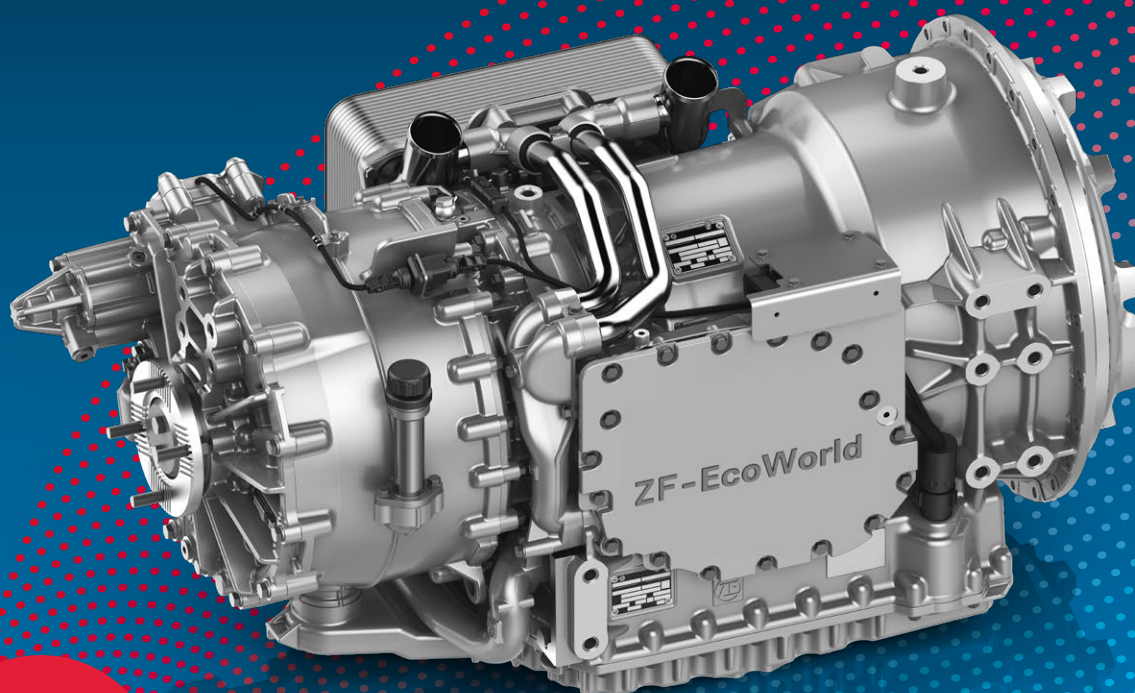




EcoWorld

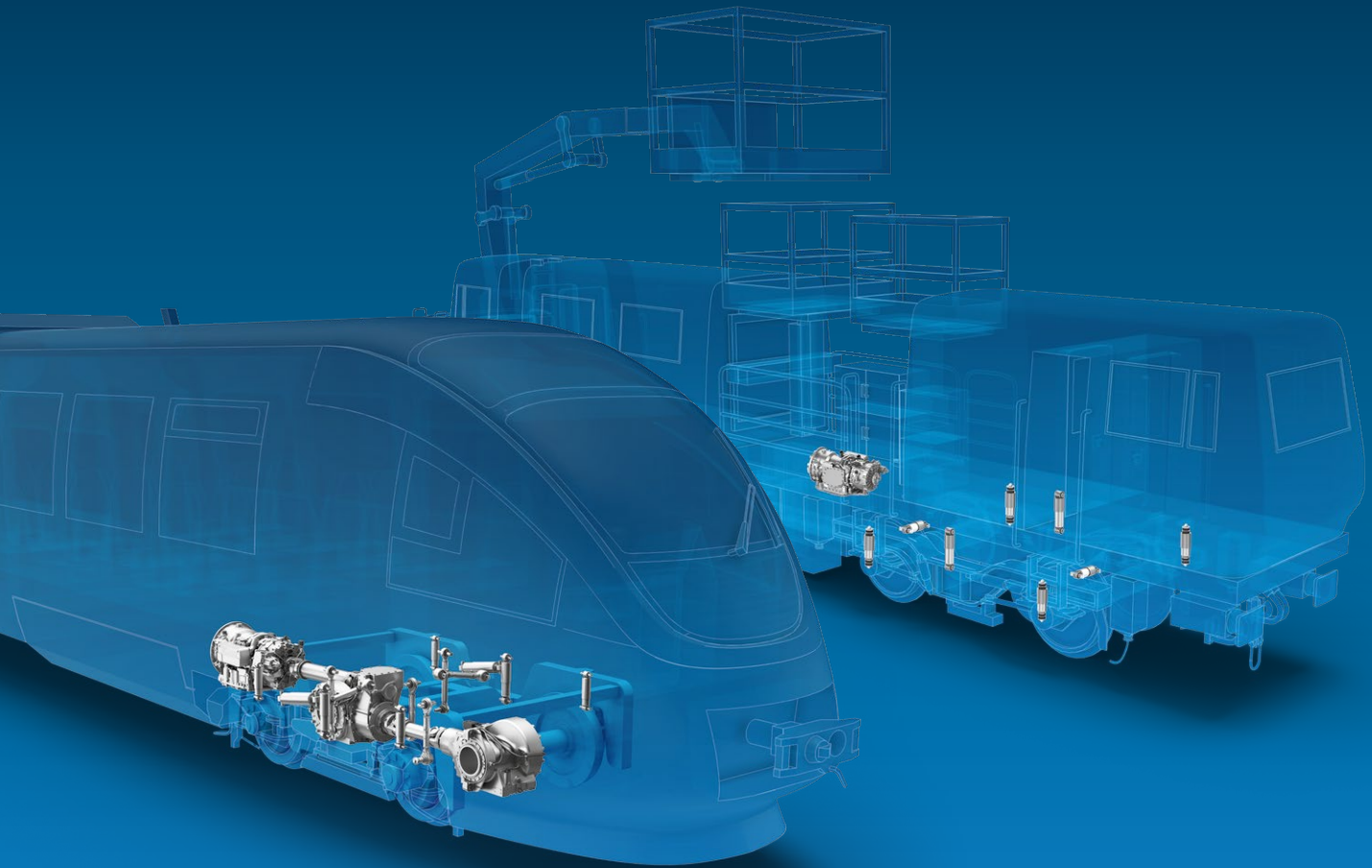
Fuel-saving hydromechanical transmission for
Diesel Multiple Units and Multiple Purpose Vehicles



20%
fuel savings

Contents

- 04 Cost-efficient transmission for DMU and MPV
- 05 Repowering for more profitability
- 06 Technical data
- 07 Systematic enhancements



**Powerful and
cost-effective**

Sustainable mobility concepts for tomorrow must meet the requirements of modern society with regard to speed, safety, comfort, and sustainability. At the same time, solutions are needed now to deal with current challenges in terms of increasing energy costs, fuel prices and CO₂ pollution.

For rail transport, this is possible with driveline, chassis and safety technology by ZF. Innovative ZF drive systems for Diesel Multiple Units (DMUs) and Multiple Purpose Vehicles (MPVs) benefit from transmission technology which has been tried and tested millions of times in road traffic. In addition to more driving comfort and safety, they also offer significantly reduced fuel consumption and CO₂ emissions, a key factor for successful operators.

