assembly Manual is based on the design level of a ZF production unit at the time of preparation of the Repair Manual.

The ZF Passau GmbH reserve the right to replace the present Disassembly and Assembly Manual by a successional edition without advance notice. Upon request, the ZF Passau GmbH will advise what edition is the latest one.

ATTENTION:

For the installation as well as for the commissioning of the unit, the Instructions and Specifications of the Vehicle Manufacturer have to be observed!

ZF Passau GmbH

Donaustr. 25 - 71

D - 94034 Passau

Abt.: ASDM / Section : ASDM

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Technische Änderungen vorbehalten! With the reserve of technical modifications!

Sous réserve de modifications techniques!

Konstruktionsstand / Design level	2002/10
2.Auflage / 2st Edition	2004/10
3.Auflage / 3st Edition	2005/03
4.Auflage / 4st Edition	2005/06

TABLE OF CONTENTS	Chapter/Page
Preface	0/1
General	0/2 ... 3
Examples of Contact Pattern for the Gleason gear-tooth system	0/4 ... 5
Lubrication and Maintenance Instructions	0/6 ... 8
Wear Measurement – Multi-Disc Brake	0/9
Inscription on Model Identification Plate and Specifications for Spare Parts Orders	0/10
Conversion Table for Dimensional Units	0/11
Denomination of Standard Dimensions	0/12
Torque Limits for Screws	0/13
SPECIAL TOOLS	W/1 ... WB/7
List of Special Tools (required special tools)	W/1 ... 11
Illustrated tables	WB/1 ... 7
DIS- AND REASSEMBLY	1/1 ... 4/24
<u>1. Disassembly of Output and Brake</u>	1/1 ... 10
<u>2. Reassembly of Output and Brake</u>	2/1 ... 14
<u>3. Disassembly of Axle Insert (Type: LK) and Oil Pipes</u>	3/1 ... 14
3.1 Separate Outputs from the Axle Casing	3/1 ... 4
3.1.1 Separate Output (LH) from the Axle Casing	3/1 ... 3
3.1.2 Separate Output (RH) from the Axle Casing	3/3 ... 4
3.2 Disassembly of Axle Insert	3/4 ... 10
3.2.1 Disassembly of Limited-Slip Differential (D-2400)	3/7 ... 8
3.2.2 Disassembly of Drive Pinion	3/8 ... 10
3.3 Disassembly of 100% - Differential Lock	3/11 ... 12
3.4 Disassembly of Oil Pipes	3/13 ... 14

**Thanks very much for your reading,
Want to get more information,
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manual**

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TABLE OF CONTENTS

Chapter/Page

4. <u>Reassembly of Oil Pipes and Axle Insert (Type: LK)</u>	4/1 ... 24
4.1 Reassembly of Oil Pipes	4/1 ... 3
4.2 Reassembly of 100% - Differential Lock	4/4 ... 6
4.3 Reassembly of Axle Insert	4/7 ... 20
4.3.1 Determine Shim Thickness for a Perfect Tooth Contact Pattern	4/7 ... 8
4.3.2 Install the Drive Pinion	4/8 ... 12
4.3.3 Reassembly of the Limited Slip Differential (D-2400)	4/13 ... 18
4.3.4 Adjust the Backlash, Bearing Rolling Moment and Bracket Width	4/18
4.4 Mount Outputs to the Axle Casing	4/21 ... 24
4.4.1 Mount the Output (LH)	4/21 ... 23
4.4.2 Mount the Output (RH)	4/23 ... 24

PREFACE

This documentation has been developed for the skilled Serviceman, trained by the ZF 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 Servicemen, whose practical and theoretical training is constantly completed to the actual situation in our Training School.

The Service Stations, established by the ZF 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.

ZF Passau GmbH

Service Department

GENERAL

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

When repairing the axle, ensure utmost cleanliness and that the work is carried out in an expert-like manner. The axle should only be disassembled for renewing damaged parts. Covers and housing parts installed with seals must be loosened by slight blows with a plastic mallet after screws and nuts have been removed. For removing parts being in tight contact with the shaft such as antifriction bearings, bearing races, and similar, use suitable pulling devices.

