ZF Services UK — Off Highway Products and Services
The company behind the brands

**ZF Services UK – OE quality products and support to match**

A wholly-owned subsidiary of German parent company ZF Friedrichshafen AG and part of the ZF Group, ZF Services UK is responsible for parts supply and technical, fitment and marketing support to OEMs and the independent aftermarket in the UK and Ireland. Sales support is provided to OEMs producing in the UK and technical support is provided to OE production lines and dealer networks. The company has an annual turnover of £54 million in the UK and a workforce of around 200 people based at facilities in Nottingham and Crick. Both sites are accredited to ISO 9001:2008 and environmental management standard ISO 14001:2004.

Established in 1973, ZF Services UK in Nottingham (formerly ZF Great Britain Ltd) occupies a 13,000 square metre site carrying out unit repair, overhaul and remanufacture, and providing technical support. Specialist facilities include warranty inspection areas employing root cause analysis methodology as a continuous improvement tool. Of its 150 employees, 80 are technically trained and qualified to ZF’s stringent original equipment (OE) manufacturing standards, and many go on to achieve master technician status.

The Crick site (formerly ZF Trading UK Ltd) supplies ZF Services UK’s distribution partners in the independent automotive aftermarket with OE-quality replacement parts under the globally recognised brands of SACHS, LEMFÖRDER, BOGE and ZF Parts. In addition, this site provides customer service and technical support and is also the company’s logistics hub.
The ZF Group has been a reliable and proficient partner of international vehicle manufacturers for more than 90 years. In addition to being one of the world’s leading suppliers of driveline and chassis components, ZF is Europe’s largest and most technically advanced independent transmission manufacturer, supplying automotive, off highway, rail, marine, defence, industrial and most recently, wind turbine applications.

64,000 people are employed by the ZF Group across the globe at 123 production sites and 650 service and trading centres. Committed to engineering excellence and innovation, it has 4,600 technologists dedicated to maintaining its technical leadership. The ZF Group has an annual turnover of approximately €12.9 billion and each year reinvests more than five percent of its earnings in Research & Development.
Service and support

**Expert technical support**
ZF Services UK provides full life technical support for all ZF special driveline products, including Off Highway transmissions and driveline components. This timely and effective support helps to maintain the efficiency of Off Highway vehicles and reduce costs for their operators. Continuous investment in the Nottingham site’s dedicated facilities and a network of service partners throughout the UK ensures that the right products and expertise are always on hand, with backup from ZF’s worldwide network, if required when sourcing less common components. This ensures a minimum of downtime for Off Highway vehicles with the further benefit of realistic pricing due to global buying power.

**Technical helpline**
Around 40 percent of transmission or driveline component problems reported via the ZF Services UK technical helpline can be solved during the telephone call, through ZF Services UK’s technical experts offering free advice and talking the customer through some straightforward fault-finding procedures. Where a more detailed investigation is required, the same call can be used to book a site visit for fault diagnosis and to arrange a repair or a remanufactured or service exchange unit to get the vehicle back into service fast.

**On-site transmission health checks, diagnostics and repairs**
In the event of a vehicle breakdown, one of ZF Services UK’s field engineers can attend the vehicle on-site, minimising loss of revenue and unscheduled downtime for the customer. Equipped with diagnostics tools and commonly needed parts, the engineer will run comprehensive checks to rapidly confirm the cause of the problem and in many cases can rectify the fault during the same visit. ZF Services also offers on-site scheduled inspections and preventive maintenance programmes including transmission health checks and component condition monitoring via oil sampling. These can be booked to take place during quieter periods, ensuring that a vehicle’s transmission and driveline is always in optimum condition to face times of peak demand.

