



ZF Aftermarket is the expert in transmission diagnosis, service & repairs

- **Transmission troubleshooting requires specific expertise**
- **ZF competence centre in Dortmund is the aftermarket partner of choice for transmission repairs**

Although modern transmissions are designed to be efficient and durable, problems can still occur. In order to avoid costly vehicle downtime, it's vital that customers have easy access to a specific fault diagnosis and repair service. Here, ZF Aftermarket explains the differences in transmission system design, clarifies how its bespoke competence centre in Dortmund centre can assist customers of both ZF and non-ZF transmissions systems, and explains the procedure from initial due diligence through to diagnosis and repair using parts of Original Equipment Manufacturer (OEM) quality.

Regardless of whether a gearbox design is for a manual, automatic or hybrid transmission, independent garages can count on the highly specialized system competence of ZF Aftermarket when it comes to diagnosis, service and repair. From its competence centre in Dortmund, the business has the specialized knowledge to professionally repair the majority of vehicle manufacturers' transmission systems using OEM quality spare parts.

For the driver, the most recognizable difference exists between manual and automatic transmissions. While the manual switch is purely mechanical, the automatic transmission connects the engine power using a torque convertor rather than a clutch. Hybrid transmissions - also designed without a clutch unit - have an automatic shift mechanism and a separating clutch with reduced drag torque.



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Causes of errors are diverse

Usually, a passenger car (PC) transmission lasts the entire life cycle of a vehicle. However, errors in the shifting process, wear and contamination as well as worn or missing transmission oil can limit functionality – and component damage calls for professional repair. .

As all PC transmissions are exposed to high stresses on a daily basis, incorrect operation, faulty peripheral vehicle parts or lack of maintenance can quickly lead to damage. Often transmission damage is highlighted by metallic rattling noises or vibrations during gear shifting. In many cases, this is just a matter of replacing small worn components such as needle bearings, synchronizer rings, shift sleeves, seals or is due to an incorrect oil level. Non-observance of such symptoms can result in massive consequential damage to the interior of the gear unit, resulting in significantly higher repair costs.

Also unnecessarily high engine speeds and an accumulation of shifting errors can eventually lead to defects. For manual gearboxes, faulty operation is usually due to the clutch pedal being operated too late or released too early, or to an incorrect gear being engaged. A frequent operating error with automatic transmissions is shifting from D to R gear while the vehicle is still rolling.

There are symptoms indicating transmission damage, but these are caused by a component that interacts with the transmission - for example a defective clutch, dual mass flywheel or a defective air flow meter.

Step by step: Transmission repair

ZF Aftermarket experts clearly define the process of professional and structured transmission repair: fault diagnosis, cleaning, disassembly, maintenance and - depending on requirements - repair or replacement of individual parts. Due to the technical complexity of transmissions, ZF Aftermarket recommends garages always perform comprehensive diagnostics, maintenance and repairs in cooperation with the ZF Service Partner on site.



Step 1: Diagnosis and interpretation of vehicle data

The basis for a reliable diagnosis is the readout of the fault memory and the highly specialized interpretation of all relevant vehicle data.

Diagnostic devices are used to support professional and systematic troubleshooting throughout the entire vehicle.

Developed for ZF products, the ZF Testman diagnostic device focuses on driveline technology. In contrast to other diagnostic solutions, the system can also be used with transmissions that have already been removed. This makes it possible to read out the transmission electronics, check statistical and dynamic vehicle data, obtain unfiltered information from the car fault memory, train ZF components and mirror the software of individual components.

For sporadic faults, the web-based Vivaldi Onboard Unit and the corresponding ZF telematics platform Openmatics will provide an intelligent solution in the future to enable reliable diagnostics during vehicle use.

Step 2: Gear unit cleaning with sandblasting technology

After identifying the causes of the fault, the gearbox is cleaned. This means that any stuck deposits and dirt residue are removed with the aid of sandblasting technology.

Step 3: Dismantling the gear unit

ZF Aftermarket then examines the components inside the transmission. To do this, the transmission is completely dismantled and the individual parts inspected and, if necessary, measured. The torque converter in automatic transmissions is emptied, cleaned, and overhauled.

Steps 4 and 5: Mechatronics repair and inspection

After the repair, manual transmissions are switched through on the assembly trestle and tested for noise. In the case of automatic transmissions, the Hydra test bench checks the mechatronics under real-life conditions. In order to simulate realistic temperature and



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pressure conditions, the transmission oil is heated to 75 degrees Celsius.

Steps 6 and 7: Assembly and final tests on the test bench

After assembly, the gear unit is filled with new oil. The ZF Group has developed a specific test rig for its automatic transmissions for the careful testing of tightness and function - an innovation of which there are only three worldwide and which is currently being extended for non-IF transmissions. Finally, the software of the automatic transmission is reset to its original state. A final test run of the transmission in the vehicle completes the repair process.

ZF Aftermarket`s system competence

The central prerequisites for repairing transmission damage are comprehensive specialist knowledge and a high level of diagnostic expertise for gearboxes of all brands. The worldwide ZF Service Partner network supports independent workshops in complex transmission repairs as a strong and quality-oriented service provider.

ZF Aftermarket also offers spare parts and transmission oils in OEM quality. This ensures fast, professional, and reliable repairs, including replacement to series production status.

Captions:

- 1) Professional gear repair: Removal of the gearbox.
- 2) Repairing transmissions is one of ZF Aftermarket's core competencies.
- 3) After repair and reassembly, the automatic transmission is finally tested on the ZF test bench.

Pictures: ZF

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ZF Friedrichshafen AG

ZF is a global leader in driveline and chassis technology as well as active and passive safety technology. The company has a global workforce of 146,000 with approximately 230 locations in some 40 countries. In 2017, ZF achieved sales of €36.4 billion. ZF is one of the largest automotive suppliers worldwide.

ZF allows vehicles to see, think and act. The company invests more than six percent of its sales in research and development annually – in particular for the development of efficient and electric drivelines and also in striving for a world without accidents. With its broad portfolio, ZF is advancing mobility and services in the automobile, truck and industrial technology sectors.

With integrated solutions and the entire ZF product portfolio, the ZF Aftermarket Division of ZF Friedrichshafen AG guarantees the performance and efficiency of vehicles throughout their life cycle. Its combination of established product brands, digital innovations, customized products and services, and a worldwide service network has made ZF a sought-after partner and number two in the global automotive aftermarket.

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