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

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

**REFE-
RENCE:** For heating up parts such as bearings, housings etc., only a heating furnace or an electric drier is permitted to be used!
Parts fitted in heated state have to be installed subsequently after cooling down to ensure a perfect contact!

CAUTION

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

When installing snap rings and retaining rings pay attention to an exact contact in the grooves!

Lined plates with organic friction linings (e.g. paper linings) must not be washed (negative effect on lining adhesion).

They are only allowed to be dry-cleaned (leather cloth).



DANGER

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

Structure of the Repair Manual

The structure of this Repair Manual reflects the sequence of the working steps for completely disassembling of the dismantled unit.

Special tools required for performing the respective repair work are listed in the text as well as in the Chapters “W” (List of Special Tools) and “WB” (Illustrated Tables).

Important information on industrial safety

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


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


Persons performing repair work must familiarize themselves with these regulations.

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

The repairer is obliged to perform the training.

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

 CAUTION	This symbol is indicated in this repair manual as reference to special working procedures, methods, information, the use of auxiliaries etc.
--	---

 DANGER	This symbol refers to situations, if lacking care can lead to personal injury, danger to life and damages on the product.
---	--

<u>REFE- RENCE</u>	Prior to starting the checks and repair work, thoroughly study the present instructions.
-------------------------------	--

<u>REFE- RENCE</u>	<p>Illustrations, drawings and parts do not always represent the original; the working procedure is shown.</p> <p>The illustrations, drawings, and parts are not drawn to scale; conclusions regarding size and weight must not be drawn (not even within one representation).</p> <p>The work must be performed according to the description.</p>
-------------------------------	--

<u>REFE- RENCE:</u>	After the repair work and the checks, the expert staff must convince itself that the product is properly functioning again.
--------------------------------	---

TRAGBILDBEISPIELE ZUR GLEASONVERZÄHNUNG

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

EXEMPLES POUR LA DENTURE GLESON

Ideales Tragbild d.h. die Ritzeldistanz stimmt

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

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

Bild / Figure 1/3/5

Schubflanke (Konkav)

Coast side (concave)

Côté poussé (concave)

Bild / Figure 1



Bild / Figure 2/4/6

Zugflanke (Konvex)

Drive side (convex)

Côté entraîné (convexe)

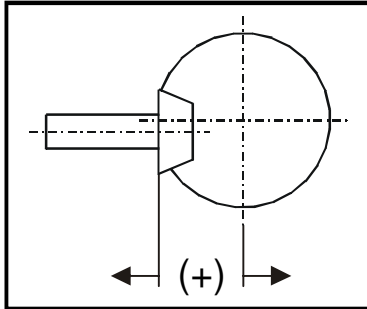
Bild / Figure 2



Ritzeldistanz muß größer werden

Pinion distance must be increased

La distance du pignon doit être augmentée



Ritzeldistanz muß kleiner werden

Pinion distance must be decreased

La distance du pignon doit être diminuée

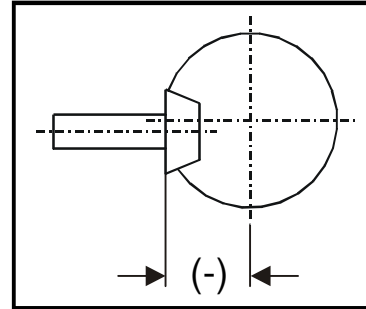


Bild / Figure 3



Bild / Figure 5



Bild / Figure 4



Bild / Figure 6



LUBRICATION- AND MAINTENANCE INSTRUCTIONS FOR ZF-AXLES MT-S 3105

1. Oil specification:

Oils according to ZF List of Lubricants **TE-ML 05** are allowed to be used for ZF-Axles MT-S 3105.