**Prompt strip and assess service plus rapid repair turnaround**
ZF Services UK recognises that customers often prefer to have their own gearbox repaired and returned rather than accept an exchange unit. To meet this demand with minimal downtime, on arrival at the ZF Services workshop the unit is stripped for initial examination. The customer is then promptly provided with an estimate for parts and labour before any further work is agreed. All assessment and repair operations are performed by ZF factory trained engineers, and only genuine ZF parts and OE consumables are used throughout. All units are fully rig tested and warranted before being returned to the customer.
Installation checks detect unresolved problems
After transmission removal and replacement following repair or remanufacture, it pays to request a post-installation check from ZF Services UK to ensure full interoperability with other vehicle systems. During the check, a ZF Services UK engineer will inspect transmission mountings, propshafts, engine connections and the operation of any direct interlocks or other safety functions. The transmission control unit software will also be updated to the latest version.

In more than 75 percent of cases where these checks have been carried out, the engineer has identified items on the vehicle that are either not working or not to specification, with recommended corrective action. As a consequence, the vehicle operator’s investment is protected through prolonged transmission life and enhanced long-term reliability.

Remanufacturing and repair
ZF Services UK is committed to remanufacturing many of its products to reduce energy usage, minimise carbon footprint and conserve raw materials. During the remanufacturing process for ZF’s products, factory-trained ZF Services UK engineers strip the worn unit to component level and the individual parts are washed, measured and tested to assess their ability to complete another lifecycle. Worn parts are discarded for raw materials recycling, while components that meet the necessary criteria are remanufactured to within the original tolerances and placed into stock. The unit is then rebuilt according to the latest specifications for that particular product. Where components are not available from remanufactured stock, new OE items are supplied to complete the assembly. Certain wear items are always replaced with new OE parts as a matter of course. Where the product incorporates electronic control, software is updated to the latest release. Finally, the assembly is performance tested to the same criteria as for a new unit and warranted before release to the market. For product lines where remanufacturing is not a viable option or there is negligible market demand, ZF Services UK can provide repair components and services.
## Construction vehicle driveline technology applications

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Products for construction vehicles
Driveline technology

Torque converter
1. The Sachs torque converter helps to coordinate all components of the powertrain. Its hydraulic characteristics are matched to each specific application according to vehicle type, engine characteristics and transmission steps. The sheet metal design reduces weight and a lock-up clutch lowers fuel consumption, while the integrated torsion damper decouples vibrations.

Hydrodynamic powershift transmissions
2. ZF Ergopower 115, 130, 160, 190, 210, 260, 310
ZF Ergopower fully automatic transmissions offer completely new standards to the market, incorporating helical gears with high tooth contact area and vertical orientation of the spur gears. This arrangement bridges the difference in height between input and output shaft, allowing the axle differential to be integrated into the housing with no additional transfer box required. The result is an improvement in gearshift quality and reduced fuel consumption. Ergopower transmissions are designed to offer a degree of serviceability by the customer to allow higher productivity.

3. ZF Ergopower LII
ZF Ergopower LII is an automatic powershift transmission suited to dump trucks of up to 82 tonnes GVV / 50 tonnes payload. The transmission offers up to eight forward and four reverse gears, smoothly shifted by electronic control even under the highest loads. An integrated primary retarder provides the Ergopower LII with impressive braking torque of 1,000-1,800Nm depending on the model, significantly reducing wear on the service brake. A high gear ratio spread reduces fuel consumption of the dump truck by enabling engine speed reductions of up to 20 per cent.

4. 4 WG 92/98 T, WG 98 TC/TSC, WG 90/94/98
Backhoe loaders, telescopic handlers and other small, self-propelled off-road vehicles are required to be increasingly more mobile and manoeuvrable, particularly where they operate in inner-city areas. The WG shuttle transmissions meet this need with optimum performance and low noise output for both high road speeds and quick reversing. These transmissions are tuned to each individual application and designed to offer a degree of serviceability by the customer for higher productivity.
Hydrostatic powershift transmissions

5 HL Series
The ZF HL Series comprises three transmission variants, each with two alternative gear ratio sets for versatile application to modern wheel excavators. High efficiency, optimum gear ratio spacing and high ground clearance enhance driving characteristics, and the transmission can be mounted either directly on a ZF axle or separately on the chassis.

