

# REPAIR MANUAL

**ZF-AS Tronic**

**Bus**

**Repair level 1 - 2**

Maintenance, diagnosis, replacement of components

1337 751 101

**CAUTION**

**The ZF order numbers listed in this document apply to standard ZF products.**

**Variances are possible depending on the vehicle manufacturer.**

**The binding ZF order numbers are listed in the relevant parts list – parts list no. can be found on the transmission type plate.**

Subject to technical modifications.

Copyright by ZF Friedrichshafen AG

This document is protected by copyright. Any form of reproduction or dissemination not wholly corresponding to the intended use of this documentation is prohibited without the approval of ZF Friedrichshafen AG.

Printed in Germany

ZF Friedrichshafen AG, MC-C / 2003-09

Edition: 2003-09

**1337 751 101**

	Page
Overview of amendments .....	5
Preface .....	7
Important information.....	8
Instructions for carrying out repairs.....	9
Tightening torques .....	11
Changing from DIN to ISO standard codes .....	13
Test device, diagnosis tool.....	15
ZF-Intarder diagnosis tool.....	20
<b>1 Maintenance .....</b>	<b>1-1</b>
1.1 Visual inspection of wiring .....	1-1
1.2 Maintenance of pneumatic system .....	1-1
1.3 Type plate .....	1-1
1.4 Approved oil grades .....	1-1
1.5 Oil volume .....	1-1
1.6 Transmission breather .....	1-2
1.7 Oil change intervals .....	1-2
1.8 Oil level check.....	1-2
1.9 Oil change (transmission without ZF-Intarder) .....	1-3
1.9.1 Filling oil.....	1-3
1.10 Oil level check.....	1-4
1.11 Instruction plate for oil change .....	1-5
1.12 Oil change (transmission with ZF-Intarder) .....	1-5
1.13 Oil filter change .....	1-6
1.14 Oil filling .....	1-7
1.14.1 Oil filling during an oil change.....	1-7
1.14.2 Oil filling after transmission repairs .....	1-7
1.15 Engine coolant .....	1-8
1.16 ZF-Intarder type plate .....	1-8
<b>2 Diagnosis .....</b>	<b>2-1</b>
2.1 Diagnosis for vehicles with ZF display and ZF range selector.....	2-1
2.2 Diagnosis with TestmanPro.....	2-2
2.3 Transmission actuator data sheet 20-pin .....	2-3
Pin assignment .....	2-4
Transmission actuator data sheet 18-pin .....	2-5
<b>3 Component replacement .....</b>	<b>3-1</b>
3.1 Transmission actuator .....	3-1
3.1.1 Removing transmission actuator .....	3-1
3.1.2 Fitting.....	3-3
3.1.3 Dismantling transmission actuator.....	3-6
3.1.4 Assembling transmission actuator .....	3-6
3.1.5 Programming transmission actuator .....	3-7
3.1.6 Replacing pressure limitation valve .....	3-7
3.2 Clutch actuator .....	3-8
3.2.1 Removal .....	3-8
3.2.2 Fitting.....	3-9

	Page
3.3 Replacement of driver disc.....	3-11
3.3.1 Fitting engine, clutch and transmission.....	3-11
3.4 Clutch release mechanism.....	3-12
3.4.1 Removal of release fork .....	3-13
3.4.2 Fitting release fork .....	3-14
3.5 Output flange .....	3-14
3.5.1 Removal .....	3-14
3.5.2 Fitting .....	3-14
3.5.3 Removing output cover .....	3-15
3.5.4 Fitting output cover .....	3-15
3.5.5 Removing yoke .....	3-16
3.5.6 Fitting yoke .....	3-16
3.6 Speed sensor (impulse sensor), output, depends on vehicle manufacturer .....	3-17
3.6.1 Removal .....	3-17
3.6.2 Fitting .....	3-17
3.6.3 Connector replacement .....	3-17
3.7 Replacing Neutral switch.....	3-18
3.7.1 Removal .....	3-18
3.7.2 Fitting .....	3-18
3.7.3 Connector replacement .....	3-18
3.8 Replacing components on Intarder .....	3-19
3.8.1 Speed sensor, output.....	3-19
3.8.2 Tacho sensor.....	3-19
3.8.3 Solenoid valve.....	3-19
3.8.4 Temperature sensor .....	3-19
3.8.5 Removing 3/2-way valve.....	3-20
3.8.6 Removing / fitting Intarder wiring harness .....	3-20
3.9 Additional cooling connection .....	3-21
3.10 Display .....	3-22
3.10.1 Disassembly .....	3-22
3.10.2 Installation .....	3-22
3.10.3 Connection diagram.....	3-22
3.10.4 Connector replacement .....	3-22
3.11 Range selector .....	3-23
3.11.1 Console switch.....	3-23
3.11.2 Steering wheel switch .....	3-24
3.11.3 Range selector keypad .....	3-25
3.12 Electronic control unit.....	3-26
3.12.1 E-module .....	3-26
3.12.2 ZMTEC.....	3-27
Connector and mating connector designations .....	3-29
Pneumatic diagram .....	3-30
<b>Annex</b>	
Documents attached.....	3-31
Drawings attached.....	3-31

---

---

Index	Issue date	Chapter	Initiator	Comments
	2003-09		BKS-R	First edition

This document has been written for skilled staff who have been trained by ZF Friedrichshafen AG to carry out maintenance and repair work on ZF products.