The ZF List of Lubricants will be updated every two years and can be requested or examined as follows:

- in all ZF Plants
- in all ZF After-Sales Service Centers
- Internet <http://www.zf.com>

Service / Tech. Information

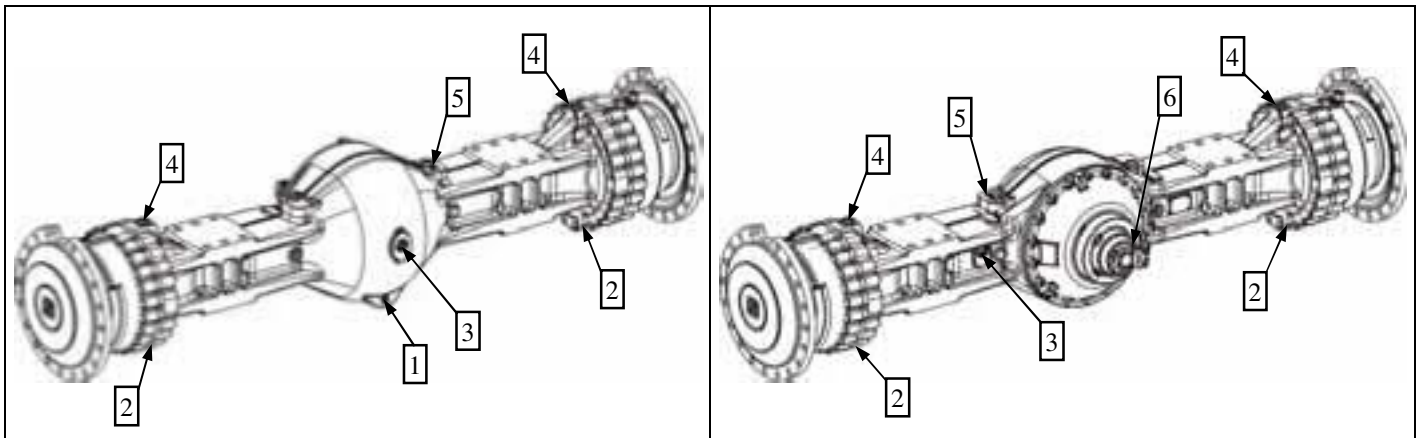
2. Oil change:

The basic requirement for a correct oil change of the axle is the horizontal plane of installation in every direction!

Place vehicle in a horizontal plane!

All drain-, filler- and level plugs must be cleaned carefully before opening!

Drain oil only immediately after a longer running time!



Legend:

- | | |
|------------------------|---------------------|
| 1 = Oil drain hole | M24x1.5 Axle casing |
| 2 = Oil drain hole | M24x1.5 Outputs |
| 3 = Oil filler hole | M36x1,5 |
| 4 = Brake bleeder | |
| 5 = Bleeder | |
| 6 = Lubrication nipple | |

2.1 Oil drain:

Loosen drain plugs 1 and 2 and drain the oil.

2.2 Oil filling:

Provide drain plugs (M24x1.5) with new O-ring and install the same.

Tightening torque $M_A = 140 \text{ Nm}$.

Fill up oil to the overflow from level plug or filler plug 3.

Filling quantity approx. 51 liters.

2.3 Check:

Check oil level after a few minutes and fill it up to the specified level, until level remains constant.

Provide filler- and level plugs (M36x1.5) with new O-ring and install them.

Tightening torque $M_A = 140 \text{ Nm}$

3. Oil change intervals:

1st oil change after 500 operating hours, further oil changes every 1000 operating hours (i.e. after 1500, 2500 etc.), however, at least once a year.

4. Oil level check:

Oil level check once a month, but especially before starting a vehicle with new or repaired axles and axle components respectively.

5. Greasing points:

Grease qualities according to the ZF List of Lubricants **TE-ML 05** are admissible for the ZF Axles MT-S 3105.

6. Bleeders:

At initial operation and during the oil change intervals, clean Bleeder 4 and 5 and make a functional check.