6 2HC 85
The hydrostatic drive 2HC 85 is used for construction machinery of up to ten tonnes GVW, meeting market demands for higher vehicle speeds and reduced fuel consumption. Vehicle speeds of up to approximately 30 mph are possible, and the two crankshaft radial piston motors that form an integral part of the drive unit increase efficiency to achieve a reduction in fuel consumption. This increases productivity, protects the environment and reduces operating costs.

7 AVG
ZF AVG hydrostatic-wheel drives significantly improve the performance and manoeuvrability of excavators and compact loaders. This compact transmission design provides excellent ground clearance, higher speed and improved traction as well as reduced power loss and lower noise levels.
Mixer transmissions

1 PLM-Series
The low-speed hydraulic motor and secondary planetary gearbox of the PLM 7 and PLM 9 transmissions combine to form a compact and powerful unit. This all-in-one system together with filter, cooler, fan and cable harness requires minimal space for installation, yet provides excellent output and the expectation of a long service life. The highly efficient design, which features a common oil circuit for the transmission and hydrostatic systems and a dual-circuit cooling system, is designed for simplified service.

2 P-Series
ZF developed the P-Series transmission as a more economical alternative to the PLM-Series. The basis of the P-Series is a two-stage planetary gearbox driven by an external hydraulic motor using a standardised SAE profile. The P-Series range offers proven, economical technology coupled with low-maintenance, wear-resistant operation, even when pushed to the limit.
The Ecomix II transmission CML 10 is some 20 percent lighter and 50 percent shorter than the PLM 9 and has improved output bearing strength for reliable off-road operation. With the new bearing concept, the installation angle is no longer dependent on drum size and drum fill, and the elastomer units incorporated into the design allow increased misalignment and axial runout of the drum. Acoustic and mechanical decoupling of the drum from the vehicle frame leads to a considerable reduction in noise and smoother running for improved driving comfort. Lifetime oil lubrication assists with easier maintenance, reduced costs and more eco-friendly operation.

Swing drive

**DR-Series**

ZF DR-Series swing drives are compact, easily maintained drives for wheel excavators of 13 to 25 tonnes GVW. They feature a two-step planetary reduction gear, powerful multi-disc brake and a common oil system for the swing drive and hydraulic systems, which does not require oil changes.
Chassis technology

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<th>Construction vehicle chassis technology applications</th>
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<th>Excavator / backhoe loader</th>
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**V-Link**
Lemförder V-links support longitudinal and lateral loads and in combination with two trailing links/torque rods, control axle location. V-links are used primarily with heavily-loaded rear axles, for instance in semi-trailer tractors or flatbed vehicles with twin axle assemblies. The Lemforder approach to intelligent lightweight construction and functional optimisation results in cost savings and improved vehicle dynamics while maintaining safety as a priority.
Axle systems

ZF axles feature particularly slim axle housings as a result of finite element design, which enables stronger but lighter products compared to conventional constructions. In particular, the ZF-Multitrac 3000 range is renowned for its reliability during continuous heavy-duty work and with its excellent ground clearance forms the ideal basis for mobile construction equipment. It is available in a variety of formats to suit vehicle weight and application; some examples are given below and on the following pages.

Rigid axles
1 ZF-Multitrac MT-G 3000
Chain-driven axles for installation and use in graders. Modular design allows drive concepts with both inboard and outboard planetary drives, the latter with wet multi-disc brakes in the final drives. A hydraulically-actuated, powershift differential lock and an efficient parking brake at the axle input complete this axle system.
Axle systems

Rigid axles (cont)

1 ZF-Multitrac MT-L 3000
For wheel loaders, featuring quiet running and wet multi-disc brakes.

2 ZF-Multitrac MT-B 3000
Designed for excavator/backhoe loaders, these axles allow high loading capacities and are equipped with internal, wet high-torque, multi-disc brakes. The parking brake at the input flange is available in dry disc or wet multi-disc format, and the differential can be supplied with hydraulically actuated dog-clutch lock, multi-disc powershift lock, or as a limited-slip version.

