Steering innovation

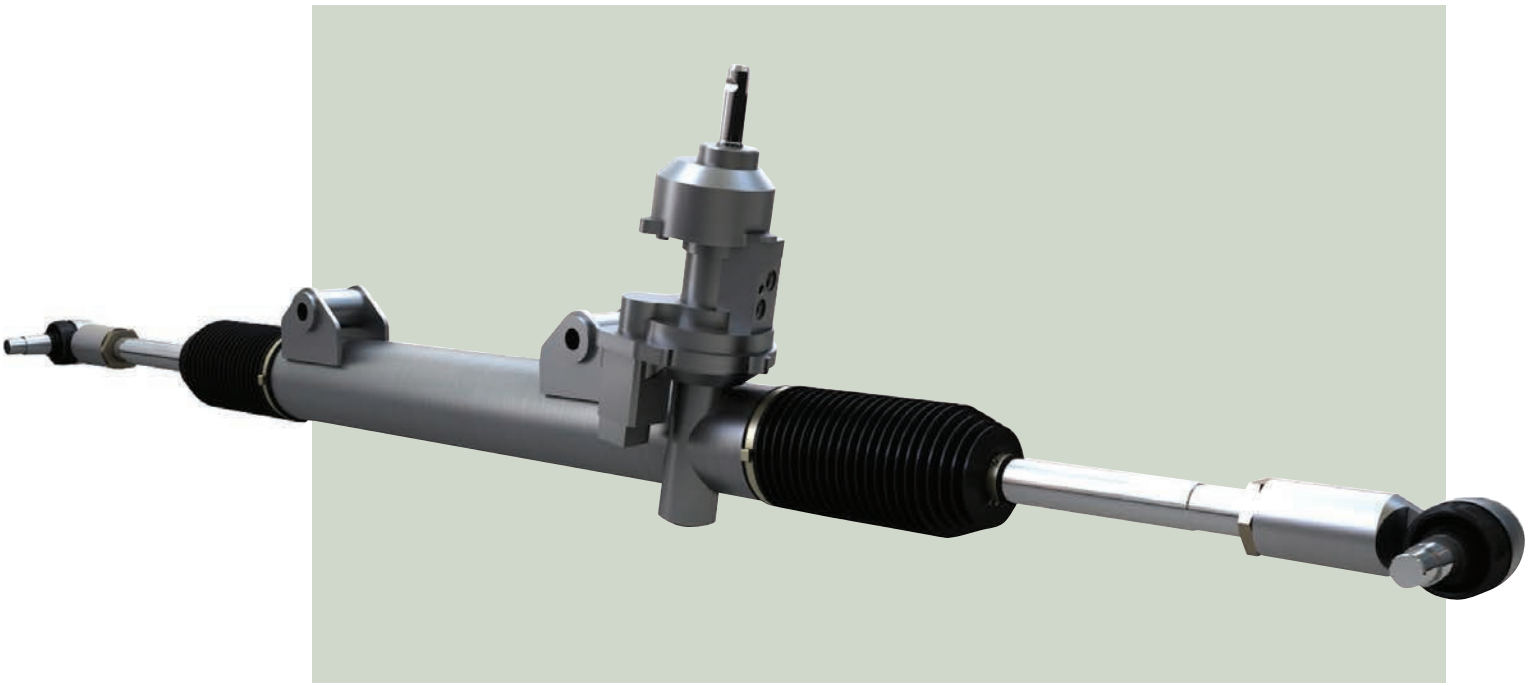

FIGURE 1: **TEDRIVE'S RACK-AND-PINION STEERING WITH ITS PATENTED IHSA MODULE**

At this year's IAA Commercial Vehicle Show, Tedrive Steering Systems GmbH launched two new and compelling technologies that hold a unique place in steering technology. One is the world's first truck rack-and-pinion steering gear with its patented iHSA module (see Figure 1). As a second innovation, Tedrive has implemented the iHSA module into recirculating ball steering systems for heavy-duty trucks and buses (see Figure 2).

With Tedrive's active recirculating ball steering systems, heavy trucks and buses can now be steered without driver input for active lane-keeping, and equipped with a range of additional functions such as commercial vehicle park assist, crosswind stabilization, as well as further safety and comfort features. With these new technological developments, the German specialist has established itself firmly as a comprehensive provider of automotive steering systems.

Active lane-keeping assistance for heavy commercial vehicles with intelligent hydraulic steering assist (iHSA) is a CO_2-optimized hydraulic steering system with all the safety and comfort functions of electromechanical power steering (EPS). It enables the integration of various active features – such as lane-keeping, crosswind compensation, trailer stabilization, and park assist – into hydraulic steering systems for heavy commercial vehicles and buses.

Tedrive is offering an iHSA application for both recirculating ball steering and rack-and-pinion systems (see Figures 3 and 4). Peter Heimbrock, head of development for Tedrive Steering Systems, explains: "In recirculating ball systems the steering input from the driver is transferred into a central block steering gear. This movement is then transmitted to the wheels via steering arm, push rod, and steering tie rod. While effective, it is also a complex system set-up with high part-count and of considerable weight. Rack-and-pinion systems can do the same job but with less part complexity, and are therefore also lower weight. Also the ride and handling performance will be improved significantly."