7. Brake:

For the pneumatic-hydraulic or via an accumulator system-operated brake actuation the following oils are admissible:

1. Motor oils SAE 10 W acc. to specification MIL-L 2104 C, MIL-L 46152, API-CC, CD, SC, SD, SE
2. ATF – Oil Type A, Suffic A, Dexron of II D

8. Brake bleeding at the vehicle:

- 8.1 Open the bleeder (4).
- 8.2 Slowly depress the brake pedal until oil flows out of the bleeder.
- 8.3 Close the bleeder again.
- 8.4 Slowly pressurize the brake and hold the pressure for some seconds.
NOTE:
The brake piston extends and the cylinder chamber fills up with oil.
The air accumulates in the upper section of the cylinder chamber.
- 8.5 Release the brake pedal and loosen the brake.
NOTE:
The reversing piston presses the air from the upper section of the cylinder into the brake line.
- 8.6 Open the bleeder (4) again.
- 8.7 Slowly depress the brake pedal until oil flows out of the bleeder.
ATTENTION:
Repeat procedure - Item 3 ... 7 - until - at Item 7 - from the beginning of the actuation no more air exits from the bleeder.

MAKE WEAR MEASUREMENT ON MULTI-DISC BRAKE

ATTENTION:

A wear measurement on the multi-disc brake has to be made at least once a year, especially in case of a changed braking behaviour like e.g.:

- Braking noise
- Braking power reduced
- Deceleration changed
- Brake fluid level changed
- Braking pressure changed

Wear measurement – Multi-disc brake (Figure 1 and 2):

A wear measurement has to be made on both output sides.

Remove the screw plug, actuate the brake and determine Dim. X acc. to Fig. 1 and 2 by means of feeler gauge. Dim. X corresponds to thickness of the piston-sided inner clutch disc.



Fig. 1

ATTENTION: If Dim. X \leq 4.0 mm, the lined clutch discs have to be replaced on both output sides!

Following to this provide the level plug with a new O-Ring and install it!

Tightening torque $M_A = 140 \text{ Nm}$

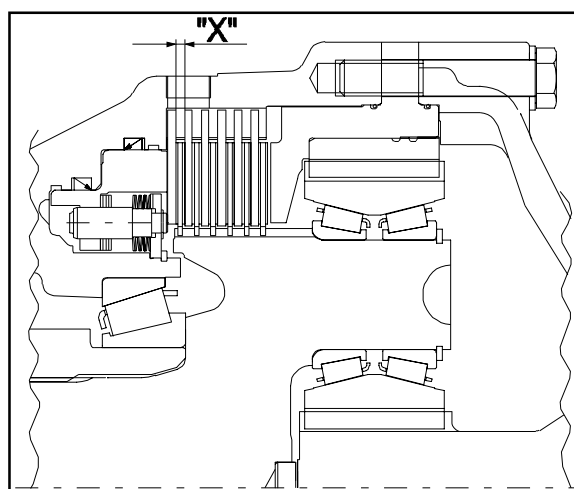
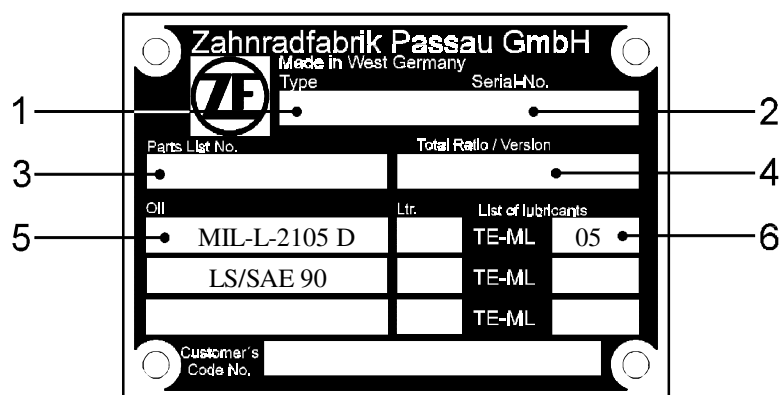


Fig. 2

INSCRIPTIONS ON THE MODEL IDENTIFICATION PLATE



Zahnradfabrik Passau GmbH
Made in West Germany

Type: _____ Serial-No.: _____

Parts List No.: _____ Total Ratio / Version: _____

Oil	Ltr.	List of lubricants
MIL-L-2105 D		TE-ML 05
LS/SAE 90		TE-ML
		TE-ML

Customer's Code No.: _____

1 = Axle Type

2 = Axle Serial No.