3 ZF-Multitrac MT-E 3000
The new MT-E 3000 axle series allows full exploitation of legally permissible vehicle widths to meet the needs of forthcoming vehicle classes. Encapsulated, wet multi-disc brakes on the front and rear axle act directly on the wheel hub to minimise undesirable swaying of the vehicle during on-site operation. The axle allows direct mount or separate installation of the two-speed powershift transfer box belonging to the system. Further benefits include extended maintenance intervals and a reduced number of lubrication points.

4 ZF-Multitrac MT-C 3000
This modular design of compactor roller axle uses tried and tested components from other axle series to maximise service life and flexibility. It features internal spring-loaded brakes, which are released by the service pressure of the hydraulic system, and further options include direct mounting of hydro-motor connections or the attachment of a transfer box.

5 ZF-Comprac Series
High ratios in the wheel heads and final drive enable this compact axle to offer increased ground clearance. The system comprises a directly mounted transfer box for hydrostatic drive and three different brake systems. In addition to a drum brake and disc brake, the Comprac series also offers a low-wear multi-disc brake at the axle input.
Steering axles
6 ZF-Multisteer MS-T 3000
For telescopic handlers; versions with both trunnion mount and above-centre pivot mount are available. High ratios in the outboard planetary drive allow a compact design at the transmission input to maximise ground clearance. Low-wear, multi-disc brakes are integrated into the transmission and a spring-applied, hydraulically-released parking brake is available as an option. Maintenance-free kingpin bearings and U-joint shafts combined with optimised sealing ensure system reliability and reduce the amount of servicing needed.

7 ZF-Multisteer MS-B 3000
The MS-B 3000 is designed to cope with the high loading capacities and extreme peak loads experienced by the front axle of a backhoe loader, and maintains steering precision even with a loaded bucket. The steering cylinder is integrated into the axle housing and works symmetrically; combined with a negative scrub radius, this allows high manoeuvrability even with large front wheels fitted.

8 ZF-Multisteer MS-E 3000
The new MS-E 3000 axle series allows full exploitation of legally permissible vehicle widths to meet the needs of forthcoming vehicle classes. Encapsulated, wet multi-disc brakes on the front and rear axle act directly on the wheel hub to minimise undesirable swaying of the vehicle during on-site operation. The steering cylinder is integrated into the axle housing, and the axle allows separate installation of the two-speed powershift transfer box belonging to the system. Further benefits include extended maintenance intervals and a reduced number of lubrication points.

Cabin suspension
9 Shock absorbers for the driver’s cab are available in two designs. The steel spring and shock absorber modules are of robust design and operate independently of other systems while occupying very little space. They feature an adjustable spring base to enable the units to be used with cabins of different weights. The air spring and shock absorber module is used to provide a high standard of comfort on medium or heavyweight vehicles. These units are also available with the CALM (Cabin Air Levelling Module), which incorporates a unique design of level control valve within the air spring module.
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Products for forklift trucks, dockyard and terminal trucks
1 ZF Ergopower WG
115/130/160/190/210/260/310 (long drop)
and WG 90/94/131/161/171/191/211/261/311
(short drop) transmissions
Ergopower transmission systems are available for
materials handling vehicles with internal combustion
(ICC) engine and a lifting capacity of six to 60 tonnes.
Available as automatic or powershift transmissions,
they can be optimised for different vehicle types, e.g.
IC lift-trucks, RoRo- and terminal-tractors, reach-
stackers and straddle carriers. Suitable for electronic
driveline management and inching, they are also
designed with serviceability by the customer in mind
for reduced operating costs.