Taking a modular approach to its technologies across all vehicle classes, Tedrive has developed a number of different technologies to facilitate the use of rack-and-pinion steering with rigid axles, as well as with independent suspension. A new modular steel-housing rack-and-pinion design for HCV steering up to more than 7 metric tons front-axle load and the implementation of

FIGURE 2 (RIGHT): **TEDRIVE HAS IMPLEMENTED THE IHSA MODULE INTO RECIRCULATING BALL STEERING SYSTEMS FOR HEAVY-DUTY TRUCKS AND BUSES**

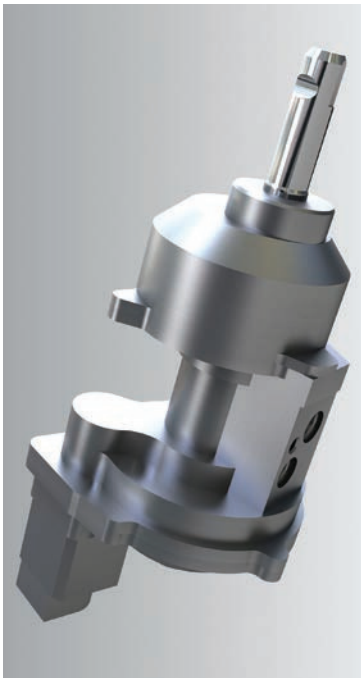

FIGURE 3 (FAR LEFT): **TEDRIVE'S IHSA MODULE FOR RECIRCULATING BALL STEERING SYSTEMS**

FIGURE 4 (LEFT): **TEDRIVE'S IHSA MODULE FOR RACK-AND-PINION STEERING**

further improvements in sealing and mounting also make it possible to meet extremely demanding durability requirements. In rack-and-pinion steering, the push rod and steering tie rod are directly replaced by the steering gear, thus significantly improving the steering feel. The number of components required is reduced, leading to a considerable saving in weight and cost, as well as less assembly complexity for Tedrive customers. Systems can now also be run at high pressures with a reduced minimum volumetric flow in the steering system, resulting in noticeable fuel savings and an associated reduction in CO_2 emissions.

It also makes sense to equip Tedrive rack-and-pinion steering with a Tedrive iHSA module. The use of this intelligent hydraulic steering assist enables the generation of steering input independently from the driver, making it possible to implement all the safety and comfort features familiar from the passenger car sector in the heavy vehicle classes for the first time using a 'plug-and-play' approach. This means, for example, that HCVs can also be equipped with an active lane-keeping assistant for the avoidance of serious accidents.

The hydraulic technology is variable, independent of front axle load, and environmentally friendly. Alongside the improved steering functionality, plus-points include optimized installation, cost and design benefits for platform strategies, and the CO_2 savings potential from the pump and steering gear. If the steering system is connected to the associated driver assistance systems via an interface, iHSA is able to perform the kind of comfort and safety functions that were previously the preserve of EPS systems from the passenger vehicle sector.

Whether in connection with rack-and-pinion, or with the conventional recirculating ball steering gears using plug-and-play, the use of iHSA technology represents a new approach to realizing active lane-keeping assistance beyond the familiar lane-departure warning systems. It is now possible to initiate steering without driver input and to implement all the safety functions familiar from the passenger car sector. With iHSA technology, Tedrive is helping commercial vehicle/bus manufacturers and fleet managers to comply with EC regulation 661/2009, which makes lane-keeping assistance mandatory for vehicle classes M2/M3/N2/N3 as of November 2013. This requirement is currently being met by an acoustic, visual, or haptic warning signal to the driver. However, the implementation of iHSA also facilitates active lane-keeping. This means that HCVs and buses can now be kept in lane without input from the driver, i.e. actively, thus significantly reducing the risk of an accident.

The Tedrive innovation also compensates for surface ruts and provides crosswind stabilization. Steering assistance adapts to the prevailing conditions, thus delivering considerably lighter and more precise steering characteristics. Alongside these functions, however, it is now also possible to implement new comfort and convenience features such as assistance with parking and maneuvering.

The packaging space required in either set-up is virtually the same as that of the conventional system. The scalable modular solution of Tedrive's recirculating ball steering system offers commercial vehicle and bus manufacturers great flexibility, as well as increased comfort and safety, paired with a high degree of performance density and environmental compatibility.

In order to expand its product portfolio to include recirculating ball steering systems, Tedrive has also acquired Chemnitz-based steering specialist RBL Brems- und Lenksysteme GmbH, making Tedrive a fully comprehensive provider of steering technologies. Tedrive steering systems now span all vehicle segments, from lightweight design for e-mobility, through to recirculating ball steering for heavy commercial vehicles and buses, making Tedrive a one-stop-shop for every OEM's steering needs.

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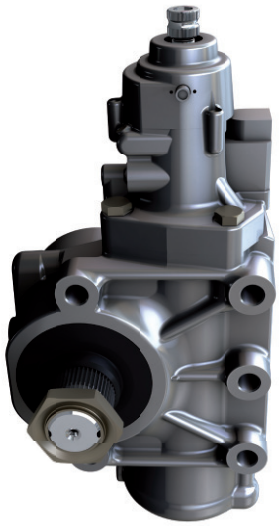
TEDRIVE IHSA® ACTIVATES STEERING SYSTEMS



In the commercial vehicle sector, tedrive premieres its patented iHSA® module, the intelligent Hydraulic Steering Assist. The iHSA® module can be integrated into tedrive rack & pinion and tedrive recirculating ball steering systems, offering commercial vehicle manufacturers a high degree of design and functional flexibility for all hydraulic steering systems. The result is a compelling combination of optimized ride and handling performance, comfort and safety, with the optional iHSA® module facilitating functions such as active lane-keeping aimed at reducing serious accidents. With the iHSA® torque overlay, heavy trucks and buses can now be steered without driver input for active lane-keeping, and equipped with a range of additional functions such as CV park assist and crosswind stabilisation.

TEDRIVE STEERING – SUPERIOR STEERING FOR STRONG VEHICLES

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