



ZF in Telescopic Handlers

- **Reduced tire wear**
- **Improved fuel efficiency**
- **OPTISTEER – improved steering kinematics**

Versatility and maneuverability are the strength of the telescopic handler. This versatility is due to the intelligent driveline technology from ZF.

ZF transmissions and axles offer complete drivelines with easy handling. The telescopic handler can be quickly fitted with shovel, fork, grab, working platform and other tool attachments for the most varied jobs. This means versatility in application in a wide variety of fields, from the construction site through to agriculture. The ZF driveline versions for telescopic handlers are also versatile. Depending on type, low-boom or high-boom designs are possible. Special telescopic handler axles support the 4-wheel steering system.

The demands on small, self-propelled off-road vehicles are continually increasing. This is particularly true in inner-city areas where modern vehicles must in future be more mobile and maneuverable. This trend is also expected to continue with telehandlers. ZF telehandlers have specially developed axles. The 4WG 98 transmissions are rated for fast reversing and speedy travel between jobs. This makes the telehandlers real masters of their trade. The best maneuverability in a tight space, a high visibility driver's cab along with reliable operation are top priorities on the vehicles. Due to high quality raw materials and the best fabrication, the ZF systems ensure absolute ruggedness, a very long service life and therefore also an enormously high level of efficiency.

ZF transmission 4WG 98

The 4WG 98 transmission has been specially developed for telehandlers. With over fifteen years of experience ZF produces transmissions for telehandlers from **2.7 tones to 5.4 tones lifting capacity. The vehicle weights are lying between 10 to 18.5 tones.** The transmissions are designed for **105 kW** input power and provide a torque of **830 Nm** at



2600 rpm. For the ZF brand it is not just the power which is important, but also relieving the workload on the driver. For example, an enormous reduction in the noise has been achieved due to skilful production. Due to short transmission shafts and an optimized housing, the driver is no longer subjected to unnecessary noise.

In addition, in difficult terrain the driver has the choice of also switching in the front axle. This reduces the wear relative to permanent all-wheel drive and thus also reduces the fuel consumption. Furthermore, this produces increased efficiency and a longer service life.

MS-T 3000 steering axles

As demonstrated in numerous tests in the company's own development centre, a very long service life is ensured by ZF axles, as well as loading capability. The highest loading capability with a dynamic axle load is up to **18.1 tones** and with a static axle load of **36.2 tones** in the top model, MS-T 3070. In order to be able to maintain flexibility in a tight space, ZF axles have a **steering angle of 55°**. The noise from the axles on the telehandlers has also been reduced through optimum matching to the transmission. ZF axles feature particularly slim axle housings. The design has been optimized with the aid of **finite element methods** such that the axles are substantially stronger, but nevertheless lighter compared to conventional construction. For the installation in the vehicle versions with trunnion and above-centre pivot mountings are available. High transmission ratios in the external planetary drive facilitate a compact construction in the region of the driveline and also optimized installation conditions in the vehicle chassis. This also contributes significantly to the ground clearance. The integrated, low-wear multi-disk brakes are protected against the dust and dirt of construction site operation. In addition, a spring-operated, hydraulically ventilated parking brake is available as standard.

Over the last years ZF was able to develop basic optimization in axle technology. Especially according to Efficiency and power dissipation our engineers could achieve major improvements.

The EFFICIENCY PACKAGE for Axles features:

- **OPTISTEER:**
 - is an innovative steering kinematics optionally available for telescopic handler steering axles
 - optimizes steering geometry by a variable length tie rod
 - improves steering and reduces tire wear
 - steering angle error can be reduced by more than 50%
 - reduction of tire side force by minimum of 40%
 - improved fuel efficiency

- **Low speed wheel brake:**
 - less heat generation
 - less power losses
 - less fuel consumption
 - higher brake capacity
 - low energy level

- **Cylindrical roller bearing in final drive:**
 - less heat generation
 - less power losses
 - less fuel consumption

- **Open differential w/HASR multi-disc DiffLock**
 - reduced power losses
 - improved efficiency

General advantages

Due to many years of experience in the research and development of ZF axles and transmissions the user receives two absolutely high quality components which have been mutually matched in numerous tests. Additionally, both components are delivered together on the same day, which reduces transport costs and the purchaser has the benefit of a single contact person for both products.

Fig. 10, 11, 12, 13



Presseinformation
Press Information

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ZF is one of the world's leading automotive industry suppliers specializing in driveline and chassis technologies. With a workforce of 63,000 employees, the company operates 125 plants in 26 countries. To sustain its success with innovative products, ZF invests 5 percent of its annual revenues (over € 625 million from an annual total of € 12.5 billion in 2008) in research and development.

The ZF division Off-Road Driveline Technology and Axle Systems with headquarters in Passau specializes in the development and production of transmissions and axles for agricultural and construction machines as well as axle systems for buses and trucks. With approximately 7,500 employees, the division recorded a turnover of € 1.9 billion in 2008.

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