2 ZF Ergomat GK-Series
The GK-Series is a modular system of electronic
helical bevel gear drives to suit most lift truck
applications. The ZF-patented hypoid bevel drive has
a high transmission ratio for increased performance
with reduced installation space, and offers the
advantages of easy assembly and maintenance,
minimal envelope circle, lifetime lubrication and low
noise operation. The GK10 is the standard drive for
walkie lift trucks of up to two tonnes lifting capacity,
and the GK30 is a high performance bevel gear drive
for 3.4 tonne wheel load.

3 ZF Ergomat GP-Series
The GP-Series has two independent wheel drives
to minimise the turning circle. The combination of
dual motors, spur gear and planetary drive fulfils the
counterbalance truck requirement for an installation
width of less than 1m. The planetary gear with
wheel bearings is fully integrated into the wheel,
with the spur gear drive positioned adjacent to it. A
wide range of transmission ratios and various brake
actuation systems make this a very flexible choice
of drive.

ZF Services offers a comprehensive portfolio of transmissions,
single and twin-motor axles, single-wheel drive units and
electric steer units for IC and Class 1, 2 & 3 forklift trucks.
4 ZF Ergomat AT-Series
The AT35 axle is equipped with a single motor and a differential, offering an alternative to the GP-Series dual-motor drive concept for applications where the smallest frame width is required. A wet-running multi-disc brake is integrated into the axle, and the method of brake actuation can be matched to customer requirements.

5 ZF Ergomat GPA-Series
The GPA20 axle system consists of a two-stage planetary gear with the wheels and AC drive motors arranged coaxially. As standard, this drive has an integrated wet-running multi-disc brake. The lifting frame is mounted directly on the axle, and as with the GP Series, two independent wheel drives enable minimum turning circles.

6 ZF-EPS
A joint project with ZAPI (Italy), the market leader for electronic controllers, ZF-EPS is an electric steer-by-wire system that replaces the hydraulic steering on front-driven three-wheeled lift trucks. It offers the advantages of low operating noise through optimised gear technology, a high ratio, and lower power consumption compared to hydraulic steering.
Driveline technology

Automatic transmissions

1  AS Tronic
The ZF-AS Tronic transmission system is suited to use in heavy mobile cranes and has a maximum torque of 3000 Nm. It integrates an electro-pneumatically shifted constant-mesh gearbox with an automated dry clutch and encloses them in an alloy casing to provide a complete, ready-to-install unit that integrates all shifting and control elements. An electronic engine control unit and CAN communication must be in place before the ZF-AS Tronic transmission system can be used. ZF-AS Tronic models 12 AS 2302 SO/ WO, 16 AS 2602 SO/WO and 12 AS 3002 SO/WO are the versions currently in operation. Automatic coordination of engine, clutch and transmission protects the entire driveline, reducing stress peaks to minimise wear and servicing and maximise service life. The AS Tronic drive management system reduces load on both driver and vehicle driveline, calculating optimal gear step and shift timing, controlling clutch and shift sequences, and coordinating them with the engine control system. The software is optimised for each individual application. In addition, the integrated Intarder provides safe braking and lowers wear and tear on the main brakes. The ZF-PTO range, periphery, clutch and cable set are available as options.

2  TC Tronic HD
The ZF-TC Tronic HD transmission system adds a wear-free converter/clutch unit to the reliable ZF-AS Tronic, and is suited to use in very heavy mobile cranes with a maximum torque of 3000Nm. Using a torque converter to increase driving power when starting up and manoeuvring heavy crane vehicles reduces load on the driveline. When the vehicle is in motion, the torque converter automatically locks up, transferring engine power efficiently via the 12-speed overdrive transmission in the same manner as the fuel-saving ZF-AS Tronic. Switching between automatic and manual gear selection is available at any time. Vehicle engine braking is enabled and PTOs are available on request.
3 AS Tronic mid
The ZF-AS Tronic mid transmission system is suited to use in medium-weight mobile cranes requiring lower torque handling capability than provided by the larger ZF-AS Tronic, on which it is based. With 12 pneumatically-shifted gear steps, this transmission system covers a wide range of applications, providing a low power-to-weight ratio for torque ranges from 800 to 1,600 Nm. The lightest transmission in its engine power class, its high efficiency and adaptive computer-aided gear selection result in reduced fuel consumption.