**This manual refers to a volume production ZF product in accordance with the state of development on the date of issue.**

However, due to further technical developments, repair work on your unit may require other work practices and other test or adjustment data which are not contained in this manual.

We therefore recommend that you entrust your ZF product to supervisors and fitters who have had their practical and theoretical knowledge updated on a regular basis at our Service-Training-Center.

Service points equipped by ZF Friedrichshafen AG all over the world offer you:

1. Well-trained staff
2. Specified equipment,  
e.g: special tools
3. Genuine ZF spares, to our latest specifications

All work performed at these service points is carried out conscientiously and with care.

**Warranty:**

**Repair work carried out at ZF service points is covered by warranty in accordance with the prevailing contractual conditions.**

Damage resulting from work performed by non-ZF staff in an improper and unprofessional manner, together with any follow-on costs caused by such work, is not covered by the contractual liability.

This also applies to instances in which genuine ZF spares have not been used.

**ZF FRIEDRICHSHAFEN AG**

Commercial Vehicle and Special Driveline Technology  
Division  
Service Werk 2  
Tel.: (0 75 41) 77-0  
Fax: (0 75 41) 77-908000  
Internet: [www.zf.com](http://www.zf.com)

**SAFETY NOTICE**

Companies who repair ZF units are responsible for their own work safety.

**To avoid injury to staff and damage to products, all safety regulations and legal requirements which apply to repair and maintenance work must be observed. Before starting work, mechanics must familiarize themselves with these regulations.**

Staff required to carry out repairs on ZF products must receive appropriate training in advance. It is the responsibility of each company to ensure that their repair staff are properly trained.

**The following safety instructions appear in this manual**

**NOTE**

Refers to special process, techniques, data, use of auxiliary equipment etc.

**CAUTION**

**This is used if other incorrect, unprofessional working practices could damage the product.**

**⚠ DANGER**

**This is used when lack of care could lead to personal injury or death.**

**GENERAL INFORMATION**

Read this manual carefully before starting any tests or repair work.

**CAUTION**

**Pictures, drawings and components shown do not always represent the original object but are simply used to illustrate working procedures. Pictures, drawings and components are not to scale and no information about size and weight should be inferred (even within a complete drawing). Always follow the working steps as described in the text.**

After completion of repair work and testing, skilled staff must satisfy themselves that the product is functioning correctly.

**⚠ THREATS TO THE ENVIRONMENT**

**Lubricants and cleaning agents must not be allowed to enter the soil, ground water or sewage system.**

- **Ask your local environment agency for safety information on the relevant products and adhere to their requirements.**
- **Collect used oil in a suitably large container.**
- **Dispose of used oil, dirty filters, lubricants and cleaning agents in accordance with environmental protection guidelines.**
- **When working with lubricants and cleaning agents, always refer to the manufacturer's instructions.**

**CAUTION**

**The transmission must NOT be hung on the input shaft NOR on the output flange.**

**In any instances of doubt, always contact the relevant specialist department within ZF After-Sales Service for advice.**

**Ensure cleanliness and professional work whenever working on the transmission.**

**The intended tools must be used to dismantle and assemble the transmission.**

After removing the transmission from the vehicle, clean thoroughly with appropriate washing agent before opening.

Pay particular attention to the corners and angles of housings and covers when cleaning with appropriate washing agent.

Parts held on with Loctite can be slightly loosened if warmed with a hot air blower.

### CLEANING PARTS

Remove old remains of gaskets from all sealing faces. Carefully remove burrs or other similar patches of roughness using an oil stone.

Lube bores and grooves must be free of anti-corrosion agents and foreign bodies. Check that they can move freely.

Carefully cover opened transmissions to prevent the entry of foreign matter.

### REUSING PARTS

A competent person must inspect parts such as ball or roller bearings, multi-discs, thrust washers etc. to decide whether they can be reused or not.

Replace parts which are damaged or have suffered from excessive wear.

### GASKETS, LOCKING PLATES

Parts which cannot be removed without being damaged must always be replaced with new parts (e.g. gaskets and locking plates).

### SHAFT SEALS

Always change shaft seals with rough, ripped or hardened seal lips. Seal contact surfaces must be totally clean and in perfect condition.

### REWORKING

Rework may only be carried out on the seal contact surfaces using plunge-cut grinding. Never use an emery cloth. Ensure there are no traces of grinding or rifling from grinding.

If rework is needed on spacer washers or shims etc. because of clearance settings, ensure that the reworked areas contain no face runout and are of the same surface quality.

### TRANSMISSION ASSEMBLY

Find a clean site to assemble the transmission. Gaskets are fitted without the use of sealing compound or grease. When measuring silicon-coated gaskets, take care **not to include** the silicon layer in the measurement.

During transmission assembly, comply with all adjustment data and tightening torques specified in the repair manual.