



REPAIR INSTRUCTIONS 1-2

ZF – ERGOPOWER 4/6 WG-110



REFERENCE

For information concerning description, installation instructions, operation and maintenance, see respective Operating Instructions, ZF-Ordering-No. 5872 196 002.

ZF Passau GmbH

Donaustr. 25 - 71
D - 94034 Passau

Abt.: ASTDM / Section : ASTDM

Nachdruck auch auszugsweise ohne die Genehmigung der ZF Passau GmbH nicht gestattet!

Copyright ZF Passau GmbH!

Copying even partially not permitted!

Reproduction même par extrait est interdite!

Technische Änderungen vorbehalten! With the reserve of technical modifications!

Sous réserve de modifications techniques!

1.Auflage / 1.Edition



PREFACE

This documentation has been developed for skilled staff trained by the ZF Passau for the repair and maintenance works on ZF-units.

Documented is a ZF-serial product representing the design state at the time of the 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 different adjustments and testing specifications.

Therefore, we recommend to commit your ZF-product to foremen and technicians whose practical and theoretical training is permanently updated in our after-sales service school.

The service stations established world-wide by the Zahnradfabrik Friedrichshafen are offering to you:

1. Continuously trained staff
2. Prescribed facilities, e.g. special tools
3. Genuine ZF-spare parts meeting the latest state of development

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

Repairs carried out by ZF-service stations are covered by a respective warranty within the scope of the applicable contractual conditions.

Damage caused by improper or unskilled work carried out by others than ZF-staff as well as resulting consequential costs, if any, are excluded from this contractual liability.

This also applies, if the use of genuine ZF-spare parts is renounced.

ZF Passau GmbH

Off-Road Transmissions
and Axle Systems
Division

GENERAL

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

When repairing the transmission, ensure utmost cleanliness and that the works are carried out in an expert-like manner.

The transmission 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 works 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:

REFERENCE: For heating up parts such as bearings, housings etc., only a heating furnace or an electric drier is permitted to be used!

CAUTION

When assembling the transmission, absolutely observe the indicated torque limits and adjustment data. Screws and nuts must be tightened according to the enclosed standard table, unless otherwise specified. In view of the risk of functional failures in the control unit, the use of liquid sealing agents is not permitted. By no means, Molykote is permitted to be used. Lined plates must not be washed. They must be cleaned with a 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 the dismantled transmission. Dismantling and installing as well as the disassembly and assembly of a main group are always summarized in one chapter.

Special tools required for performing the respective repair works are listed under „Special tools“.

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 works.


Persons performing repair works 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:

	Serves as reference to special working procedures, methods, information, the use of auxiliaries etc..
---	--

CAUTION	Is used, if a deviating and improper working procedure can damage the product .
----------------	--

 DANGER	Is used, if lacking care can lead to personal injury or danger to life .
---	---

REFE- RENCE	Prior to starting the checks and repair works, thoroughly study the present instructions.
------------------------	---

CAUTION:	<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 works must be performed according to the description..</p>
-----------------	--

REFE- RENCE:	After the repair works and the checks, the expert staff must convince itself that the product is properly functioning again. .
-------------------------	--

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 lineaire en kg/m; Densité superficielle en t/m²

Begriff Unit Unité	Formelzeichen	neu New Nouveau	alt old Vieu	Umrechnung Conversion Conversion	Bemerkungen Note Nota
Masse Mass Masse	m	kg (Kilogramm)	kg		
Kraft Force Force	F	N (Newton)	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) . 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			

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



Repair Instruction

Off-Road Transmissions
and Axle Systems
Division



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

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	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

Size	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



Preface

The present Documentation has been developed for skilled personnel which has been trained by the ZF for the Maintenance and Repair operations on ZF-units.

However, because of technical development of the product, the Maintenance and Repair of the unit in your hands may require differing steps as well as also different setting and test data.

This Manual is based on the technical state at the printing.

At the preparation, every possible care has been taken to avoid errors.

However, we are not liable for possible mistakes concerning the representation and the description.

We are reserving ourselves the right of modifications without previous information.

The responsibility lies with the owner and the user, to pay attention to the safety indications, and to carry out the Maintenance operations according to the prescribed Specifications.

The ZF is not liable for faulty installation, incorrect treatment, insufficient Maintenance, improperly and unskilled performed works, and for the subsequential damages resulting from it.

It is ***imperative*** to pay attention to the corresponding Specifications and Manuals of the Vehicle Manufacturer.

Important Informations concerning the technical reliability and reliability in service are accentuated by the following Symbols:



Valid for Instructions which must be observed at the Maintenance, the Performance or the Operation of the vehicle !



Is inserted at working and operating procedures which have to be exactly respected to avoid a damage or destruction of the unit or to exclude a danger to persons !