4 Ecomat
ZF-Ecomat is a versatile transmission whose product quality has been proven under the toughest application conditions, making it suitable for all special purpose vehicle applications such as mobile cranes. It has the best size-to-power ratio in its class and is equipped with new CAN-capable electronic shift modules. These ensure a consistent level of shift comfort with pressure regulation during gear-shifts, enabling smooth starts even on the most difficult terrain, without power interruption or clutch wear. An integrated retarder with continuously variable control provides additional braking safety, and a new diagnostic system with menu logic allows fast, straightforward system diagnosis.
Transfer cases

ZF transfer cases offer a complete range for medium and heavy mobile cranes in a compact, weight-optimised design. All accept high input rotation speed, offer an optional integrated oil pump for an external oil cooling system and are suitable for use with ZF’s automatic drivetrain management system (ADM). Apart from DR 1610, they also provide the facility to mount hydraulic pumps on the idler shaft for emergency steering purposes, and offer an optional PTO.

<table>
<thead>
<tr>
<th>Transfer case</th>
<th>VG 2700</th>
<th>VG 2000</th>
<th>VG1600</th>
<th>VG1200</th>
<th>VG 750</th>
<th>DR 1610</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max input torque, Nm</td>
<td>33,000</td>
<td>25,000</td>
<td>14,000</td>
<td>14,000</td>
<td>10,000</td>
<td>19,000</td>
</tr>
<tr>
<td>Max input speed, rev./min</td>
<td>2,800</td>
<td>2,800</td>
<td>3,500</td>
<td>3,000</td>
<td>3,500</td>
<td>2,800</td>
</tr>
<tr>
<td>PTO available</td>
<td>2,000Nm</td>
<td>2,000Nm</td>
<td>2,000Nm</td>
<td>2,000Nm</td>
<td>2,000Nm</td>
<td>-</td>
</tr>
<tr>
<td>Ratio on-road/off-road</td>
<td>0.91/1.407</td>
<td>0.89/1.536</td>
<td>0.89/1.536</td>
<td>1.00/1.75</td>
<td>1.00/2.00</td>
<td>1.00/1.00</td>
</tr>
<tr>
<td>Suitable for ADM</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Transfer case summary

Although broadly similar in design, individual transfer cases in the range offer certain unique features as follows:

VG 2700 is the most powerful transfer case in the world, accepting an input torque of up to 33,000Nm.

VG 2000 offers two shaft distances of 300 or 396mm.

VG 1600 offers two shaft distances of 300 or 396mm and is the first two-speed transfer case to be directly mounted onto an automatic transmission.

VG 750 employs an aluminium housing to offer a unique lightweight design at only 115kg.
Additional technologies

ZF-ADM Automatic Drivetrain Management
ZF-ADM provides fully automatic, microprocessor-supported control of all drivetrain gear change functions. It is suited to Off Highway vehicles with or without all-wheel drive and comprises mechanical hardware, electronics and specific software. Driving conditions are detected by sensors and CANbus networking before initiating the appropriate shift. The core components of the system are special ZF-ADM dog clutches controlled by the ZF-ADM electronic control unit, giving slip-free transmission of driving torque and 100 percent of possible traction. This gives increased driving stability, safety and reduces driver fatigue. The drivetrain is protected from incorrect operations, fuel consumption is lowered, tyre wear reduced and the service life of the vehicle is increased.
Products for agricultural vehicles
Driveline technology

**Powershift transmissions**
1 **T-7000 Series**
The T-7100, T-7200 and T-7300 models of the T-7000 series combine the benefits of automatic gear changing under full load with the durability of a synchromesh transaxle, to suit medium- and high-powered tractor applications. The vehicle manufacturer can choose the cost-effective basic model with manual powershifting, for optional full powershift automation or for integration of the transmission functions into a future-oriented driveline management system via CANbus and electronic control with full diagnostic functions. Proven in use to be extremely reliable, this transmission series covers the power range from 75 to 320HP.