3 = ZF - Parts - List No.

4 = Total-Ratio of the Axle / Version with or without ZF-multi-disc self locking differential

5 = Type of lubricant

6 = Lubricant specifications

NOTE FOR 6: ZF - List of lubricants for ZF - Axles TE - ML 05 !

NOTES FOR THE COMPILATION OF SPARE PARTS ORDERS

When ordering genuine ZF - Spare Parts please indicate :

1. Axle type

2. Serial - No.

3. ZF - Parts List No.

4. Trade Mark and Type of vehicle

5. Denomination of the Spare Part

6. Spare Part No.

7. Way of delivery

NOTE : Point 1, 2 and 3 see Model identification Plate.

Please complete the above mentioned details in order to avoid mistakes in the delivery of ordered spare parts!

VERGLEICHSTABELLE FÜR MASSEINHEITEN
CONVERSION TABLE
TABLEAU DE CONVERSION

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

BEZEICHNUNG DER GESETZLICHEN EINHEITEN
DENOMINATION OF STANDARD DIMENSIONS
DENOMINATION DES DIMENSIONS STANDARDISEES

Hinweis : längenbezogene Maße in kg/m; flächenbezogene maße in t/m²

Note : linear density in kg/m; areal density in t/m²

Nota : Densité linéaire en kg/m; Densité superficielle en t/m²

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

TORQUE LIMITS FOR SCREWS (IN Nm) TO ZF STANDARD 148

Friction value: μ total= 0.12 for screws and nuts without after-treatment, as well as phosphatized nuts. Tightening by hand!

Torque limits, if not especially indicated, can be taken from the following list:

Metric ISO-Standard thread DIN 13, Page 13

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

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



LIST OF SPECIAL TOOLS FOR DISASSEMBLY AND REASSEMBLY

ZF - MULTITRAC MT – S 3105 4474 054 013

Disassembly Chapter/Figure	Reassembly Chap./Fig.	<u>Designation and Application</u>	Part Number
1/1		<p><u>Assembly truck cpl. with tilting device</u> <u>Holding fixture</u> 1 Set = 2 pcs. <u>Clamps</u> 2 Set = required Universal use. To mount the cpl. axle MT-S 3105 onto the assembly truck.</p>	<p>5870 350 000 5870 350 077 5870 350 075</p>
1/4	2/44	<p><u>Lifting bracket</u> Universal use. Facilitates the dis- and reassembly of the cpl. output.</p>	5870 281 043
1/8	2/33	<p><u>Assembly truck cpl. with tilting device</u> <u>Holding fixture</u> 2 pcs. required Universal use. To mount the cpl. output, output shaft 4474 354 058 ; 081 onto the assembly truck.</p>	<p>5870 350 000 5870 350 113</p>
1/9		<p><u>Pry bar set</u> 1 Set = 2 pcs. Universal use. To remove and install covers, housings, flanges as well as axle components.</p>	5870 345 065
1/10		<p><u>Striker</u> Universal use . To remove the slotted pin 0631 328 665 from the adjusting nut.</p>	5870 650 001
1/11	2/34	<p><u>Socket spanner #</u> SW 105 To loosen and to tighten the adjusting nut M 95 x1.5 = 4474 354 015 on the planet carrier. Applicable in combination with: <u>Centering bracket #</u></p>	<p>5870 656 078 5870 912 028</p>
1/12	2/32	<p><u>Set of external pliers</u> A1-A2-A3-A4 Universal use. For externally clamping retaining rings.</p>	5870 900 015