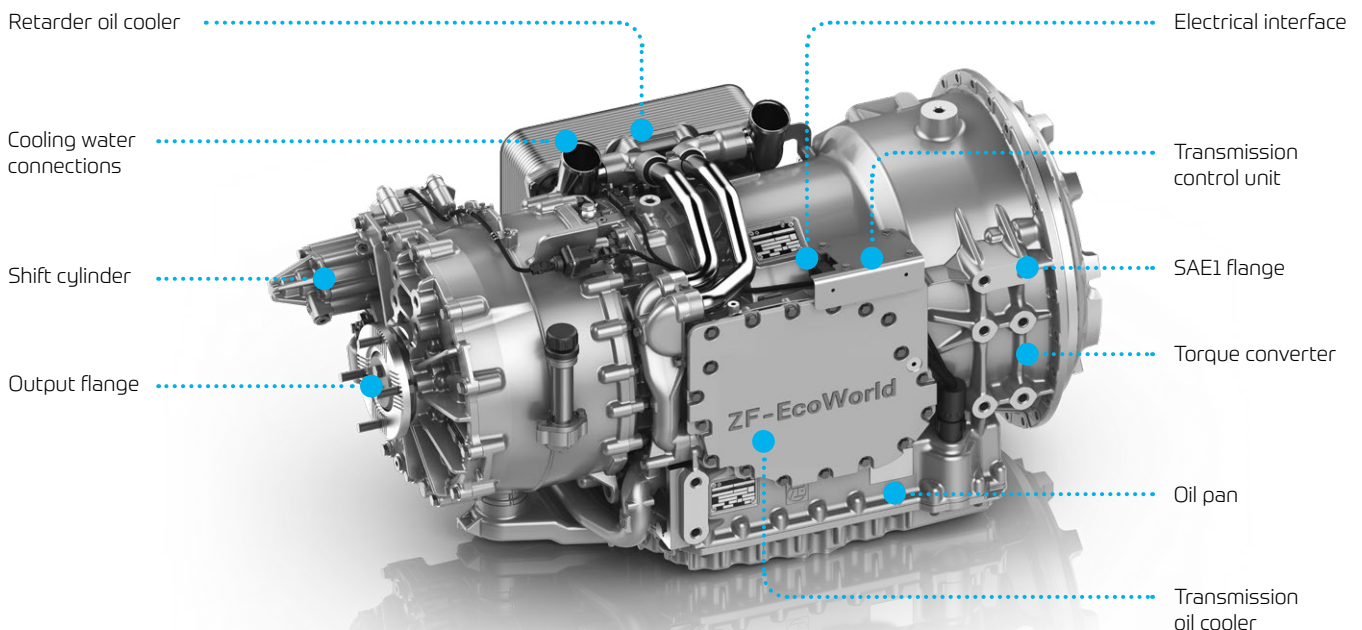
Up to 20 percent fuel savings in comparison to hydrodynamic transmission

Six speeds in both directions, plus integrated retarder

The consistently further developed six-gear powershift transmission EcoWorld features an integrated reversing function and is used in DMUs (Diesel Multiple Units) and Multiple Purpose Vehicles. It provides a towing function, as well as a coasting function which can save additional fuel depending on the route, engine type and load condition. The transmission achieves maximum efficiency and is equipped with a powerful torque converter. All transmission functions are controlled by electronics fitted directly on the transmission (transmission control unit). EcoWorld can be used for new vehicles and for the field of repowering.

Highlights EcoWorld

- Powershift transmission with hydraulic converter and 6 gears bi-directional
- Integrated reversing function
- Reduction of CO₂ emissions
- Very compact, lightweight design
- Flexible adaptation to driveline (acceleration, tractive force and speed)
- Enables towing and coasting function





Repowering for more profitability

Fuel costs account for two-thirds of an operators asset Life Cycle Costs (LCC), improving vehicle efficiency is more and more important and challenging than ever.

Modern drive systems that contribute to saving fuel and increasing the vehicles' life cycles are becoming more and more important. The ZF repowering package is an economic solution to meet these requirements.

For existing diesel train units and special vehicles, in terms of technology, the outdated main transmission is replaced with a state-of-the-art, more cost-effective and economic driveline. The engine, existing bogie with it's axle drives are not affected. Optimised mechanical gear ratios work to keep the engine in the best economical speed range, especially while accelerating and driving at lower train speeds. The ZF driveline also reduces waste heat significantly, improving the train cooling system capacity and at the same time generating substantially less CO₂ emissions.