**Synchromesh transmissions**
2 **T-500 and T-600 Series**
A combination of long life, operational efficiency and easy handling characterises the T-500 and T-600 synchromesh transaxes. Particularly well-suited to the 50 to 185HP power range, the inline design with its low centre of gravity provides improved vehicle stability. These transmissions feature eight fully-synchronized forward gears in the main operating range and are integrated into various tractor concepts for use in orchards, vineyards and all types of grassland applications.
Products for agricultural vehicles

**Continuously variable transmissions (CVT) for tractors**

3 **ZF S-Matic**

The time savings, reduced fuel consumption and unrivalled driving comfort offered by stepless driving contribute to optimum working efficiency. Without having to operate the clutch and shift gears, the driver can concentrate on productivity. In addition to continuously variable gear ratio, other features include highly-adaptable electronic control, active standstill control and various driving modes. The ZF S-Matic range of CVT transmissions covers the power range between 100 and 380HP.

4 **ZF Eccom and ZF Eccom drop design**

The continuously variable transmissions of the ZF Eccom series have been developed for modern high-powered tractors between 400 and 650HP and are specifically adapted to the requirements of vehicles with a frame-built chassis. The modular design provides flexible configuration of power distribution to the drive system and to the optional PTOs. Further benefits include active standstill control and various driving modes, e.g. automatic, PTO and cruise control.

5 **Combine harvester drive**

ZF’s rugged and reliable combine harvester drives provide efficient traction for self-propelled harvesting machines of 7.5 to 24 tonnes GVW. They require minimal installation space, have low maintenance requirements and are easy to operate, offering selectable driving speed ranges and quick reversing at constant drive motor speed.
Axle systems for tractors

1. Suspended front axle chassis subframe
   This is a component of the hydropneumatically-suspended front axle. The frictionless interaction between its durable, maintenance-free damping components and fastening elements leads to reduced noise generation, superior vibration damping and enhanced comfort.

2. AS-3000 Agrosteer steering axle
   A high ratio in the planetary drive of the AS-3000 Series steering axle ensures optimum efficiency, slim axle design and excellent ground clearance, while still withstanding high loads. Steering angles of up to 55 degrees provide high levels of maneuverability and cross-country mobility, combined with low soil stress due to precise steering geometry. Careful attention to the sealing of this axle means that it can be used in flooded fields where necessary without detriment to reliability or long service life. The AS-3000 series covers the power range from 75 to 180HP.

3. ZF-Terrasteer steering axle
   Versatile steering axle ZF-Terrasteer combines high efficiency with a modular design, lowering operating costs and providing the vehicle manufacturer with more flexibility to meet individual customer requirements. The design incorporates a limited-slip differential and integrated steering cylinder. Two versions are currently available, covering the 180 to 230HP power range.
Active suspension systems

4 Continuous Damping Control (CDC) for cabins CDC eliminates the need to compromise between comfort and stability in the cabin. It offers considerably enhanced ride comfort, especially in off-road situations and reduces driver fatigue through dynamic adjustment of damping forces.

Cabin suspension

5 Shock absorbers for the driver’s cab are available in two designs. The steel spring and shock absorber modules are of robust design and operate independently of other systems while occupying very little space. They feature an adjustable spring base to enable the units to be used with cabins of different weights. The air spring and shock absorber module is used to provide a high standard of comfort on medium or heavyweight vehicles. These units are also available with the CALM (Cabin Air Levelling Module), which incorporates a unique design of level control valve within the air spring module.