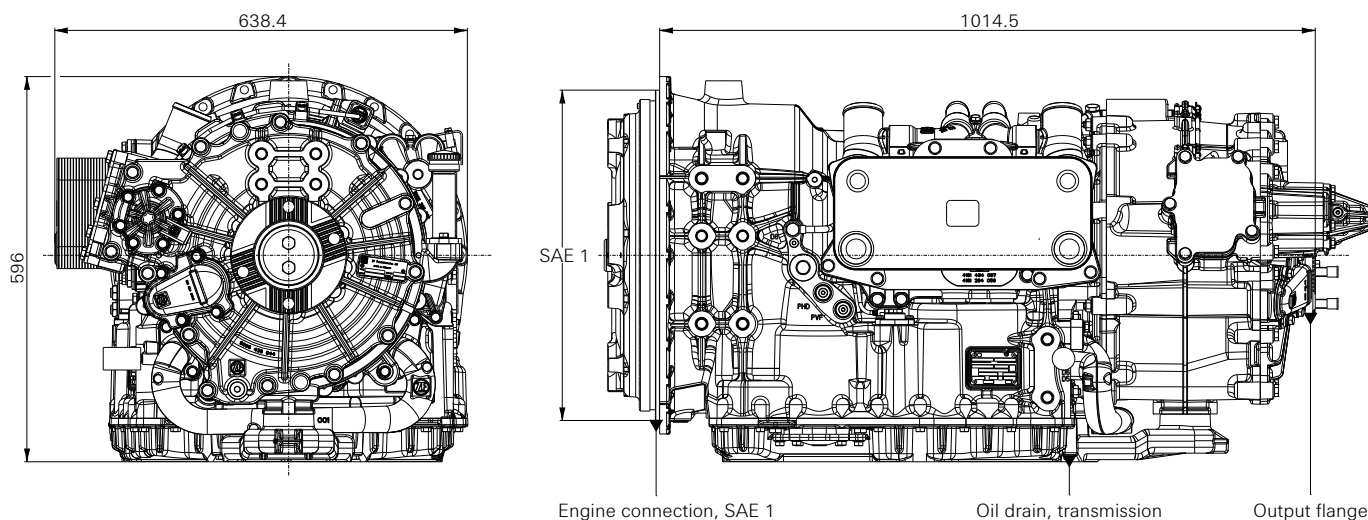
EcoWorld is also an ideal solution for Repowering

- Significant reduction in Life Cycle Costs (LCC)
- Rapid return on investment
- Much lower oil quantity for every oil change
- Better train acceleration
- Dynamic, comfortable starting
- Low noise emission and environmental impact
- Compliant with safety standards IEC 61508 and CENELEC 5012x
- Compliant with safety integrity Level SIL2

For more information on Repowering:
www.zf.com/rail



Technical Data



Input torque	Input power	Input speed	Retarder (heavy duty)	Length	Weight without oil
[Nm]	[kW]	[rpm]	[Nm]	[mm]	[kg]
max. 2,500	up to 600	max. 2,600 (2,100)*	up to 1,900	1,013	501

* In sixth gear

Maintenance interval	Oil change interval	Transmission oil
750,000 km or 20,000 hours	180,000 km or 3 years	Lubricant class 16N / 16Q (acceptable TE-ML 16)

Features/function

- Integrated primary retarder
- Electric oil level sensor
- Continuously high brake force right down to low speeds
- Central electronic control unit directly on the transmission
- One standard electrical interface
- No additional pneumatics, integrated hydraulics
- Short shifting times
- Can be used in powerpacks and remote-mounted installations

Systematic enhancements

In parallel with the EcoWorld, ZF offers a newly developed wheelset transmission. The result is a new drive system that can be combined with a range of axle ratios, which opens further application fields. This makes it suitable for slow speed operations purposes as well as for fast rail vehicles in long-distance transport. At higher ratios, EcoWorld also handles steep gradient changes with ease.

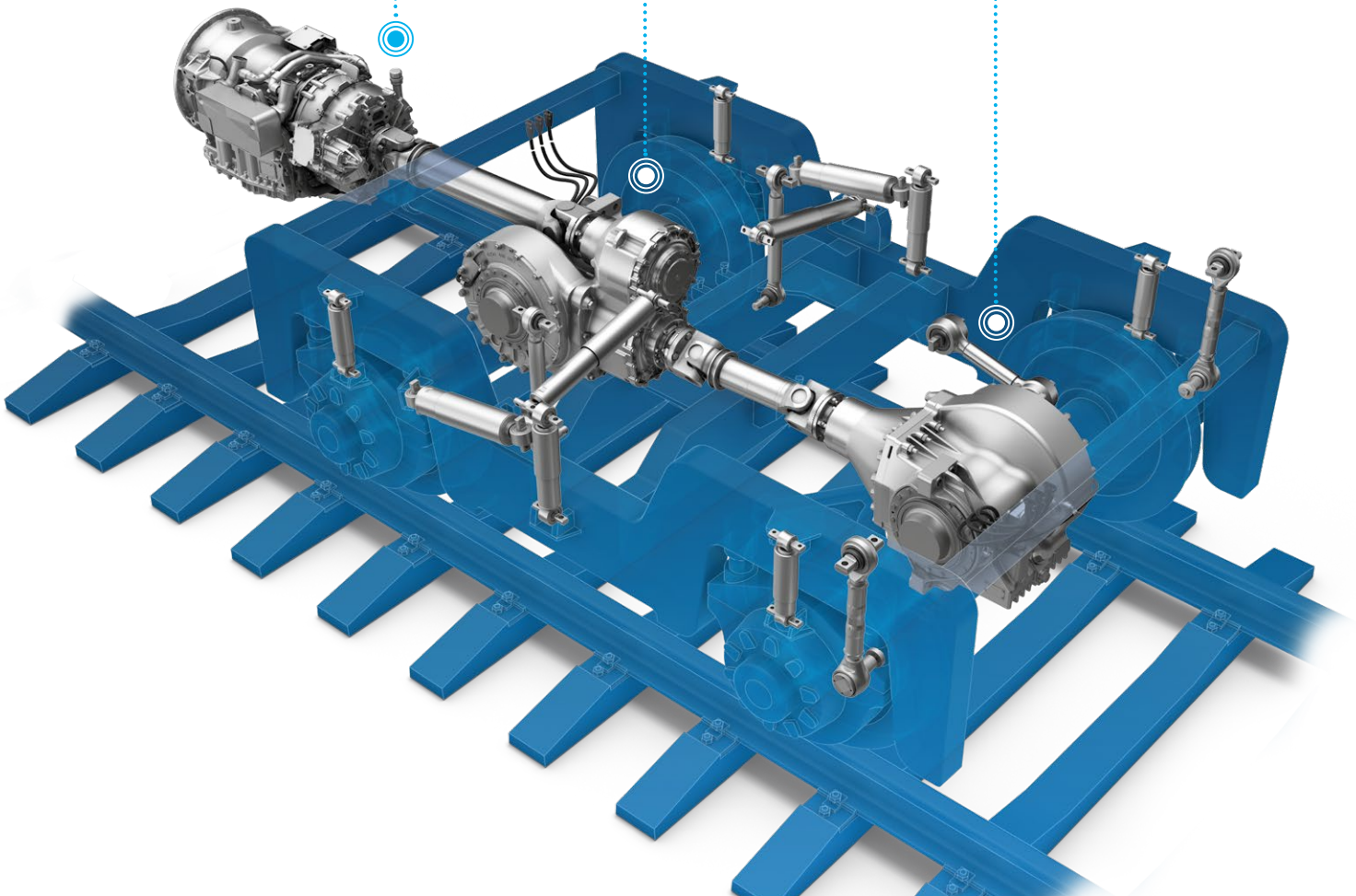
Highlights ZF Wheelset Transmission

- Robust and tested components for utmost reliability
- Master- and slave-combination with hypoid gears
- Max. input torque: 12,000 Nm
- Max. input speed: 3,500 rpm
- Ratio variants: 2.26; 2.47; 2.78; 3.27; 3.58; 4.03; (3.5; 3.83; 4.3)*

*Available ratios for Multiple Purpose Vehicles with specialized spur gear module

Optional Condition Monitoring

Smart Typeplate, bearing temperature monitoring, acceleration sensor, oil level sensor



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